Toward a Blue Economy: A Promise for Sustainable Growth in the Caribbean

WORLD BANK GROUP

Suggested Citation: Patil, P.G., Virdin, J., Diez, S.M., Roberts, J., Singh, A. (2016). Toward A Blue Economy: A Promise for Sustainable Growth in the Caribbean; An Overview. The World Bank, Washington D.C.

Artist Statement

We refer to Mother Earth as our blue planet. Have you ever wondered why? We grow up looking at maps and our eyes fix on the familiar, six continents full of countries with people, mountains, forests and rivers. When we spin our desktop globes fast, however, a transformation takes place and the world spins blue!

Our world is indeed a blue planet with over 70 percent of the earth's surface covered by oceans and seas, our global ocean. Much of it is unknown and unexplored, a new frontier for discovery. Yet, many things take place on and within the ocean space ranging from commerce and trade to fishing and leisure.

Our cover art depicts our planet from the perspective of our major oceans, viewing our world bottom up and centering on the Southern Ocean surrounding Antarctica. What emerges is the shape of the world from our ocean-centered view and shows just how much blue covers earth.

The many images inside the globe suggest how full our oceans are. Our global ocean is full of life - coral reefs, whales and sea turtles that drive tourism; and fish of all shapes and sizes that feed billions. Yet, as we know, the ocean - and its underlying value - is under threat from climate change and other human induced threats.

The colors associated with each of the seventeen United Nations Sustainable Development Goals, including the one for oceans, SDG14, surrounds our ocean-centered globe. Our global ocean will likely be vital in their achievement.

Through the magnifying glass, we invite you to take a closer look at our global ocean and in particular, the Caribbean Sea and its transformation toward a blue economy.

Cover Credit: Helena Eitel & Pawan Patil, Ocean Art

REPORT NO: AUS16344
SEPTEMBER 2016

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Acronyms and abbreviations

CCI	Caribbean Challenge Initiative
CLME	Caribbean Large Marine Ecosystem
CMSP	Coastal and Marine Spatial Planning
CRFM	Caribbean Regional Fisheries Mechanism
CRIFF	Caribbean Catastrophic Risk Insurance Facility
DOWA	Deep Ocean Water Applications
ECROP	Eastern Caribbean Regional Oceans Policy and Action Plan
EEZ	Exclusive Economic Zone
EIA	U.S. Energy Information Administration
FOSP	Future Ocean Spatial Planning
GDP	Gross Domestic Product
GEF	Global Environment Facility
GNI	Gross National Income
IEA	International Energy Agency
ICT	Information and Communication Technology
IUU	Illegal, Unregulated and Unreported
MPA	Marine Protected Area
MSP	Marine Spatial Planning
NPV	Net Present Value
OECD	Organization for Economic Co-operation and Development
OECS	Organization of Eastern Caribbean States
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
TEU	Twenty Foot Equivalent Units
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	UN Framework Convention on Climate Change
UWI	University of the West Indies
WATO	We are the Oceans
WTTC	World Travel and Tourism Council

Glossary of terms

OCEAN ECONOMY **a.** Ocean Service **b.** Economic Sector/ Industry	The economic activities that take place in the ocean, receive outputs from the ocean, and provide inputs to the ocean (Park and Kildow 2014). **a.** Economic activity of the ocean economy that provides benefit to people **b.** Specific area or group of companies in the ocean economy
OCEAN'S NATURAL CAPITAL ASSETS **a.** Living Resources **b.** Nonliving Resources **c.** Ecosystems and Ecosystem Processes	The total available biophysical stock of natural resources in the ocean, for example, fish stocks, minerals and energy resources, mangrove forests, and so on, (Narloch, Kozluk, and Lloyd 2016) comprising: **a.** Renewable stocks of natural resources that are harvested for use, such as fisheries; **b.** Nonrenewable stocks of natural resources harvested for use, such as minerals from the seabed; and **c.** The interaction between the living and nonliving environment as a functioning unit (for example, coral reef ecosystems, mangrove ecosystems, and so on) (MEA 2005).
OCEAN POLICIES	The policies that affect the health and wealth of the ocean.
BLUE ECONOMY **a.** Blue Economy Framework **b.** Blue Economy Indicators **c.** Blue Growth	A sustainable ocean economy, where economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy (Economist Intelligence Unit 2015). **a.** Graphic illustration of the complex relationship between the economic activity and ecological systems in the ocean space. **b.** Indicators to measure changes in the inputs received by the ocean economy from the underlying natural capital (as a factor of production), and at the same time the outputs from that economy that impact or affect the levels of this natural capital. **c.** Growth in the blue economy or sectors of the ocean economy consistent with the definition of the blue economy.
BLUE ECONOMY POLICY FRAMEWORK **a.** Coastal and Marine Spatial Planning	An operational policy agenda to foster economic growth and development in ocean spaces, while ensuring that the ocean's natural assets continue to provide the resources and environmental services on which human well-being relies (OECD 2011). **a.** A public process of analyzing and allocating ocean uses over space and time to achieve economic, ecological, and social objectives (Ehler and Douvere 2007).

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Foreword

Since Rio+20 the blue economy has gained momentum across the globe and the Caribbean region seems poised to embark on a pathway toward sustainable blue growth. More and more coastal and island nations are looking at the ocean as the next frontier for economic development. By harnessing the marine and coastal resources, Caribbean countries could not only boost growth, but also tackle some of the key challenges faced by these economies including high unemployment, low growth, food security, poverty, as well as resilience to climate change.

The current Caribbean ocean economy represents more than 17 percent of the region's GDP. With the region's growing population, demand for seafood and therefore aquaculture production will increase, shipping traffic and tourism will continue to grow, and new ocean industries will emerge. At the same time, the ecological processes of the sea are changing significantly, due to human activities, resulting from overfishing, poorly planned coastal development, land-based sources of pollution (plastic entering the sea and untreated effluent), etc. The two overarching trends in the Caribbean Sea – growing ocean economy and declining ocean health, led Ministers to inquire about the blue economy concept at last year's G20 Development Committee dialogue with Caribbean finance ministers and central bank governors.

In response, *Toward a Blue Economy: A promise for Sustainable Growth in the Caribbean* will serve as a guide to help Caribbean policy-makers plan a successful transition to a blue economy and socially equitable 'blue growth'. This report attempts to quantify the current ocean economy in the region and summarize projections about where we may find new pockets of sustainable growth, and define the blue economy concepts and possible policy responses that might better align economic growth and environmental health in the Caribbean. At a global level, the transition to a blue economy will significantly contribute to achieve Sustainable Development Goal (SDG) 14 for the ocean and other goals such as poverty reduction, food security, energy security, climate change mitigation, among others.

The World Bank is supporting this important agenda for the Caribbean. We hope that this report will help policy makers identify smart policies to harness the ocean and all its natural assets, and enable a sustainable use of ocean resources for the well-being of Caribbean countries, as well as serve as a model to other regions pursuing the same efforts.

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World Bank Country Director for the Caribbean

Acknowledgments

This report, *Toward a Blue Economy: A Promise for Sustainable Growth in the Caribbean* was prepared by a multi-institutional team led by Pawan G. Patil, Senior Economist at the World Bank Group in collaboration with John Virdin, Director of Ocean Policy at Duke University's Nicholas Institute for Environmental Policy Solutions; Julian Roberts, Advisor on Ocean Governance at Commonwealth Secretariat; Asha Singh, Head of Ocean Governance at Organization of Eastern Caribbean States (OECS) during the preparation of this report and Sylvia Michele Diez, Environmental Specialist, Latin America & Caribbean Region at the World Bank.

The team is grateful to the participants of the G20 Working Group on the Caribbean Blue Economy who were consulted during the preparation of the report. The team also acknowledges the vision of Ambassador Dr. Angus Friday and the contributions of Ray Moldenhauer, Director of RM Strategies, who organized meetings and brainstorming sessions with the Government of Grenada on visioning their Blue Economy and participants of Grenada's Blue Week, whom provided valuable feedback. The report benefited from the research assistance from Tibor Vegh and contributions of Sunzhe Cao, Geoffrey Cooper, Julia Lewis and Prof. Jay Golden at the Duke Center for Sustainability and Commerce, as well as Daniel Dunn and Jesse Cleary, all from Duke University Nicholas School of the Environment; and to Peter Kristensen, Lead Environmental Specialist, Africa Region, World Bank and Emilia Battaglini, Lead Environmental Specialist, Europe and Central Asia Region, World Bank who served as peer reviewers. The team appreciated valuable insights, inputs, and/or support from Alessandro Legrottaglie, Sabine Hader, Francisco Galrao Carneiro, Cecile Thioro Niang, Kseniya Lvovsky, Raha Shahidsaless, Christelle Chapoy, Keiko Ashida, Juliana Isaza, and Helena Eitel, our Dickey Center Summer intern from Dartmouth College, among others who are also acknowledged with thanks.

The work was carried out with the multi-institutional support of Sophie Sirtaine, Country Director for the Caribbean Region, Paula Caballero, former Senior Director of the Environment and Natural Resources Global Practice and Raul Alfaro-Pelico, Practice Manager, Environment and Natural Resources Global Practice, all of The World Bank; Tim Profeta, Director of the Nicholas Institute for Environmental Policy Solutions at Duke University; Dr. Didicus Jules, Director General, Organization of Eastern Caribbean State; and Deodat Maharaj, Deputy Secretary General, Commonwealth Secretariat.

The report was formally edited by John Virdin, Duke University and Pawan G. Patil, World Bank. Any errors in the report, factual or otherwise are the sole responsibility of the core multi-institutional team members and editors.

Overview

Our global ocean covers more than seventy-two percent of the earth's surface and is responsible for providing food, jobs, and recreation for a large portion of the world's population and has become a significant driver of global GDP.[1] Our oceans drive economic activity, responsible for eighty percent of global trade, thirty-two percent of hydrocarbons extracted for energy needs, and for both domestic and international tourism for almost 200 countries and overseas territories. The contribution of the ocean economy to global value added has recently been estimated, conservatively suggesting its contribution is in the order of US$1.5 trillion annually, or roughly 3 percent of global value added.[2]

As more and more countries look to the ocean as a new economic frontier and new source of industrialization and growth, the ecosystems upon which many ocean economic activities depend are changing at an unprecedented rate, and not necessarily for the better. While our ocean is responsible for generating the oxygen we need for every second breath we take and can sequester up to five times more carbon than tropical forests, this important function is under threat due to climate change and other human-initiated factors. Maintaining and restoring ocean the functions and integrity of these ecosystems (i.e. 'ocean health') is now synonymous with growing ocean wealth. Sustainably developing ocean spaces for a nation's economic advancement and growth is the cornerstone to deriving economic benefit from its blue economy, and driving blue growth.

The 2012 Rio+20 conference first raised the notion of a "blue economy" and the need to stimulate "blue growth," particularly for island nations and developing countries with significant coastlines and/or maritime areas. This was further raised at the 2014 SIDS conference. Just as the green economy and green growth was once on the frontier of development planning and investment, its maritime-based equivalent has captured the imagination of policy makers, the United Nations, OECD, Commonwealth Secretariat, development finance organizations such as the World Bank, and NGOs alike. How to stimulate economic growth in ocean areas may be understood to many; but it is not clear what a sustainable ocean economy or blue economy should look like, and under what policies, conditions, and pathway is it most likely to develop.

Sustainably developing ocean spaces for economic growth and development while maintaining (or in fact improving) ocean health can define a new era of economic opportunity for ocean-facing countries. However, with each promise of ocean-based economic reward, comes a real risk to future generations. According to OECD (2016), many ocean-based industries have the potential to outperform the growth of the global economy as a whole, including boosting employment. The same report projects that over the next fifteen years through 2030, the ocean economy could more than double its economic contribution to GDP equivalent. The question remains, *at what cost, and to whom?* Notably, what role will the tens of millions of small-scale fishers throughout the developing world play in this economy?

The oceans are in trouble due to a range of man-made factors including overfishing, pollution, climate-change induced ocean acidification, among other factors, yet their potential for economic advancement is significant – notably for coastal and island developing countries, and particularly across the Caribbean. In June 2015, the G7 Science Academies issued a statement of scientific consensus, informing that human activities are leading to changes in the oceans' ecosystems that will significantly impact societies and well-being. This will undoubtedly have a direct impact on current and future economic growth of ocean-facing countries and small island developing states around the world. Better understanding of ocean ecosystems, and the value of natural marine assets and ecosystem services to both ecological processes and economic activity will help to assess a nation's ocean wealth, and in doing so better define a pathway to support the growth of a country's blue economy.

1 According to the World Bank, more than 350 million jobs are directly linked to marine resources such as fisheries, with ninety percent of those jobs coming from the developing world.
2 OECD (2016); The Ocean Economy in 2030. OECD, Paris.

Executive summary

This report attempts to demystify and define the blue economy for Caribbean policy-makers, a new concept being discussed within development circles and emerging as a new development paradigm for the sustainable development of our oceans and seas (Sustainable Development Goal 14) and particularly for the economic growth and development of ocean-facing countries, including Small Island Developing States (SIDS). Better understanding the challenges and opportunities for developing a blue economy for countries that share the Caribbean Sea was chosen as the regional focus for this report, in response to a series of questions first raised by finance ministers and central bank governors during the inaugural Caribbean Region Dialogue with the G20 Development Working Group in April 2015. This Dialogue was convened to better understand how to (a) develop a so called blue economy across the Caribbean and (b) mobilize resources in support. Basic questions raised during the dialogue, such as: *what is the blue economy and why is it important for the Caribbean?* were left largely unanswered. This report aims to provide such answers, to guide Caribbean policy-makers towards the transition to a blue economy, and socially equitable 'blue growth.'

The hypothesis of this report is that the Caribbean Sea's ecosystems and natural resources form a unique asset for the region's countries and territories, and that understanding and measuring the economic activity tied to this asset, and dependent upon it, is essential for sustainably growing these economies or supporting sustainable and equitable growth or *blue growth*. Better understanding of this new frontier will contribute to more informed decision-making over existing ocean assets, and as a result, greater economic resilience for the region. More importantly, this natural resource, if well managed, has a potential to make a much greater contribution to poverty reduction and shared prosperity for the region's growing population of 40 million, as well as increasing their resilience to climate change. Countries across the eastern Caribbean in particular have been affected by a series of adverse events, including the erosion of trade preferences; the decline in official foreign assistance; turbulence in the business cycles of the countries that matter the most for the region in terms of tourism revenues and foreign direct investments; and recurrent natural disasters.[3] With greater clarity on how to derive growth from their blue economies, these countries also have an opportunity to build greater resilience to exogenous shocks.

The report also serves as an important first step to re-orient the long-standing conventional wisdom that largely focuses on estimating the costs and benefits of protecting our ocean to estimating the true potential of the ocean as an economic space and engine for growth, while developing associated policies to better manage their sustainable use. This approach would help ensure that the basic needs of people are met without further adverse cost to the health of the Caribbean Sea. Essentially, this report speaks to the contribution that ocean ecosystem services play in delivering sustainable and resilient development outcomes and promotes the blue economy as a new frontier to stimulate sustainable and shared economic growth and development derived from well-managed ocean assets.

The report is structured in four chapters that together, respond to the fundamental questions raised by decision-makers within finance ministries and central banks across the Caribbean. Chapter 1 provides a working definition of the ocean economy and the blue economy concepts, and explains

3 Taming Volatility: Fiscal Policy and Financial Development for Growth in the Eastern Caribbean; Report No: AUS15511, World Bank, 2016.

why these terms are growing in importance globally and specifically across the Caribbean. The chapter cites recent studies, notably from the OECD, that suggest the ocean economy is globally valued conservatively at over one and a half trillion US dollars in 2010. The same studies suggest that the contribution of the ocean economy to global wealth is growing (notably as a share of national wealth for many coastal and island countries) and likely to do so for coming decades according to current trends (in what has been termed in some cases as a new wave of 'industrialization' in the ocean).

Chapter 1 also estimates for the first time the gross revenues generated by the ocean economy in the Caribbean as a baseline for future policy, which are estimated at US$407 billion (as of 2012), equivalent to some 14 to 27 percent of the estimated value of the global ocean economy (though the Caribbean Sea covers less than one percent of the area of the global ocean). The composition of this economy is dominated by the estimated value of the volume of cargo shipped through the Caribbean Sea, together with tourism and oil and gas in the region's island states and territories. The chapter concludes with a synthesis of current projections for growth in the ocean economy of the Caribbean, highlighting potential opportunities in aquaculture, tourism and coastal carbon sequestration (i.e. 'blue carbon') among others.

Chapter 2 deconstructs the ocean economy, suggesting that a significant portion of the economic value derived from the ocean is based on the natural resources and ecological systems that function in economic terms as the ocean economy's natural capital asset base. The chapter describes this *natural ocean capital* as consisting of three components: renewable stocks or *living resources* that are harvested for use such as fisheries, non-renewable stocks or *non-living resources* harvested for use such as minerals from the seabed, and *ecosystems and ecosystem processes* that represent the interaction between the living and non-living environment as a functioning unit (e.g. coral reef ecosystems, mangrove ecosystems, etc.). This chapter then synthesizes the current information available to present a snap shot of the status of the Caribbean Sea's natural capital, which indicates that it is being depleted, largely due to the anthropogenic drivers of overfishing, coastal development, pollution, introduction of invasive species and the impacts of climate change – the implication being declining ocean health means declining ocean wealth.

Importantly, chapter 2 does not exclude the intrinsic values that ocean ecosystems may have or suggest that their economic values are of greater priority, but rather emphasizes the connection between the ocean's ecological systems and the economic activity defined in the ocean economy. The chapter illustrates that status of the Caribbean Sea large marine ecosystem is intimately linked to the long term economic growth of the region, whether directly supporting key sectors of the ocean economy in the Caribbean, or impacted by others and constituting a risk to their growth.

Chapter 3 attempts to reconcile two global and Caribbean region-specific trends – a growing ocean economy and declining natural capital asset base – and suggests that reformed and integrated policy packages are necessary for sustainable development of countries' ocean space and long-term growth from their ocean economies. The report points out that two overarching ocean use trends have become clear at both the global level and for the Caribbean Sea: *growing economic activity (see Chapter 1), together with human-driven changes in ecological systems that have reduced the ocean's natural capital (e.g. decreasing fish stocks, alteration of coastal ecosystems, increased pollution, etc. – see Chapter 2).* The report raises and answers a key question: if all indications suggest that the first trend (growth in the ocean economy) is at an early stage, what are the implications, given the second trend (an eroding ocean asset base and therefore declining ocean health)?

Chapter 3 also presents the blue economy concept and a conceptual framework to better understand it, as a guide to help policy-makers reconcile the trends in a growing ocean economy and declining ocean health. That a sustainable ocean economy emerges when economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy while intuitively simple, has not yet been made explicit, *The blue economy* concept emerges as a lens by which to view and develop policy agendas that simultaneously enhance ocean health and economic growth, in a manner consistent with principles of social equity and inclusion. The chapter proposes a blue economy conceptual framework to illustrate the inputs received by the ocean economy from the underlying natural capital (as a factor of production, providing a non-market flow to the ocean economy[4]), and at the same time the outputs from

4 OECD (2016) The Ocean Economy in 2030. OECD, Paris.

that economy that impact or affect the levels of this natural capital and the flows of benefits that they can sustainably provide. On this basis, the chapter proposes a generic blue economy policy framework to guide policy-makers in the transition, and suggests some consideration for both monitoring and financing a blue economy. The chapter then suggests some examples and benefits of applying this policy framework in the Caribbean, highlighting discussions around 'blue growth' sectors such as aquaculture, marine renewable energy, nature-based tourism and green infrastructure restoration, among others.

Chapter 3 does not purport to model the transition to a blue economy in the Caribbean, though the conceptual framework proposed could be the basis of a future blue economy model in the region. However, the chapter does propose a conceptual framework, generic policy framework and examples of policies to promote 'blue growth' undertaken by the Organization of Eastern Caribbean States (OECS) in 2013 and more recently by the Government of Grenada, to illustrate the benefits of a blue economy approach and the potential risks in failing to account for the ocean's natural capital. In doing so, this chapter answers the unresolved question posed by Caribbean finance ministers and central bank governors: *what is the blue economy?* While our proposed policy framework for a Caribbean Blue Economy conceptualizes an ocean economy that (a) measures natural ocean capital, (b) manages competing uses of the ocean space in order to better conserve natural capital, enhance social benefits and reduce conflicts, and (c) spurs innovation and investment in sectors and technologies that simultaneously increase economic benefits and natural ocean capital, the same framework can be adopted to any region and globally too. The OECS region, and in particular Grenada, has led the transformation to a blue economy in the Caribbean, and can offer best practice 'blue' solutions to be applied at a sub-regional and national levels. In global terms, the chapter also suggests the wide-ranging contribution that the transition to a blue economy could make towards achieving a number of the targets set for at least ten of the Sustainable Development Goals (SDGs), in addition to SDG 14 for the oceans.

Chapter 4 offers an *approach* for consideration by decision-makers to serve as a guide in enabling a transition toward a Caribbean blue economy. Specifically, the approach calls for decision-makers across the Caribbean region to consider three core recommendations: (1) Allow a set of *Ocean Principles* to help guide direction and needed investment to transition toward a blue economy; (2) Review, discuss & adopt a *Blue Economy Policy Framework* governed by a set of proposed policy priorities to enable such a transition, and (3) Consider five key action-oriented *Ocean Strategies* to sustain the transition. While the proposed Ocean Principles and Policy Framework under which to consider them are discussed in detail in Chapter 4, we conclude this executive chapter summary with a more detailed review of five proposed Ocean Strategies, which may provide policy makers with a more action-oriented lens through which to read this report.

These five key strategies (with accompanying actions) which could enable and sustain a transition to a Caribbean Blue Economy include: *Strategy 1: Measure both the region's ocean economy and natural capital*; Action 1.1: Improve the statistical and methodological base for measuring the scale and performance of the ocean economy; Action 1.2: Establish natural capital accounts for the Caribbean Sea at the national and regional level; *Strategy 2: Manage the Caribbean ocean space in a more integrated manner;* Action 2.1: Create/expand integrated approaches to ocean governance; Action 2.2: Apply marine spatial planning at the scale of EEZs; Action 2.3: Invest in restoration and maintenance of marine ecosystem function and integrity, with a focus on protecting critical ecosystems and ecosystem processes; Action 2.4: Build and strengthen the institutional and human capacity to act; *Strategy 3: Invest in sustainable growth and key public goods*; Action 3.1: Promote Ocean Principles to guide investment in the blue economy; Action 3.2: Advance key infrastructure investments; *Strategy 4: Monitor the transition over time*; Action 4.1: Continue to enhance knowledge of the Caribbean Sea; Action 4.2: Expand maritime domain awareness of the Caribbean Sea; Action 4.3: Track key indicators for the transition to a blue economy; and finally, *Strategy 5: Repeat steps 1–4, adapting based on experience*.

This report serves as an important first step to assessing the true potential of the ocean as an economic space and engine for growth, while developing associated policies to better manage their sustainable use. At the same time, this report attempts to demystify the blue economy, explaining what it is and why it matters, particularly to Caribbean nations. It is our hope, that this report serves as an important input to an evolving discussion that will enable policy makers to find better ways to harness the ocean and all its natural assets to enable a long-lasting and sustainable use of ocean resources for the betterment of citizens of Caribbean Sea-facing countries and the region and the planet as a whole.

1 The Growing Ocean Economy

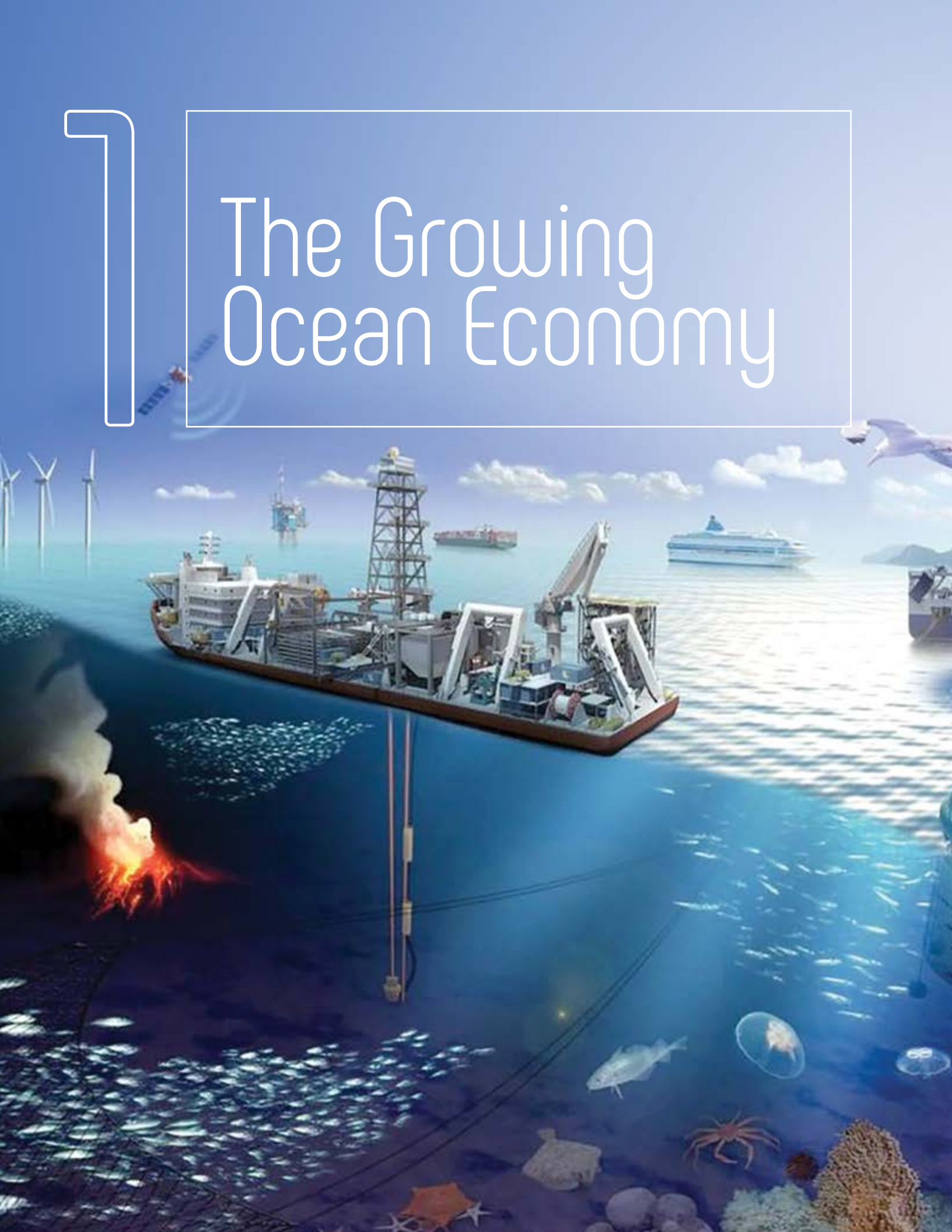


Photo Credit: OECD

1.1 The Global Ocean Economy

Covering over two-thirds of the planet, the global ocean is fundamental to human well-being, regulating the earth's climate, absorbing some 30 percent of anthropogenic emissions of carbon dioxide, and providing seafood and nutrition essential for more than a billion people (IPCC 2013; FAO 2014a). The ocean also connects cities and countries around the world, driving economic activity and trade for the 38 percent (and growing) of the global population that lives within 100 kilometers of the sea. Submarine cables cross the ocean's floor to carry 90 percent of the electronic traffic on which communications rely. Coastal ecosystems such as coral reefs help protect communities and cities from storm surge and wave damage, while mangroves, sea grasses, and salt marshes are significant natural carbon sinks (United Nations 2016). The estimated 1 to 1.4 million different species who live in the ocean also supply a growing number of medicines and drugs approved to increase human health (Costello et al., 2010; Montaser and Luetsch, 2011).

The ocean may also be a new economic frontier, driven by a growing population in search of new sources of growth, and rapid technological advances making new resources accessible (Economist Intelligence Unit 2015; OECD 2016). For example, global offshore wind capacity has developed from practically nothing twenty years ago to a capacity of more than 7 gigawatts (GW) today, and projections suggest further growth of an order of magnitude by 2050 (OECD 2016). Seaborne trade is expected to continue to growth at annual rates of at least 3 to 4 percent to 2030, and global tourism at a rate of almost 4 percent annually to 2025 – much of which will likely be coastal and ocean tourism (OECD, 2016).

The physical context of the ocean shapes this new economic frontier: a fluid, buoyant, three-dimensional environment, where resources can shift or migrate over long distances. Economic activity in this space, traditionally focused on shipping, tourism, fishing, and offshore oil and gas (all of which are undergoing changes), is set to change dramatically in the coming decades according to the Organisation for Economic Co-operation and Development (OECD), with emerging industries that include offshore wind, tidal and wave energy, oil and gas exploration and production from previously inaccessible waters, offshore aquaculture, seabed mining, cruise tourism, and marine biotechnology, among others. The potential benefits from the development of these activities and the use of the ocean is considerable, and could help address many of the key challenges facing the population in coming decades, from food insecurity to the search for new sources of energy and jobs (OECD 2016).

Despite the wide range of economic activity dependent upon and shaped by the ocean as a discrete and unique segment of the global economy and its potential for growth, measures of this 'ocean economy' have historically not been available. The term has not even been consistently defined, with 14 different countries using 14 different definitions (Park and Kildow 2014). For the purposes of this report, the ocean economy is defined as "the economic activities that take place in the ocean, receive outputs from the ocean, and provide inputs to the ocean."

These economic activities come together in the ocean as a system. Industries in the ocean economy are not developing in isolation, but interact in a number of different ways—similar to other closely interconnected clusters of economic activities that function as an economic system or 'economy' rather than a fragmented collection of individual sectors. Recent history has shown that once such systems or clusters develop, they benefit from more coherent strategic approaches to their development, for example, the notion of the 'information economy' with the growth of information and communication technology (ICT) and more integrated infrastructure planning. Similarly, more recently different segments of the space sector (for example, launchers, satellite construction and operations, global communications, and so on) have come to see themselves as the 'space economy', just as the different strands of the relatively young biotechnology sector have come to be perceived as a 'bioeconomy' (OECD 2016).

Drawing from work by the Economist (Economist Intelligence Unit 2015) and OECD (OECD 2016), respectively, the components of the 'ocean economy' can be shown as follows:

Table 1.1. The Ocean Economy: Component Parts and Future Trends

TYPE OF ACTIVITY	OCEAN SERVICE	ECONOMIC SECTOR/ INDUSTRY	FUTURE TRENDS
Harvesting of living resources	Seafood	Fisheries	Demand for fish and hence seafood to continue to grow, requiring aquaculture production to double by 2050 without improved capture fisheries yields. However, ending overfishing in the ocean and rebuilding depleted stocks could increase the ocean's yield by as much as 20 percent (MEA 2005; Waite et al. 2014).
		Aquaculture	
	Marine biotechnology	Pharmaceuticals, chemicals	The first drugs derived from marine organisms were commercialized over the past decade, together with considerable growth in nutraceutical and other nonmedical uses of marine natural products, and new technologies are fostering renewed interest in marine biotechnology (MEA 2005). As such, the global market for marine biotechnology products and processes is a significant and growing opportunity, projected to grow from US$2.8 billion in 2010 to US$4.6 billion by 2017 (OECD 2016).
Extraction of nonliving resources, generation of new resources	Minerals, sand, and gravel	Seabed mining	Interest in seabed minerals is expected to be sustained over the long-term future, given limitations on some land-based mineral resources, though it remains unclear whether deep-sea mining will come on stream any time soon on a commercial scale (notably given uncertainty over environmental impacts) (OECD 2016). According to one projection, by 2030, 10 percent of the world's minerals, including cobalt, copper, and zinc could come from the ocean floors (UNEP 2014a).
	Energy	Oil and gas	In 1980, offshore oil and gas production provided 20% of consumption needs. By 2014 it rose to 30% and is expected to continue to grow as most of the new discoveries globally are primarily offshore in waters as much as 3 kilometers deep, as compared to 1 kilometer just 20 years ago (Brakenhoff 2015). The coming 15 years could see a significant increase in deep water offshore production, while production from shallow-water fields may decrease (OECD 2016). At the same time, gas extraction is expected to grow in both shallow and deep waters, from slightly above 17 million barrels of oil equivalent/day in 2014 to 27 mboe/d in 2040 (OECD 2016). Total hydrocarbons (gas and oil) from offshore are expected to grow at about 3.5% per year up to 2030 (IAEA 2014).
	Energy	Renewables	An assessment of the world's exploitable offshore wind resources has placed the estimates around 22 TWa(a) (Arent et al. 2012) which is approximately nine times greater than the International Energy Agency's (IEA) 2010 estimate of average global electricity generation capacity (MEA 2005). Global installed offshore wind capacity has developed from practically nothing twenty years ago to greater than 7 gigawatts (GW) today, while projections suggest there is potential for 40–60 GW by 2020 and growth of a further order of magnitude by 2050 (OECD 2016).

Source: Adapted from Economist Intelligence Unit (2015), OECD (2016).
Note: (a) TWa = average number of terawatt-hours over a specified time.
(b) World Travel and Tourism Council. http://www.wttc.org/-/media/files/reports/economic%20impact%20research/economic%20impact%202015%20summary_web.pdf.
(c) http://www.worldwatch.org/global-plastic-production-rises-recycling-lags-0.

Table 1.1. The Ocean Economy: Component Parts and Future Trends

TYPE OF ACTIVITY	OCEAN SERVICE	ECONOMIC SECTOR/ INDUSTRY	FUTURE TRENDS
Extraction of nonliving resºurces, generation of new resources	Freshwater	Desalination	Global desalination capacity has been increasing exponentially (Lattemann et al. 2010). The size of the global desalination market in 2025 is estimated to be seven times larger than it was in 2000 (Bremere et al. 2001).
Commerce, tourism and trade	Transport and trade	Shipping	Currently some 90% of global trade is carried on the ocean, and by 2050 maritime freight transport is projected to quadruple from 2010 (OECD and ITF 2015). More specifically, seaborne trade is expected to grow by 4.3% in 2016, 4.1% per year over the period 2017–19, 4.0% per year on average over 2020–29, and 3.3% between 2030 and 2040 (OECD 2016).
		Port infra-structure and services	Projected to increase by 4.7% from 2015 to 2020 (Lucintel 2015), with healthy increase over longer term given the expected rise in freight transport.
	Tourism and recreation	Tourism	Global tourism and travel's contribution to global gross domestic product [GDP] (already over 10%) is expected to grow at a rate of 3.8% per year from 2015 to 2025(b)—much of which will be coastal and marine. As populations are ageing and incomes rising in many countries, combined with relatively low transport costs, coastal and ocean locations will become even more attractive tourist destinations, and recent developments suggest that marine tourism is likely to grow at a faster rate than international tourism as a whole (OECD 2016).
		Coastal development	Migration and development of the coastal zone (defined as land <100 km from the coast) around the world has increased faster than inland areas since 1970, leading to much higher population densities, for example, most of the world's 'mega-cities' such as Tokyo, New York, Seoul, Mumbai, Shanghai, Jakarta, and so on). Development is projected to affect 91% of all inhabited coasts by 2050 and will contribute to more than 80% of all marine pollution, as we move toward a world with 9.6 billion people. For example in China the growth of coastal urban areas is currently more than three times the national rate (Neumann et al. 2015; World Bank 2012a).
Indirect contribution to economic activities and environ-ments	Carbon sequestration	Blue carbon (that is, coastal vegetated habitats)	The full social cost of the carbon released into the atmosphere as a result of clearing mangroves has been estimated at between US$3.6 and 18.8 billion per year, at a price (that is, the true 'social' cost) of US$41 per ton of carbon dioxide (Pendleton et al. 2012). Blue carbon conservation is expected to become a significant portion of reductions in tropical forest emissions.
Indirect contribution to economic activities and environ-ments	Coastal protection	Habitat protec-tion, restoration	Though it varies by habitat and site measured, analysis has shown that coastal habitats (coral reefs, mangroves, salt marshes, seagrass/kelp beds) reduce wave height significantly (average of be tween 35% and 71% across 69 sites studied) and thereby help reduce flooding (Narayan et al. 2016). The need for restoration of such habitats will only grow. For example, coastal protection from flooding and erosion is the largest economic service provided by mangrove systems in Thailand, and is a significant function of mangroves in many tropical countries (Barbier 2012). Yet at the current rates of change, most mangrove forests will be lost in the next two decades (Nellemann et al. 2009). As the sea level rises, at least 900 million people could be living in vulnerable low-lying coastal zones (that is, <10 m), mostly in Asia (Neumann et al. 2015).

Source: Adapted from Economist Intelligence Unit (2015), OECD (2016).
Note: (a) TWa = average number of terawatt-hours over a specified time.
(b) World Travel and Tourism Council. http://www.wttc.org/-/media/files/reports/economic%20impact%20research/economic%20impact%202015%20summary_web.pdf.
(c) http://www.worldwatch.org/global-plastic-production-rises-recycling-lags-0.

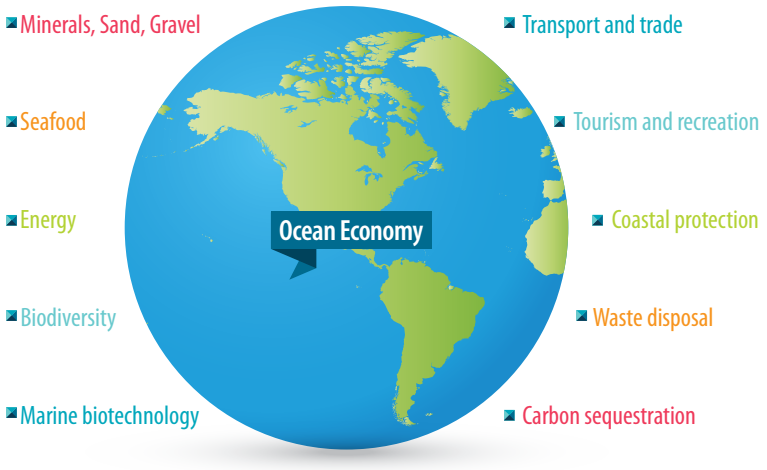
Table 1.1. The Ocean Economy: Component Parts and Future Trends

TYPE OF ACTIVITY	OCEAN SERVICE	ECONOMIC SECTOR/ INDUSTRY	FUTURE TRENDS
Indirect contribution to economic activities and environments	Waste disposal for land-based industry	Assimilation of nutrients, solid waste	The demand for use of ocean ecosystems for waste disposal continues to grow. For example, nutrient loads from land to sea are estimated to have increased roughly threefold from pre-industrial levels (UNEP 2012a). Similarly, an estimated 275 million metric tons of plastic were produced in 2010, of which 4.8 to 12.7 million tons entered the ocean (Jambeck et al. 2015). Subsequently, global plastic production rose to roughly 299 million tons in 2013.(c)
	Existence of biodiversity	Protection of species, habitats	Assuming recent 4.5 percent annual growth rate of the area of the global ocean designated for some form of protection could be maintained beyond 2020, the current global protection target of 10% of the area of the global ocean under protection would be reached by 2035 (Boonzaier and Pauly 2016). This does not necessarily imply that all protection designations prevent extraction, or are effectively enforced to protect species and habitats within these zones.

Source: Adapted from Economist Intelligence Unit (2015), OECD (2016).
Note: (a) TWa = average number of terawatt-hours over a specified time.
(b) World Travel and Tourism Council. http://www.wttc.org/-/media/files/reports/economic%20impact%20research/economic%20impact%202015%20summary_web.pdf.
(c) http://www.worldwatch.org/global-plastic-production-rises-recycling-lags-0.

Of course Table 1.1, and in this report the definition of the ocean economy, does not include a number of recognized marine ecosystem services (Liquete et al. 2013), such as regulating services for climate and weather or cultural services for cognitive effects, where scarcity has not yet been clearly measured or determined.

Figure 1.1. The Ocean Economy



The contribution of the ocean economy to global GDP has rarely been measured, though a number of recent estimates have been made generally on the order of some US$1.5 to 3 trillion annually, or roughly 3 to 5 percent (see Table 1.2) (Global Ocean Commission 2014a; Hoegh-Guldberg et al. 2015). Subsequent to these estimates, the most extensive effort to date has been the development of an Ocean Economy Database by the OECD, suggesting conservatively a contribution in 2010 on the order of US$1.5 trillion in value added (or 2.5 percent of world gross value added) (OECD 2016). The relative contribution of the ocean economy is much higher in a number of coastal and island states with large ocean areas, for example providing an estimated 10 percent of China's GDP in 2014, and 20 percent of Indonesia's (Economist Intelligence Unit 2015).

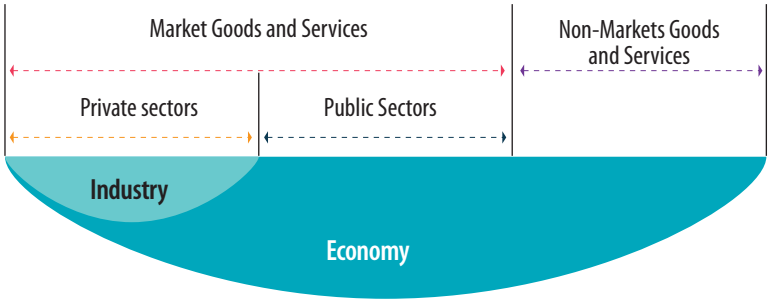
Table 1.2. Estimates/Citations of the Contribution of the Global Ocean Economy

ESTIMATES/CITATIONS OF ANNUAL CONTRIBUTION (US$)	METHODOLOGY	SOURCE
3–5 trillion 'global ocean economic activity'	Estimate only - no details provided	FAO 2014c
6–21 trillion 'economic value of ocean goods and services'	Estimate only - no details provided	World Ocean Council(a)
3 trillion 'market value of marine and coastal resources'	Estimate only - no details provided	Global Ocean Commission 2014a
2.5 trillion 'gross marine product'	Averaged a 'top-down' analysis extrapolating the percentage of known ocean economy contributions to GDP, and a 'bottom-up' analysis estimating the value of marketed goods and services produced by industries as well as other benefits.	Hoegh-Guldberg et al. 2015
1.5 trillion value added of ocean-based industries in 2010 33% offshore oil and gas 26% ocean and coastal tourism 13% ports 11% maritime equipment	Developed a database of country information on value added per industry, supplemented by literature (note: does not include small-scale fisheries).(b)	OECD 2016

Note: (a) World Ocean Council. http://www.oceancouncil.org/site/faq.php.
(b) OECD's Ocean Economy Database consists of 169 coastal countries and draws heavily on United Nations (UN) and OECD sources to collect industry-specific data on physical capital stock, employment, and value added for those ocean-based industries defined in ISIC Rev.3 (International Standard Industrial Classification of All Economic Activities).

However, many of these estimates do not include a number of tangible services provided by the ocean's ecosystems as described in Table 1.1 and for which markets do not exist, but yet are critical pieces of the global ocean economy—for example, carbon sequestration, coastal protection, waste disposal, and the existence of biodiversity (see Figure 1.2 below). For example, a recent study estimated that in 46 countries containing over 53 percent of estimated mangroves worldwide, these ecosystems reduced the area of the coastal zone subject to storm surge by some 30 percent or 36,061 square kilometers (Blankespoor, Dasgupta, and Lange 2016). As the OECD emphasizes, measures of the ocean economy without such natural stocks and nonmarket goods and services will always be incomplete (OECD 2016). Additionally, using GDP to measure the ocean economy only captures the annual economic output, but does not account for changes to the underlying natural capital assets[5] in this economy and the future benefit streams that they can provide (World Bank 2012b). Simply stated, the ocean economy consists of more than just industries, but a number of key economic services provided by the ecosystems, some of which may not have markets.

Figure 1.2. The Portion of the Ocean Economy Measured by Markets

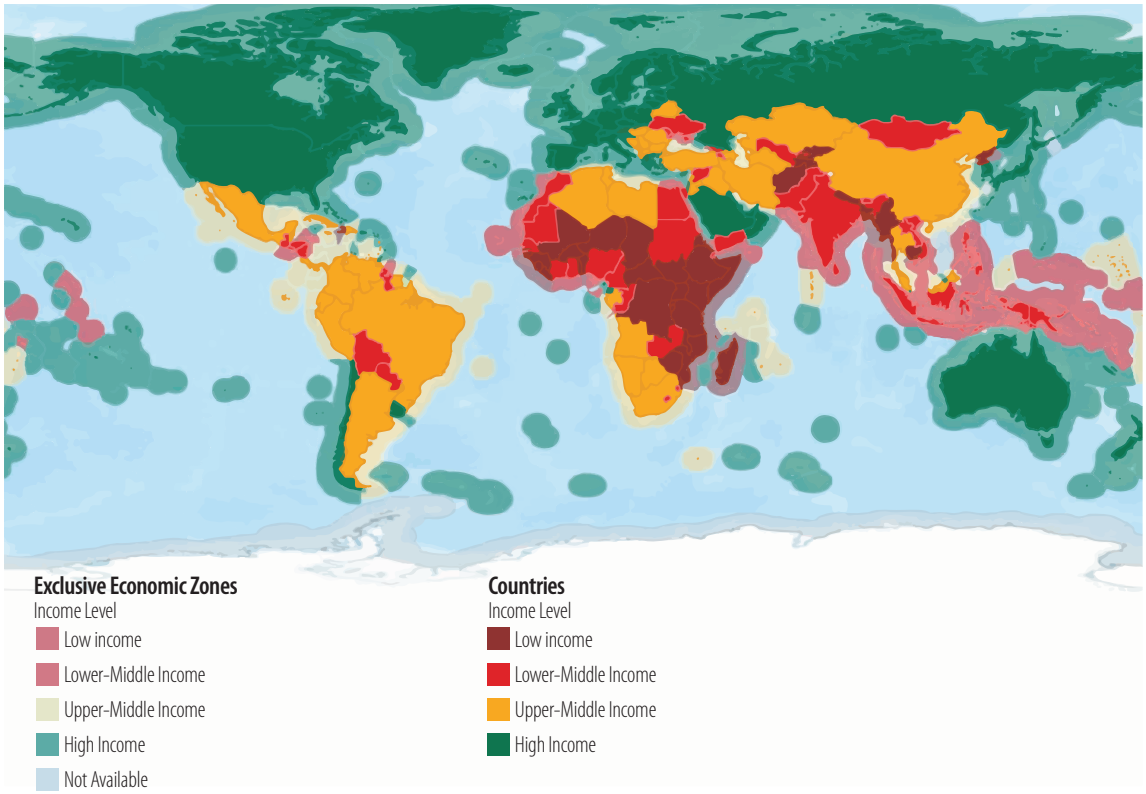


Source: Park and Kildow (2014).

5 Natural capital assets are defined broadly here as the total available biophysical stock of natural resources in terms of land and soil, forest and timber, water, minerals and energy resources, fish stocks, and air and climate (Narloch, Kozluk, and Lloyd, 2016).

Regardless of the measures of the ocean economy, this segment is critically important for many of the world's low-income coastal and island states. For 54 lower and lower-middle income coastal and island states, almost two-thirds of the national territory is ocean (see Figure 1.3). For small island developing states (SIDS) in particular, the ocean economy and national economy are often indistinguishable.

Figure 1.3. Ocean Area under Jurisdiction of Low and Lower – Middle-Income Countries (in red)



Source: Blue Ribbon Panel to the Global Partnership for Oceans (2013).

As indicated in Table 1.1, the ocean economy is projected to grow rapidly this century as the global population reaches 9.6 billion by 2050, and countries continue to look to the sea for the next economic frontier. Demand for seafood will continue to grow as will aquaculture production, shipping traffic will multiply several times, and tourism will continue to increase, to name a few. Renewable energy from the ocean, such as from wind, waves, and currents, among others, offers the potential to help meet increasing global energy demand while reducing long-term carbon emissions. The Economist (2015) suggests that in this century, the ocean is likely to become an economic force, as activity accelerates at a pace reminiscent of the previous industrialization on land (Economist Intelligence Unit 2015).

1.2 The Ocean Economy of the Caribbean

Perhaps nowhere is the ocean economy more relevant than in the Caribbean Sea, where many states and territories are defined by the ocean. The Caribbean Sea covers less than 1 percent of the world's ocean area (2.75 million square kilometers), nonetheless, it directly supports the economies of 37 coastal and small island countries and territories.[6] This natural resource, if well managed, has the potential to make a much greater contribution to poverty reduction and shared prosperity for the region's growing island population of 40 million, as well as increasing their resilience to climate change. And the ocean may indeed be the frontier for growth for these economies in the coming decades, as countries look to the Caribbean Sea for new sourc es of food, energy, and jobs while diversifying their economies to reduce reliance on a limited number of key exports.

Figure 1.4. The Caribbean Sea

Source: Transboundary Water Assessment Programme 2015.

Surprisingly, the region's ocean economy is not well measured or understood, even as the next frontier for growth. This report includes a review of existing literature and secondary data, to generate a first-order estimate of the size and composition of the Caribbean ocean economy as a discrete and unique segment of the region's overall economy. However, these estimates are meant to be indicative of the magnitude of the ocean economy, capturing only measurable gross revenues for the most recent year available (2012), and not actually value added. In many accounting frameworks, a satellite account for ocean industries and economic sectors is not maintained, making estimates of the contribution to GDP difficult to measure.

6 As a unit of analysis, this chapter focuses on the potential blue economy of the Caribbean Sea, that is, the ocean economy of the 37 coastal and island states and territories bordering the Caribbean Sea, plus The Bahamas. The full list is as follows: Anguilla, Antigua and Barbuda, Aruba, The Bahamas, Barbados, Belize, Bonaire, British Virgin Islands, Cayman Islands, Colombia, Costa Rica, Cuba, Curaçao, Dominica, the Dominican Republic, Grenada, Guadeloupe, Guatemala, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Nicaragua, Panama, Puerto Rico, St. Barthelemy, St. Eustatius, St. Kitts and Nevis, St. Lucia, St. Maarten, St. Martin, St. Vincent and the Grenadines, Trinidad and Tobago, U.S. Virgin Islands, and República Bolivariana de Venezuela.

Table 1.3. The Ocean Economy of the Caribbean in 2012: A Snapshot

TYPE OF ACTIVITY	OCEAN SERVICE	ECONOMIC SECTOR/ INDUSTRY	INDICATIVE ANNUAL GROSS REVENUES (US$, BILLIONS IN 2012 U.S. DOLLARS)			NOTES/METHODS
			ISLAND STATES AND TERRITORIES	MAINLAND COUNTRIES	TOTAL	
Harvesting of living resources	Seafood	Fisheries	0.37	4.62	4.99	Estimated based on catch data from Food and Agriculture Organization (FAO) FishStatJ (FAO 2016a), and value per metric ton from Sumaila et al. (2007) and Swartz et al. (2012).
		Aquaculture	0.04	1.86	1.90	Value produced retrieved from FAO FishStatJ (FAO 2016a)
	Marine biotechnology	Pharma-ceuticals, chemicals, and so on	n.a.	n.a.	n.a.	Data not available to estimate the size of the Caribbean marine biotechnology sector, though a number of drugs (for example, Ara-A, AZT, Ara-C) have been developed in the past from Caribbean coral reefs (Bruckner 2002).
Extraction of nonliving resources, generation of new resources	Minerals, sand, and gravel	Seabed mining	n.a.	n.a.w	n.a.	Data not available to indicate seabed mining occurring currently in the Caribbean Sea.
	Energy	Oil and gas	5.64	34.25	39.89	Only offshore oil and gas included. Trinidad and Tobago is the leading producer among Island States and Territories, generating roughly 66% of offshore oil production in island waters (Cuba produces another 29%) (EIA 2015) and 98% of natural gas (EIA 2016). Both natural gas and oil exploration activities have continued at a fast pace in Trinidad and Tobago over the early 2000s (GENI 2003), and in Colombia (PwC 2014) and Venezuela, RB (ENI 2015) more recently.
		Renewables (marine)	n.a	n.a.	n.a	Data not available to disaggregate marine renewables from total renewables, which generated some US$1.3 billion in revenues in 2012 according to the U.S. Energy Information Administration (EIA) (EIA 2016). For total renewables (terrestrial and marine), EIA estimates the Islands States and Territories produced an estimated 3.66 billion kWh renewable electricity in 2012 (EIA 2015). For example, Bonaire currently generates some 90% of total energy from wind (12 turbines with a total 11 MW capacity) (RMI 2015). To supplement wind-based generation in times of low wind, the island also has 14 MW of diesel generation, designed to be able to run on locally grown algae-based biodiesel (Pei 2010; RMI 2015).

*Note: * Average of estimated value over the time period from 2000 to 2050 has not been adjusted to 2012 U.S. dollar.*

Table 1.3. The Ocean Economy of the Caribbean in 2012: A Snapshot

TYPE OF ACTIVITY	OCEAN SERVICE	ECONOMIC SECTOR/ INDUSTRY	INDICATIVE ANNUAL GROSS REVENUES (US$, BILLIONS IN 2012 U.S. DOLLARS)			NOTES/METHODS
			ISLAND STATES AND TERRITORIES	MAINLAND COUNTRIES	TOTAL	
Extraction of nonliving resources, generation of new resources	Freshwater	Desalination	n.a	n.a	0.23	The regional Caribbean Desalination Association has been active in promoting the growth of the industry (CaribDA 2016), and the 2012 value of production reported at US$0.53 per m3 (US$2 per 1,000 gallons) for a total of approximately US$230 million (EPA 2016).
Commerce, tourism, and trade	Transport and trade	Shipping	n.a	n.a	311.32	In the container shipping industry, US$311.32 represents the value of the total 'twenty foot equivalent units' (TEUs) assumed to be shipped through the region (8.2% (Rodrigue and Ashar 2015) of 2012 global container shipping volume of 155 million (UNCTAD 2012)), assuming a value of US$24,494 per TEU (Olivier and Slack 2007).
		Port infrastructure and services	n.a	n.a	n.a	Revenues available for specific ports only, not systematically. Kingston, Jamaica; Port of Spain, Trinidad and Tobago; and Freeport, Bahamas are the region's largest ports with regard to volume (TEUs) (CEPAL 2009). For example, the Port of Kingston reports annual revenues of US$109 million in 2011 (JMS 2013). Additionally a new transshipment port has been under construction since 2012 in La Brea, South Trinidad (InvesTT 2012; Caribbean Maritime 2014), and in 2014 The Bahamas announced a US$250 million project to expand the container port in Freeport (The Government of The Bahamas 2014).
	Tourism and recreation	Tourism	47.1	n.a	47.10	Total marine and coastal tourism revenues for Island States and Territories (WTTC 2015), though revenues are not available for coastal tourism in mainland countries. Tourism in the Island States and Territories projected to increase to over US$70 billion per year by 2024 (WTTC 2014).
		Coastal development	n.a	n.a	n.a	Data not available

*Note: * Average of estimated value over the time period from 2000 to 2050 has not been adjusted to 2012 U.S. dollar.*

Table 1.3. The Ocean Economy of the Caribbean in 2012: A Snapshot

TYPE OF ACTIVITY	OCEAN SERVICE	ECONOMIC SECTOR/ INDUSTRY	INDICATIVE ANNUAL GROSS REVENUES (US$, BILLIONS IN 2012 U.S. DOLLARS)			NOTES/METHODS
			ISLAND STATES AND TERRITORIES	MAINLAND COUNTRIES	TOTAL	
Indirect contribution to economic activities and environments	Carbon sequestration	Blue carbon (that is, coastal vegetated habitats)	0.02	0.07	0.09	Assumed that the mangrove loss rates remain constant at 0.08% per year; r = 6%; carbon price US$5 per tCO2e. Total mangrove coverage used as baseline, for Island States and Territories was 2,417 km2, (10,305 for mainland countries) for a regional total of 12,722 km2 (Hamilton and Casey 2016). Assumed carbon storage of 200 (biomass) and 400 Mg C per ha (top meter of soil) (Bhomia et al. 2016), where carbon is emitted with a half-life of 10 years (Pendleton et al. 2012). At the current estimated social cost of carbon (US$40 per tCO2e), this value becomes US$704 million per year.
	Coastal protection	Habitat protection, restoration	n.a	n.a	1.47*	Protection value of Caribbean coral reefs, estimated by World Resources Institute in 2004 (Burke and Maidens 2004).
	Waste disposal for land-based industry	Assimilation of nutrients, solid waste	n.a	n.a	n.a	Data not available
	Existence of biodiversity	Protection of species, habitats	n.a	n.a	n.a	Data not available for any payments to protect Caribbean Sea biodiversity, nor global willingness-to-pay
TOTAL			53.17		406.99	These totals are likely conservative and underestimated, given that many ocean sectors have not been measured, or disaggregated at the level of the islands.

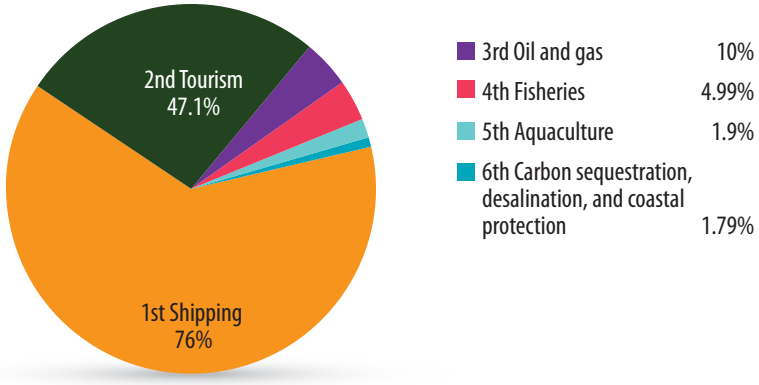
*Note: * Average of estimated value over the time period from 2000 to 2050 has not been adjusted to 2012 U.S. dollar.*

The gross revenues generated by the ocean economy in the Caribbean in 2012 were on the order of US$407 billion, equivalent to some 14 to 27 percent of the estimated value of the global ocean economy (though the Caribbean Sea covers less than 1 percent of the area of the global ocean).[7] For the portions of the region's ocean economy where estimates were available, the composition is dominated by the estimated value of the volume of cargo shipped through the Caribbean Sea, together with tourism and oil and gas in the Island States and Territories (table 1.4).

Focusing just on the Caribbean Island States and Territories, where disaggregated estimates of shipping activity and values are not available, the gross revenues generated in 2012 are estimated on the order of some US$53 billion, equivalent to over 18 percent of the total GDP for all Island States and Territories in 2012 (as compared to agriculture's contribution to GDP of some US$13 billion for the islands, and industry's

7 Using $1.5 trillion and $3.0 trillion as proxies for the estimated value of the global ocean economy, per Table 1.2

Figure 1.5. The (Measurable) Ocean Economy of the Caribbean in 2012 is Dominated by Shipping, Tourism, and Oil and Gas Industries



Source: Park and Kildow (2014).

contribution of roughly US$59 billion) (World Bank 2016).[8] This is likely conservative and even underestimated, given that a number of sectors have not been measured or disaggregated at the level of the islands, such as ports and shipping, or the protection value of coastal ecosystems (that is, 'green infrastructure'), or nonmarket values that the global community places on the existence of biodiversity in the Caribbean Sea. In one sense, the ocean economy currently measured in the Caribbean Island States and Territories is a tourism economy (88 percent), as large as many other segments of the region's economy.

Future Trends. Globally, current trends point to what has been termed a new wave of 'industrialization' in the ocean, driven by a population growing to over 9.6 billion by 2050, advances in technology and increasing consumption (Economist Intelligence Unit 2015). The OECD modeled the development of the ocean economy to 2030, projecting many ocean-based industries to outperform the growth of the global economy—indeed doubling its contribution to global value added from 2010. Of particular relevance for the Caribbean, the gross value added from ocean-based tourism is expected to more than double during this time, adding an additional US$405 billion (see Annex 1 for a summary of OECD's projections) (OECD 2016). In the Caribbean, these global trends are expected to drive growth in a number of sectors of the ocean economy, as shown in Table 1.5.

The above 'horizon scan' shows expectations in a number of individual sectors in the region's ocean economy—for example, aquaculture production growth of 30 percent, blue carbon revenues from zero to some US$700 million annually at a carbon price reflecting the estimated social cost, exponential growth in global shipping combined with expanded traffic through the Panama Canal, and more than 3 percent annual real growth in tourism to name a few—which in the aggregate would likely affect significant changes in the Caribbean Sea and its ecosystems over the coming years and decades.

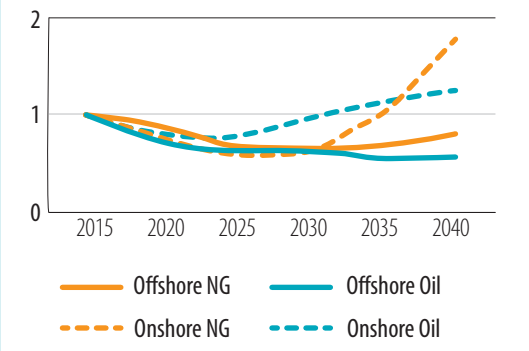
Table 1.4. The Caribbean Ocean Economy in Perspective

	EST. GROSS REVENUES IN 2012 (US$ M)	AS A % OF TOTAL GDP IN 2012	AS A % OF VALUE ADDED FROM GLOBAL OCEAN ECONOMY IN 2010***
Caribbean Ocean Economy	407,000	17.7*	27
Caribbean Island States and Territories Ocean Economy	53,000	18.4**	4

*Caribbean GDP of US$2.3 trillion, does not include territories (source: World Bank, 2016)
**Caribbean Island States GDP of $287.8 billion, does not include territories (source: World Bank, 2016)
***Value added from global ocean economy in 2010 of $1.5 trillion (Source: OECD, 2016)

8 https://www.cia.gov/library/publications/the-world-factbook/fields/2012.html#av.

Table 1.5. The Ocean Economy of the Caribbean: Future Trends

OCEAN ECONOMIC SECTOR/ INDUSTRY		TREND
Seafood	→	Globally, by 2030 aquaculture will supply two-thirds of fish production, including seafood (World Bank 2013). Assuming current capture fisheries production can be maintained, projected population growth will require aquaculture production to double in or to support current per capita consumption levels (Waite et al. 2014). In the Caribbean, capture fisheries production slightly decreased over the 2010–2014 period (FAO 2016b). Similarly, over this same period aquaculture production did not grow as fast as it has in other regions around the world, but with good governance FAO suggests that production has the potential to grow by 30% by 2025, equivalent to a rate of 3% annually (FAO 2014d).
Oil and gas	→	Globally, technological progress for production of offshore oil and gas has been significant over the last two decades, such that fields at depths of up to 3 km are accessible whereas 20 years ago it was not possible past 1 km. Experts believe that this trend will continue, and globally offshore production growth is likely to exceed onshore growth (Brakenhoff 2015). However, in the Caribbean Sea, while Colombia and Venezuela will continue offshore exploration and production, overall growth may slow relatively to terrestrial sources (Rystad Energy 2016b). 
Renewables	→	Globally, investment in renewable energy production has grown significantly over recent decades, and certainly this has been the case for marine renewables (for example, offshore wind). Throughout the Caribbean, a number of renewable energy options have been identified from the ocean, and the costs associated with the technologies have fallen dramatically over the past decade. In the coming decade, marine renewable energy may increasingly be a viable option for many islands in the region.
Shipping	→	Currently some 90% of global trade is carried on the ocean, and by 2050 maritime freight transport is projected to quadruple from 2010 (OECD and ITF 2015). The trade significance of the existing Panama Canal is clear as it has been a key conduit for international maritime trade for decades and is currently being expanded. This expansion, as well as other efforts, such as the planning of the Nicaragua Canal underway, suggest a significant future role for the Caribbean region in international maritime shipping.
Port Infrastructure and Services	→	Developing economies' share of world container port throughput is currently some 72%, and with the size of ships and traffic volumes expected to grow, existing ports such as those in the Caribbean will likely grow in capacity, together with new construction. Such transport infrastructure investment needs have been estimated at 6.2% of GDP in the region annually between 2012–2020 (UNCTAD 2016).

Note: (a) World Travel and Tourism Council. http://www.wttc.org/-/media/files/reports/economic%20impact%20research/economic%20impact%202015%20summary_web.pdf.

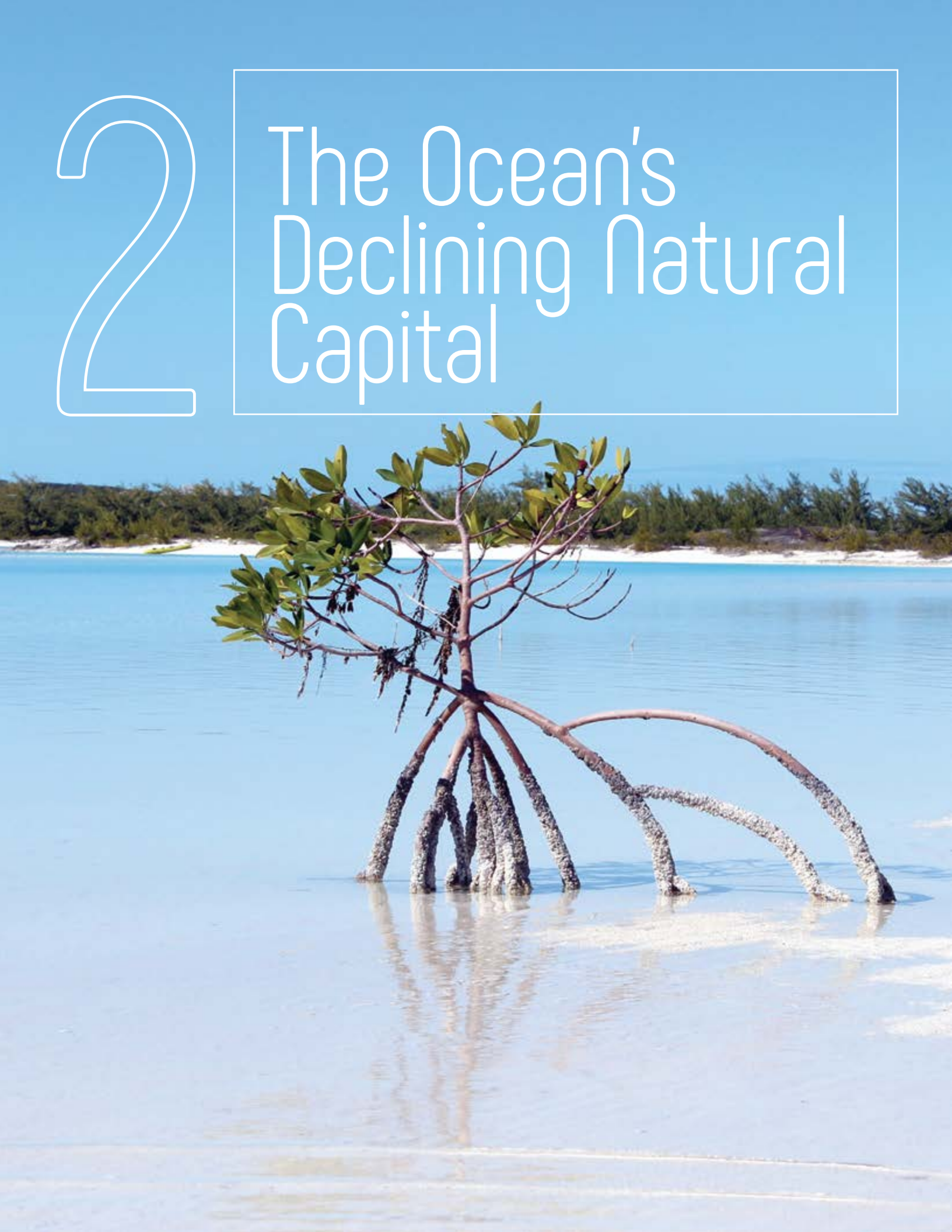
Table 1.5. The Ocean Economy of the Caribbean: Future Trends

OCEAN ECONOMIC SECTOR/ INDUSTRY		TREND
Tourism	→	Globally, tourism (already over 10% world GDP) is expected to grow at a rate of 3.8% per year from 2015 to 2025(a)—much of which will be coastal and marine. By 2025, the annual real growth in tourism's total contribution to GDP is projected at 3.3% for the Caribbean region (excluding mainland countries), and 4.5% when including mainland countries.
Blue Carbon	→	The blue carbon sector is expected to grow as carbon prices at the voluntary or compliance markets grow. Current market prices are about one-eighth of the estimated social cost of carbon value, which can be used as an indicator of the long-term carbon prices in an efficient market that prices carbon according to its climate-related damages (when emitted due to conversion).

Note: (a) World Travel and Tourism Council. http://www.wttc.org/-/media/files/reports/economic%20impact%20research/economic%20impact%202015%20summary_web.pdf.

In conclusion, even with conservative methods the size of the Caribbean ocean economy is potentially on the order of approximately 18 percent of the region's GDP and 27 percent of the global ocean economy, and this trend holds similarly for the ocean economy of the Caribbean island states and territories in comparison to the total GDP of the island states. While projections are scarce, all indications available suggest that this economy is likely to continue to grow in the coming decades faster than overall rates of economic growth, following a global trend projected by OECD (2016).

2 The Ocean's Declining Natural Capital



2.1 Overview of the Status of the Global Ocean's Natural Capital

Underpinning the global ocean economy are the natural resources and ecological systems that function in economic terms as the ocean economy's natural capital asset base. Natural capital includes: (a) living resources (that is, renewable stocks) that are harvested for use such as fisheries, (b) nonliving resources (that is, nonrenewable stocks) harvested for use such as minerals from the seabed, and (c) ecosystems and ecosystem processes that represent the interaction between the living and nonliving environment as a functioning unit (for example, coral reef ecosystems, mangrove ecosystems, and so on).

With the expected growth of the ocean economy in the coming decades, the potential changes to its natural capital asset base may be significant. The baseline is already low. For example in 2015 the G7 Science Academies issued a statement warning that human activities were causing changes to the ocean's ecosystems that would profoundly affect human well-being. In 2016 the UN Secretary General wrote that the findings of the first world ocean assessment "indicate that the oceans' carrying capacity is near or at its limit", and "urgent action on a global scale is needed to protect the world's oceans from the many pressures they face (United Nations, 2016)." Among others, four anthropogenic drivers of change in the ocean's natural capital are notable:

a) **overfishing,** as some 29 percent of the world's ocean fisheries that have been assessed are considered overfished, up from 10 percent in 1970 (FAO 2014b), while an estimated 11 to 25 million tons of fish are captured via illegal, unreported and unregulated (IUU) fishing each year (Agnew et al., 2008);

b) **coastal development** such as filling wetlands or hardening coastlines for construction that has significantly altered ecosystems and ecosystem processes, as the world has lost some 20 percent of its sea grass and mangrove habitats since 1970 and 1980, respectively, while coral reefs have declined by 38 percent since 1980 (Spalding, Kainuma, and Collins 2010; UNEP 2012b);

c) **pollution,** largely in the form of excess nutrients from sources such as agriculture and untreated sewage, which have increased roughly threefold from pre-industrial levels (UNEP 2012b) to create 'dead zones' covering 245,000 square kilometers of ocean by 2010 (Doney, 2010), together with an estimated 4.8 to 12.7 million tons of plastic entering the ocean each year (Jambeck et al. 2015), with the volume of plastic in the ocean projected to exceed the volume of fish by 2050 (WEF, 2016); and

d) **climate change and ocean acidification,** including higher surface water temperatures and rising sea levels, together with more acidic waters owing to the uptake of carbon dioxide from the atmosphere – with the mean surface ocean pH already decreasing from 8.2 to 8.1 and projected to continue to 7.7 or 7.8 by 2100 (UNEP, 2012b).

In response to these recent changes to the ocean's ecosystems, one of the 17 Sustainable Development Goals (SDGs) adopted by the UN General Assembly in September 2015 focuses on ocean conservation and sustainable use (see Box 1.1). Governments and stakeholders in countries around the

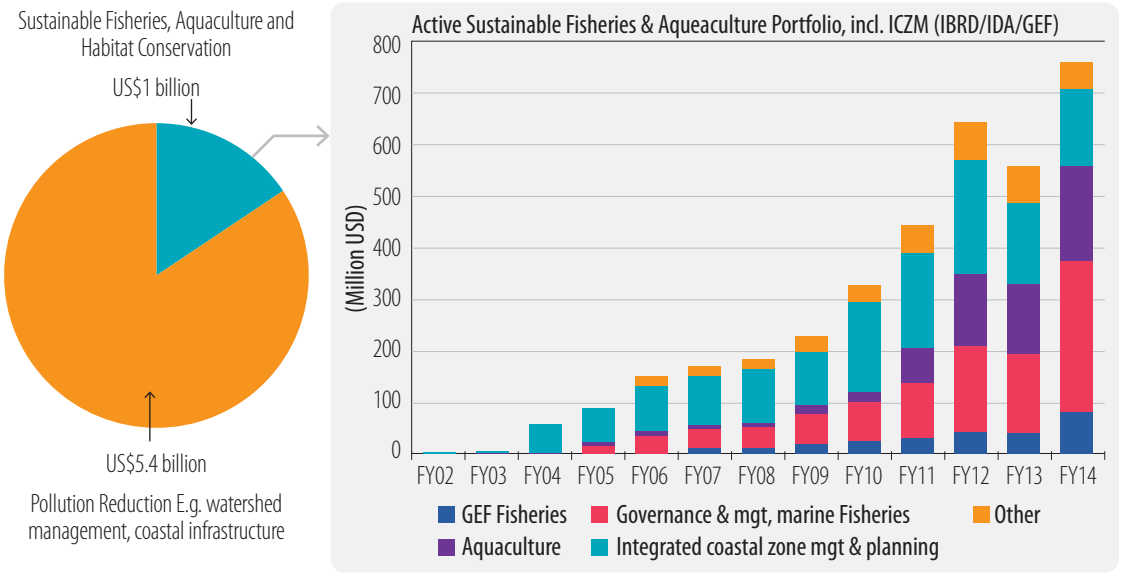
Box 2.1. Sustainable Development Goal 14 Summary:

"to conserve and sustainably use the oceans, seas and marine resources for sustainable development"

- Prevent and significantly reduce marine pollution of all kinds by 2025;
- Sustainably manage and protect marine and coastal ecosystems by 2020, including restoration, to achieve healthy and productive oceans;
- Effectively regulate harvesting of fish stocks and end overfishing, illegal, unreported and unregulated fishing by 2020 (including prohibiting subsidies that contribute to overfishing), to restore fish stocks in the shortest time feasible to levels that can produce the maximum sustainable yield;
- Conserve at least 10 percent of coastal and marine areas by 2020; &
- Increase the economic benefits to SIDS from sustainable use of ocean resources by 2030.

world have increased efforts and investments in policy reforms and rule changes to better safeguard and/or restore functionality in ocean ecosystems. For example, the World Bank has increased its active investment portfolio in projects directly or indirectly aiming to increase the ocean's natural capital to some US$6.4 billion by 2015, with support for sustainable fisheries and aquaculture increasing from practically zero in 2004 to almost US$1 billion by 2015 (see Figure 2.1 below).

Figure 2.1. Growth in the World Bank's Portfolio of Investments in the Ocean



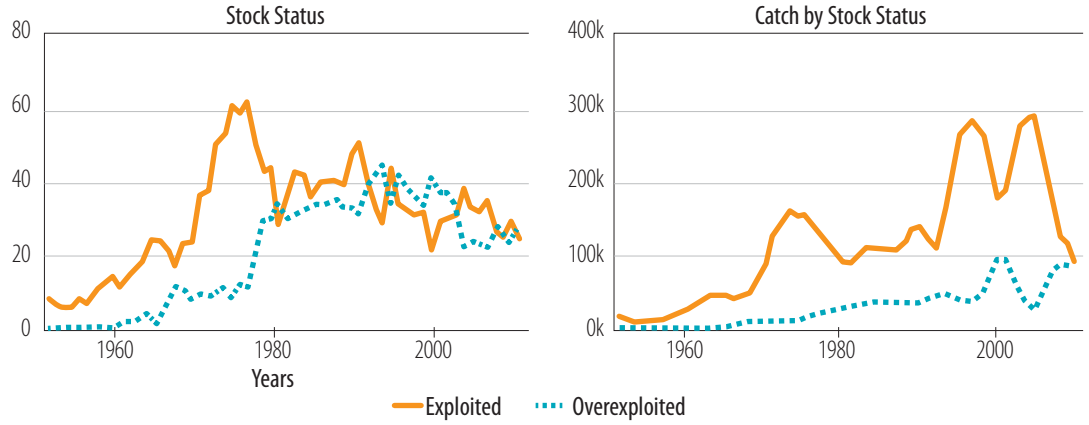
2.2 Overview of the Status of the Natural Capital Assets of the Caribbean Sea

Underlying the region's ocean economy is the Caribbean Sea and its living and nonliving resources together with the ecosystems that they form, which in aggregate can be considered as a tremendous natural capital asset that is often undervalued and even poorly defined, yet is determinant of a number of the benefits generated by the ocean economy. Throughout the literature (for example, a 'Transboundary Diagnostic Assessment' of the marine ecosystems and a 'Transboundary Water Assessment' both funded by the Global Environment Facility [GEF]) there is strong evidence that the Caribbean Sea's natural capital is being depleted, largely due to the anthropogenic drivers of overfishing, coastal development, pollution, introduction of invasive species and the impacts of climate change (CLME Project 2011). Such depletion represents a significant risk to the economic benefits generated by the region's ocean economy, and likely to future growth prospects.

The Caribbean Sea's Natural Capital Assets. Current information available on the status of the region's natural capital includes:

- *Living resources (for example, fisheries):* The Caribbean includes a wide array of living resources that support fisheries, including the spiny lobster, the queen conch, panaeid shrimps, reef fish, bottom-dwelling fish on the continental shelf, deep slope and bank fish, coastal large pelagic species (such as king mackerel, Spanish mackerel, amberjack, and dolphinfish), and offshore large pelagic species (such as yellowfin tuna, skipjack tuna, Atlantic blue marlin, and swordfish). Uncertainty about the biological status of many of the region's fish stocks has remained high, but available data suggests that nearly 60 percent of commercially exploited fish stocks in the Caribbean Sea are either overexploited or have collapsed—contributing some 50 percent of the fish landed (TWAP 2015). This status is consistent with FAO's data for the wider fishing area that includes the Gulf of Mexico together with the Caribbean Sea, where some 55 percent of the assessed fish stocks commercially harvested are considered overexploited, and another 40 percent are considered fully exploited (FAO 2014e). In particular, large pelagic stocks throughout the region have been heavily exploited, in many cases by distant water fishing nations (CLME Project 2011).

Figure 2.2. Stock Status of Commercially Exploited Fish Stocks in the Caribbean Sea

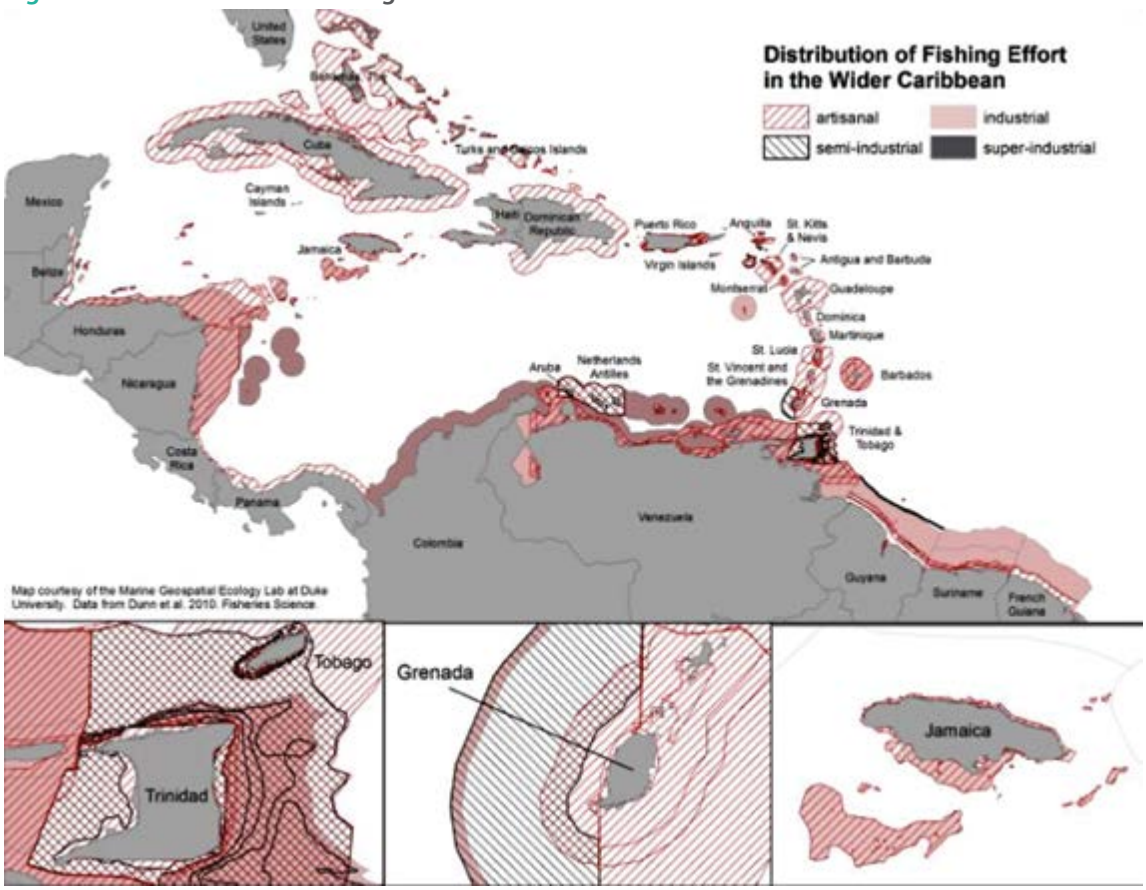


Source: *TWAP, 2015.*

- *Nonliving resources (for example, minerals, oil and gas in the seabed):* To date there has been little indication of significant deposits of commercially valuable minerals in the Caribbean seabed that could be mined[9]. With regard to oil and gas resources, significant reserves are known to be found in the waters under the jurisdiction of Colombia and República Bolivariana de Venezuela, though

9 See for example: https://www.isa.org.jm/contractors/exploration-area.

Figure 2.3. Distribution of Fishing Effort in the Wider Caribbean



Source: *TWAP, 2015.*

production from these sources is projected to decline over the coming years in comparison to terrestrial sources (WTTC 2015). Additionally, a number of countries are actively pursuing oil exploration activities, for example, The Bahamas and Barbados.

- *Ecosystems and ecosystem processes (for example, coral reefs, mangroves, sea grass beds, beaches, and so on):* The Caribbean Sea has the highest level of species diversity in the tropical Atlantic and is considered a global hotspot of marine biodiversity, supported in particular by the region's coral reef ecosystems (notably the 220-kilometer long MesoAmerican Reef system) (Roberts et al. 2002; Miloslavich et al. 2010). According to the U.S. Geological Survey, some 0.35 percent of the entire Caribbean Sea large marine ecosystem is covered by mangroves, and according to the Global Distribution of Coral Reefs in 2010 some 0.64 percent by coral reefs (TWAP 2015). There is evidence for overall ecosystem degradation in the Caribbean Sea, notably in coral reef and mangrove systems (Burke et al. 2011; Burke and Maidens 2004; CLME Project 2011). Caribbean mangrove coverage has declined steadily over the past decades at the rate of approximately 0.08 percent per year (Hamilton and Casey 2016). Coral coverage in the region has dropped significantly in recent decades, with some 75 percent of all Caribbean reefs considered to be at risk from anthropogenic impacts (Burke and Maidens 2004).

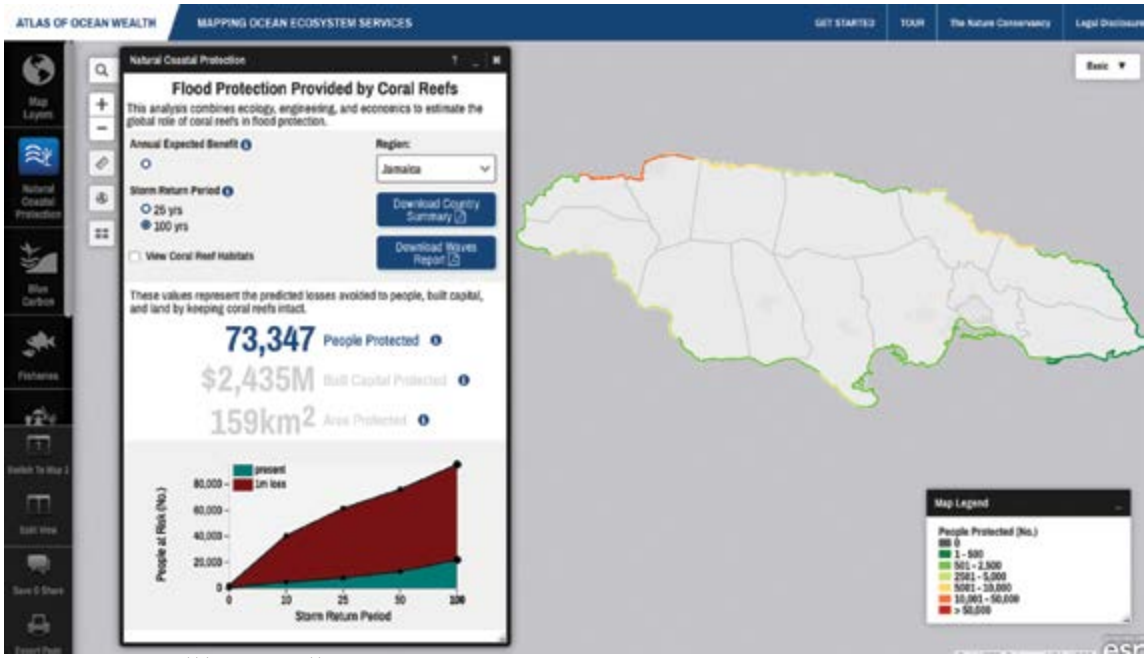
Anthropogenic Drivers of Change in the Status of the Caribbean Sea's Natural Capital Assets, in the context of climate change and ocean acidification. There are at least three significant and mutually reinforcing anthropogenic drivers of the status of the Caribbean's natural capital that are shared widely: (a) overfishing, (b) coastal development, and (c) pollution (CLME Project 2011), all occurring within the context of the effects of increasing greenhouse gas emissions and climate change, such as ocean acidification and increasing sea surface temperatures.

a) *Overfishing*: According to FAO, growth in the capture fishing industry in the region has stagnated since 1990, in conjunction with trends in declining stocks and increasing overexploitation (Burke and Maidens

Figure 2.4. Mapping Ocean Wealth Calculations of Caribbean Mangrove Coverage

Source: *Mapping Ocean Wealth http://oceanwealth.org/*

Figure 2.5. Mapping Ocean Wealth Example of Coastal Protection Benefits of Coral Reefs in Jamaica



Source: *Mapping Ocean Wealth http://oceanwealth.org/*

2004). The overall volume of fish landed in the Caribbean declined from a peak of 430,000 metric tons in 1998, to below 300,000 tons by 2010 (TWAP 2015). This trend is reflected in FAO's data on the broader fishing area that includes both the Caribbean Sea and the Gulf of Mexico, where between the late 1990s (1.75 million tons) and 2009 (1.3 million tons) (FAO 2011). At the same, total aggregate fishing effort increased steadily in the Caribbean Sea, following the global trend in the expansion of fishing activity in the 1950s, to a peak in the mid-2000s (TWAP 2015). This growth in fishing effort has led to biological overfishing in some fisheries, where the level of fishing exceeds what would be required to catch the maximum sustainable yield. Such overfishing has also had a notable impact on the region's coral reef ecosystems, with annual landings of reef resources from the capture fisheries generally declining since the mid-1970s and most considered either over or fully exploited (World Bank 2016). Commercial fishing on deep-water reefs has caused extensive damage to corals, and more broadly fishing has depleted certain herbivore species—leading to overgrowth of algae on coral reefs throughout the Caribbean (World Bank 2016).

Figure 2.6. Annual Catch (Caribbean Sea)

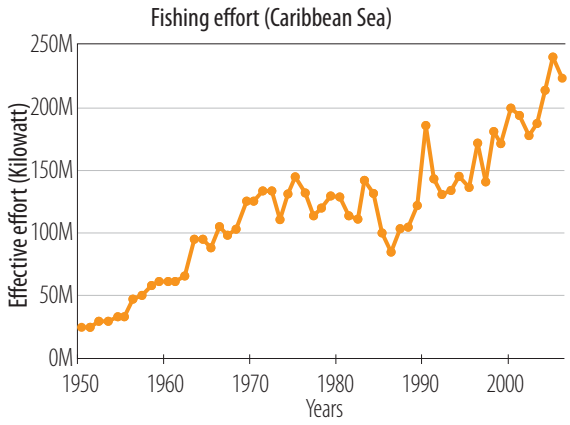
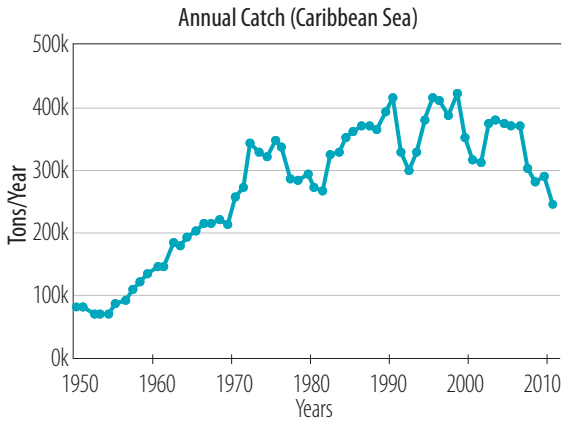


Figure 2.7. Fishing Effort (Caribbean Sea)



Source: *TWAP, 2015.*

b) *Coastal development*: Coastal population density has grown throughout the region in recent decades, with over 41 million people living within 10 kilometers of the coast, and some 166 million within 100 kilometers (Burke and Maidens 2004). This growth has placed tremendous pressure on the coastal ecosystems as natural habitats are cleared for construction, waterways are dredged for increased sea transport, and the number of visitors and users of the reefs increases, among others. For example, about 25 percent of the region's coral reefs are considered to be at threat from growing coastal development, and just over a third are located within 2 kilometers of inhabited land areas (Burke and Maidens 2004; Burke et al. 2011). These threats can directly impact the tourism sector of the region's ocean economy, given the role that coral reef ecosystems play in visitation throughout the Caribbean.

c) Pollution: The ecosystems of the Caribbean Sea, and particularly the water quality, have been significantly impacted by growing levels of pollution from untreated sewage, agricultural runoff, and marine trash (for example, plastics) (GPO 2014; CLME Project 2011). In particular, increasing volumes of untreated sewage generated by growth in coastal development has impacted water quality and public health, as an estimated 85 percent of wastewater entering the Caribbean Sea is untreated (with a higher percentage in many urban areas) (UNEP-CEP 2010; Corbin, Daniel, and Vogeley 2014). Again, this can constitute a significant risk to the tourism sector of the region's ocean economy, among others. With regard to marine debris, the Caribbean Sea is estimated to have relatively high levels of plastic concentrations compared with many other large marine ecosystems (TWAP 2015). More specifically, an estimated 0.16 to 0.42 million tons of plastic entered the Caribbean Sea in 2010 from the region's coastal population, gradually increasing to 0.29–0.79 million metric tons (MMT) per year by 2025 as the population grows (see Table 2.1) (Jambeck et al. 2015).

Lastly, other drivers of change in the status of the Caribbean Sea's natural capital assets include the introduction of invasive species such as the Indo-Pacific lionfish, which is competing with native species and changing coral reef ecosystems (FAO 2011). Of course, as mentioned previously, many of these drivers are expected to continue to be exacerbated by the effects of climate change, resulting largely from greenhouse gas emissions in the terrestrial economy.

In conclusion, these drivers of change in the status of the Caribbean Sea's natural capital assets constitute an important constraint and significant risk to the potential growth of the region's ocean economy, similar to the risks to the global ocean economy (OECD 2016). In some cases the decline of these assets may prevent sectors and industries from reaching their potential in the region, for others it may create regulatory uncertainty that also presents a significant risk. For example, impacts of coastal development and pollution on coral reef ecosystems can directly impact the tourism sector of the region's ocean economy, and reduce the net benefits that it can generate for poverty reduction and economic growth.

Table 2.1. Country and/or Island Territory level Estimates of Plastic Marine Debris: 2010 and 2025

COUNTRY/ ISLAND TERRITORIES	COASTAL POPULATION	PLASTIC MARINE DEBRIS IN 2010 - LOW ESTIMATE (MMT)	PLASTIC MARINE DEBRIS IN 2010 - HIGH ESTIMATE (MMT)	PLASTIC MARINE DEBRIS IN 2025 - LOW ESTIMATE (MMT)	PLASTIC MARINE DEBRIS IN 2025 - HIGH ESTIMATE (MMT)
Anguilla	14,561	8	21	11	29
Antigua and Barbuda	66,843	188	501	208	554
Aruba	137,910	56	149	71	190
Bahamas	341,145	200	533	258	687
Barbados	276,784	522	1,393	558	1,488
Belize	202,429	584	1,557	906	2,417
British Virgin Islands	29,674	8	22	12	31
Cayman Islands	51,864	14	38	20	54
Colombia	7,498,563	13,826	36,869	26,996	71,989
Costa Rica	2,479,298	6,314	16,836	11,384	30,358
Curacao	143,784	40	107	57	151
Dominica	70,138	117	313	214	571
Dominican Republic	8,232,586	17,734	47,290	34,301	91,468
Guatemala	2,392,442	13,734	36,625	23,655	63,079
Haiti	9,155,693	22,108	58,956	48,627	129,671
Honduras	3,324,144	14,346	38,255	28,375	75,668
Jamaica	2,820,558	1,503	4,008	8,936	3,830
Martinique	402,257	112	300	143	382
Mexico	22,647,771	15,201	40,537	35,009	93,357
Montserrat	5,173	6	15	11	29
Netherlands Antilles	227,165	62	166	55	147
Nicaragua	3,482,653	12,662	33,766	25,416	67,775
Panama	3,249,531	5,158	13,755	10,614	28,303
Puerto Rico	4,249,848	2,478	6,607	3,072	8,193
Saint Kitts and Nevis	36,102	107	286	111	297
Saint Lucia	163,227	1,006	2,684	1,292	3,444
Saint Maarten, DWI	37,429	10	28	15	39
Saint Vincent and the Grenadines	120,149	337	898	449	1,198
Trinidad and Tobago	1,358,433	14,110	37,626	11,027	29,405
Turks and Caicos Islands	22,570	7	20	10	28
USVI	134,219	37	100	44	118
Venezuela, RB	16,094,897	15,350	40,933	23,136	61,697
Total	89,469,840	157,948	421,195	294,994	786,650

Source: Data from Jambeck et al. 2015.

3 Aligning the Two Trends – The Potential for a Blue Economy in the Caribbean Sea

3.1 Two trends

Since the 'great acceleration' in global economic output and population growth beginning in the 1950s, at least two overarching trends in the use of the ocean have become clear at both the global level and in the Caribbean Sea: growing economic activity (see Chapter 1), together with human-driven changes in ecological systems that have reduced the ocean's natural capital (for example, decreasing fish stocks, alteration of coastal ecosystems, increased pollution, and so on - see Chapter 2). The question arises - if all indications suggest that the first trend (growth in the ocean economy) is at an early stage, what are its implications for the second trend? And conversely, will changes in the ocean's natural capital affect, and potentially slow, growth in the ocean economy in the Caribbean? What is the risk to the future ocean economy and therefore to ocean-facing developing countries in particular?

Figure 3.1. Two Parallel Trends in the Global Ocean

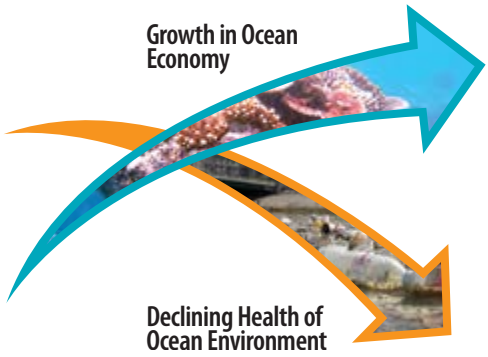
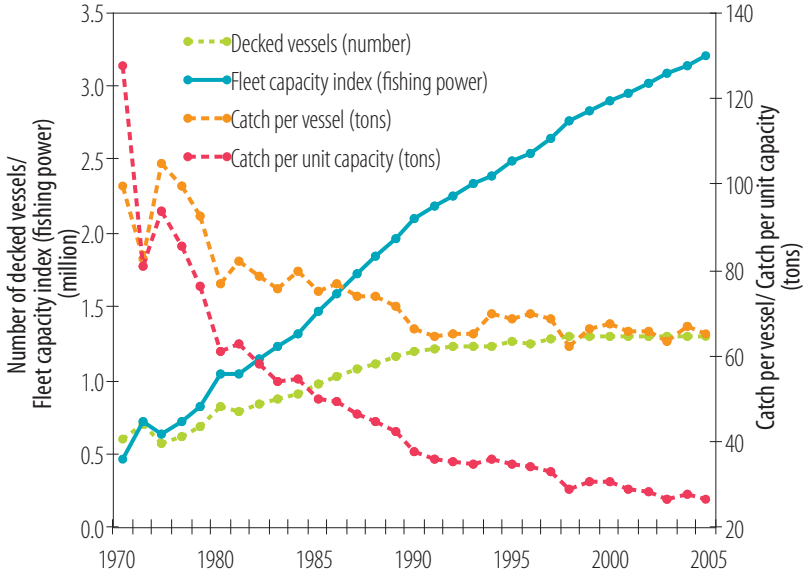
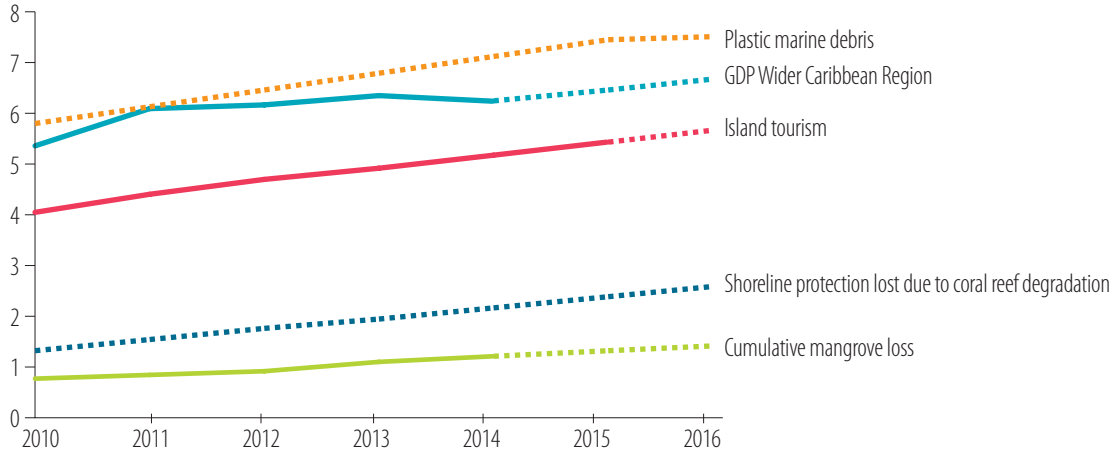


Figure 3.2. Global Fisheries: Decoupling growth in economic activity and overexploitation



Source: World Bank and FAO (2009)

Figure 3.3. Decoupling Economic Growth and Degradation of the Caribbean Sea



Source for GDP growth: *(World Bank 2016); projected growth based on 2005–2014 period; Plastic marine debris projections based on Jambeck et al. (2015); past and projected Island Tourism (WTTC 2015); trend in shoreline loss due to reef degradation (Burke et al. 2004) and cumulative mangrove loss (Hamilton and Casey 2016). Units for the data were adjusted so that all of the line graphs would be between 0 and 10 in the period.*
Note: *Plastic marine debris is measured in units of 100,000 tons; GDP is measured in trillions of current U.S. dollar; Island tourism is measured in 10s of billions of U.S. dollars; Shoreline protection is shown as an index; Cumulative mangrove loss is measured in 100 square kilometers;*

The above graph illustrates that as with the global trends, the Caribbean economy (represented by GDP for the region and tourism for the islands) has exhibited a growth trend over recent years, just as a number of indicators of the loss of natural capital have shown similar increases over that time frame. Essentially, economic growth and environmental degradation have occurred concurrently in the Caribbean Sea during this time period, illustrating the challenge of introducing policies that can promote the 'decoupling' of the trends, such that economic growth continues and even accelerates, while environmental degradation reverses.

3.2 The Concept of a 'Blue Economy'

With the simultaneous growth of (a) the ocean economy and (b) the current rate of change to the ocean's ecological systems, the concept emerging worldwide over the last decade for a 'green economy' and 'green growth' has become a more widely used lens for viewing the risks and opportunities in the ocean. The term was featured prominently for example in the outcome statement by countries at the Rio+20 Earth Summit in 2012, as a tool for policymaking that provides a lens for looking at economic and environmental policy together—focusing on economic growth without a reduction in aggregate natural capital, and the link between poverty reduction and conservation of ecological commons (UNEP 2011; Bowen and Hepburn 2014; Smulders et al. 2014). Common policy recommendations for green growth, such as those included in the OECD's global green growth strategy, often focus on:

- *Enhancing efficiency* in the use of resources and natural capital, and reducing waste (embracing 'circular economy' strategies for example);
- *Spurring innovation of new technologies* to simultaneously increase economic growth as measured by GDP and enhance natural capital, with a focus on the energy system;
- *Creating new markets* by stimulating demand for green technologies, goods, and services;
- *Measuring natural capital* as part of the economy, thereby incorporating considerations of the environment into broader economic decision making; and
- *Boosting investor confidence* through greater predictability and continuity in addressing environmental issues, while better understanding the scale of risks (for example, through application of environmental, social, and governance principles such as the Equator Principles) (UNEP 2011; OECD 2011; Jouvet and de Perthuis 2013).

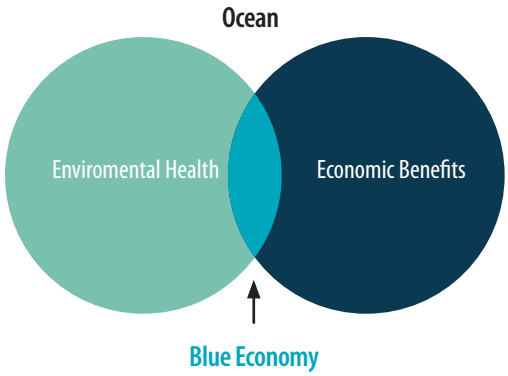
Metrics of green growth have included increased GDP for growth, together with measures of natural capital (OECD 2011), or GDP and wealth measures adjusted for natural capital, as well as process-oriented measures (Jakob and Edenhofer 2014; Narloch, Kozluk, and Lloyd 2016; UNEP 2014b; UNEP 2015a; UNEP 2015b). In 2014, the OECD proposed tracking a set of green growth indicators (maintained on the Green Growth Knowledge Platform), grouped according to (a) environmental and resource productivity (for example, more efficient, low-carbon economy); (b) the natural asset base; (c) environmental quality of life (for example, health and risks such as air pollution); and (d) economic opportunities and policy responses (for example, new technology and innovation) (OECD 2014). Policies reviewed that have supported transitions toward green growth have generated increases in wealth and a higher rate of GDP growth, and over time the jobs created in the transition exceed losses in the 'brown economy'—for example, focused on renewable energy, energy efficiency, public transportation, sustainable agriculture, ecosystem and biodiversity conservation, and land and water conservation, among others (OECD 2011). For example, the United Nations Environment Programme (UNEP) (Sukhdev, Stone, and Nuttal 2010) has featured a number of diverse 'green economy success stories' worldwide, including urban planning in Brazil, organic agriculture in Uganda, green infrastructure in rural India, and ecosystem service payments in Ecuador, among others, though few examples to date have been given for SIDS.

As the green economy concept gained prominence before Rio+20, UNEP together with a group of partners proposed to apply this concept to the ocean economy—envisaging a 'blue economy'. The focus was on policies to 'green' the ocean economy, looking sector by sector. At the Rio+20 Summit, the blue economy concept emerged in a number of different and competing discourses on human-ocean relations, including: (a) the oceans as natural capital, (b) the oceans as 'good business', (c) the oceans as integral to Pacific SIDS, and (d) the oceans as a source of small-scale fishing livelihoods (Silver et al. 2015). Subsequently, a number of national strategies and international summits were held on the subject of the blue economy broadly, as featured in FAO's 2014 State of World Fisheries and Aquaculture report (FAO 2014b). Drawing from these efforts, the Economist Intelligence Unit defined the concept of the blue economy as shown in Box 3.1 below (Economist Intelligence Unit 2015).

Box 3.1. Definition of the Concept of the Blue Economy

"A sustainable ocean economy emerges when economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy." Essentially, the blue economy concept is a lens by which to view and develop policy agendas that simultaneously enhance ocean health and economic growth, in a manner consistent with principles of social equity and inclusion.

Figure 3.4. Blue Economy Concept



The blue economy concept considers the ecological systems that provide so many of the services linked to the ocean economy as underlying and sometimes invisible natural capital assets (for example, fish stocks, coral reef systems, beach and water quality, mangroves, and so on), which help support the more visible produced capital (machinery and structures) and intangible capital (skills, expertise, and so on, with which labor is applied) (World Bank 2012b, 2006). Of course, this is not to exclude intrinsic values that these ecological systems may have or to suggest that their economic values are of greater priority, but rather to emphasize the connection between the ocean's ecological systems and the economic activity defined in the ocean economy. The blue economy concept recognizes that some activities in the ocean economy depend on the status of the underlying ecological systems (referred to in this instance as natural capital), while all have the potential to degrade them (that is, to deplete the natural capital), and thereby put jobs and economic growth in this segment of the global economy at risk. Increasingly, policy frameworks and industries are emerging that can simultaneously enhance or expand the natural and produced capital of the ocean economy, that is, grow the blue economy (or 'blue growth'). Essentially, the blue economy concept aims to provide a lens by

which to measure, identify, and encourage these types of opportunities, for a net benefit to the aggregate ocean economy and environment, consistent with principles of social equity and with a priority on poverty reduction. Of course, like many of the concepts and techniques used in the ocean space, the blue economy concept is borrowed from work on land—the green economy (as well as the circular economy)—where important differences such as clearer ownership of resources have implications for management of human activities (OECD 2016).

3.3 A Blue Economy Conceptual Framework

A conceptual framework explains graphically the main things to be studied (key factors, constructs, or variables) and the presumed relationships among them, essentially creating intellectual 'bins' containing a lot of discrete events and behavior (Miles and Huberman 1994). Alternatively, such frameworks have been defined as a network or a 'plane' of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena (Jabareen 2009). To better illustrate the complex relationship between economic activity and ecological systems in the Caribbean Sea, a conceptual framework for the blue economy is proposed here (see Figure 3.5).

This Blue Economy Conceptual Framework aims to illustrate the inputs received by the ocean economy from the underlying natural capital (as a factor of production, providing a nonmarket flow to the ocean economy (OECD 2016)), and at the same time the outputs from that economy that affect the levels of this natural capital and the flows of benefits that they can sustainably provide. If properly managed, many of these natural capital assets are renewable and capable of yielding a sustained flow of benefits. For example, fish stocks are a living resource that provides a flow of inputs into the production of seafood in the ocean economy. Alternatively, ocean economic activities may provide outputs or impacts on the ecosystems and ecosystem processes, for example, coastal development leading to construction or expansion of ports, marinas, harbors, or channels for shipping that change or convert ecosystems such as sea grass beds and mangroves. Essentially, this framework aims to capture the value of changes in the natural capital assets together with changes in economic activity, to measure the net benefit to society from this integrated blue economy, consistent with OECD's recent work characterizing the ocean economy as well as widely established concepts of a 'circular economy' where material flows to and from industry are circular (OECD 2016). Such interactions happen horizontally between different sectors of the ocean economy, and between different ecosystems of the ocean, as well as vertically between the economic sectors and ecosystems, which in aggregate affect the outcomes of the blue economy.

While no two cases or contexts are the same, there are a number of examples of a transition toward a blue economy within various sectors of the ocean economy that may be instructive, for example:

- *Sustainable fishing practices* can in some instances be rewarded with an eco-label that brings a price premium;
- *Shellfish aquaculture* can both enhance coastal water quality and produce valuable seafood that supports employment and contributes to GDP;
- *Offshore wind and other marine renewable energy technologies* could generate new jobs and significant additional energy according to some estimates; and
- *Green infrastructure along the coast* can both create jobs and protect coastal development.

As such, governments that introduce policies to enhance or encourage the transition to the blue economy could help countries capture the potential benefits, measured as the net present value (NPV) of the increase in the entire blue economy, with costs being charged to the inputs from or outputs to the natural capital. Essentially, this provides a framework for considering if the economic returns from the transition to a blue economy justify the initial investment costs in a given context, in comparison to business-as-usual to grow the ocean economy.

Figure 3.5. A Blue Economy Framework

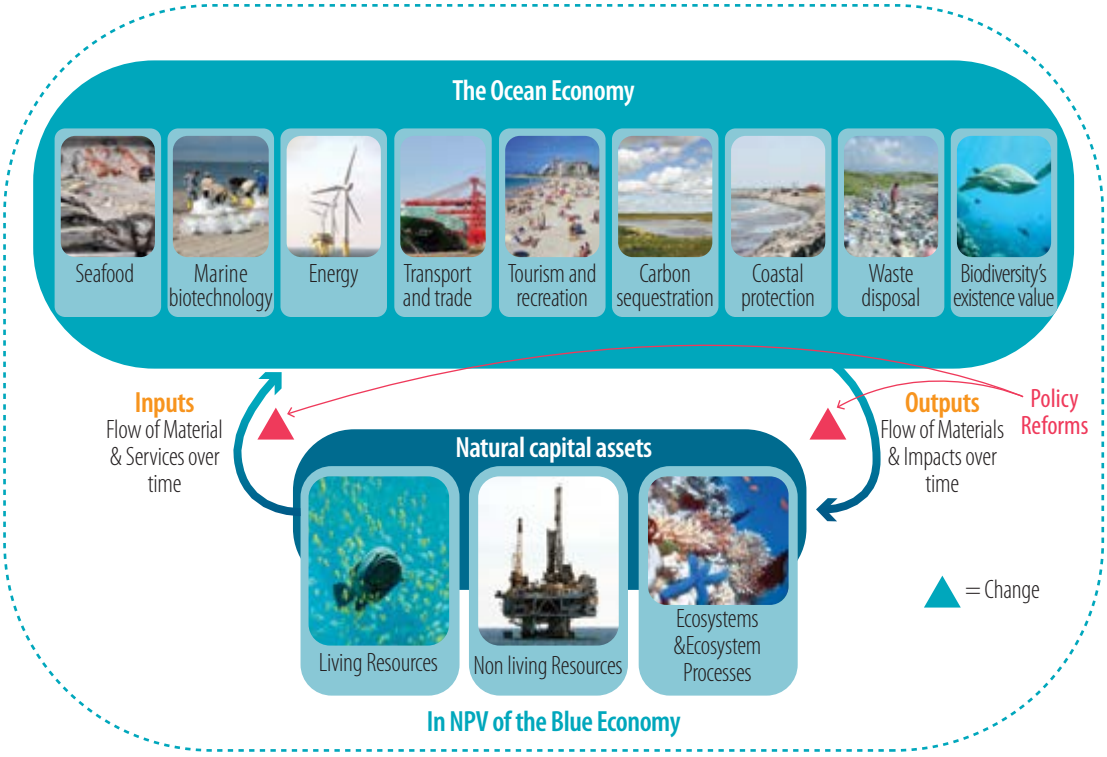


Figure 3.5 represents a graphic illustration of the entry points for policy reforms to change the flow of inputs from natural capital assets to the ocean economy over time, or conversely to reduce its outputs (for example, pollution) to the ocean's natural capital. The conceptual framework allows for consideration of the ocean economy and ecological systems together in policy design. For example, the costs of a policy reform to reduce the output from one industry in the ocean economy to the underlying natural capital assets (for example, to reduce impacts of shipping or port services on coastal ecosystems) might be far less than the inputs over time that this natural capital can provide to other industries (for example, tourism). Hence, the NPV of the entire blue economy would increase, even as the costs may be borne by one industry or sector. In essence, Figure 3.5 provides a conceptual framework for governments to:

a) **think about economic activity** in the ocean as a discrete and unique segment of the larger economy, with shared risks and opportunities (including cluster opportunities within the ocean space); and

b) **measure and incorporate natural capital assets** into accounting and supporting policies for this ocean economy.

As such, the blue economy conceptual framework translates OECD's global green growth strategy to the sea, supporting an operational policy agenda to "foster economic growth and development in ocean spaces, while ensuring that the ocean's natural assets continue to provide the resources and environmental services on which our well-being relies" (OECD 2011). The OECD breaks this policy agenda down into two broad sets of policies: (a) broad 'framework' policies that mutually reinforce economic growth and conservation of natural capital, such as tax and competition policy to increase efficiency and reduce waste, as well as innovation policies and (b) incentives that put a price on overexploitation of natural resources and on pollution, including a mix of market-based instruments such as environmentally related taxes, together with well-designed regulations and technology support policies, depending on the context (OECD 2011). Similarly, the World Bank's 2012 environment strategy also focused on 'green growth' objectives applicable to the ocean, to support policies that are: (a) '*clean*'—that is, reducing pollution; (b) '*green*'—that is, sustainably managed natural resource stocks, and ecosystems maintained to continue to provide the goods and services that depend upon them; and (c) '*resilient*'—that is, the ability of economies to bounce back from natural disasters and more volatile weather patterns (World Bank 2012a).

Policies for the blue economy. Many coastal nations have already introduced a mix of sector and industry-specific policies for economic activities in the ocean, and increasingly countries have undertaken efforts to develop more integrated policies reflecting the underlying ecosystems, including coordinating the actions of various government agencies (OECD 2016). Building from these experiences, a blue economy policy framework, to increase the NPV of the entire system in a given ocean space, would include the following components in Figure 3.6.

The policy framework in Figure 3.6 highlights the role of coastal and marine spatial planning (CMSP) in the transition toward a blue economy, whereby considerations of natural capital are integrated into the regulation of various economic activities, with the oceans envisaged as 'development spaces'. CMSP is defined here as a public process of analyzing and allocating ocean uses over space and time to achieve economic, ecological, and social objectives (Ehler and Douvere 2007). Following long traditions of regulation of conflicts between different land uses through zoning, CMSP has in many cases resulted in ocean plans and zoning, whereby maps categorize the ocean space for a particular use or array of uses, taking into account ecosystem processes (Agardy 2009). A recent review of CMSP noted 59 ocean plans in preparation or completed as of mid-2014, and conducted case studies for 5 of these plans, which in aggregate created an estimated US$310 million in new economic value, largely through offshore wind developments in the northern United States and in Belgium. The plans studied helped to reduce conflicts between different ocean users, for example, wind developers and fishers, as well as expanded ocean area under protection (for example, with fishers gaining protection of key fishing grounds from wind farms or other uses in some cases) (Blau and Green 2015).

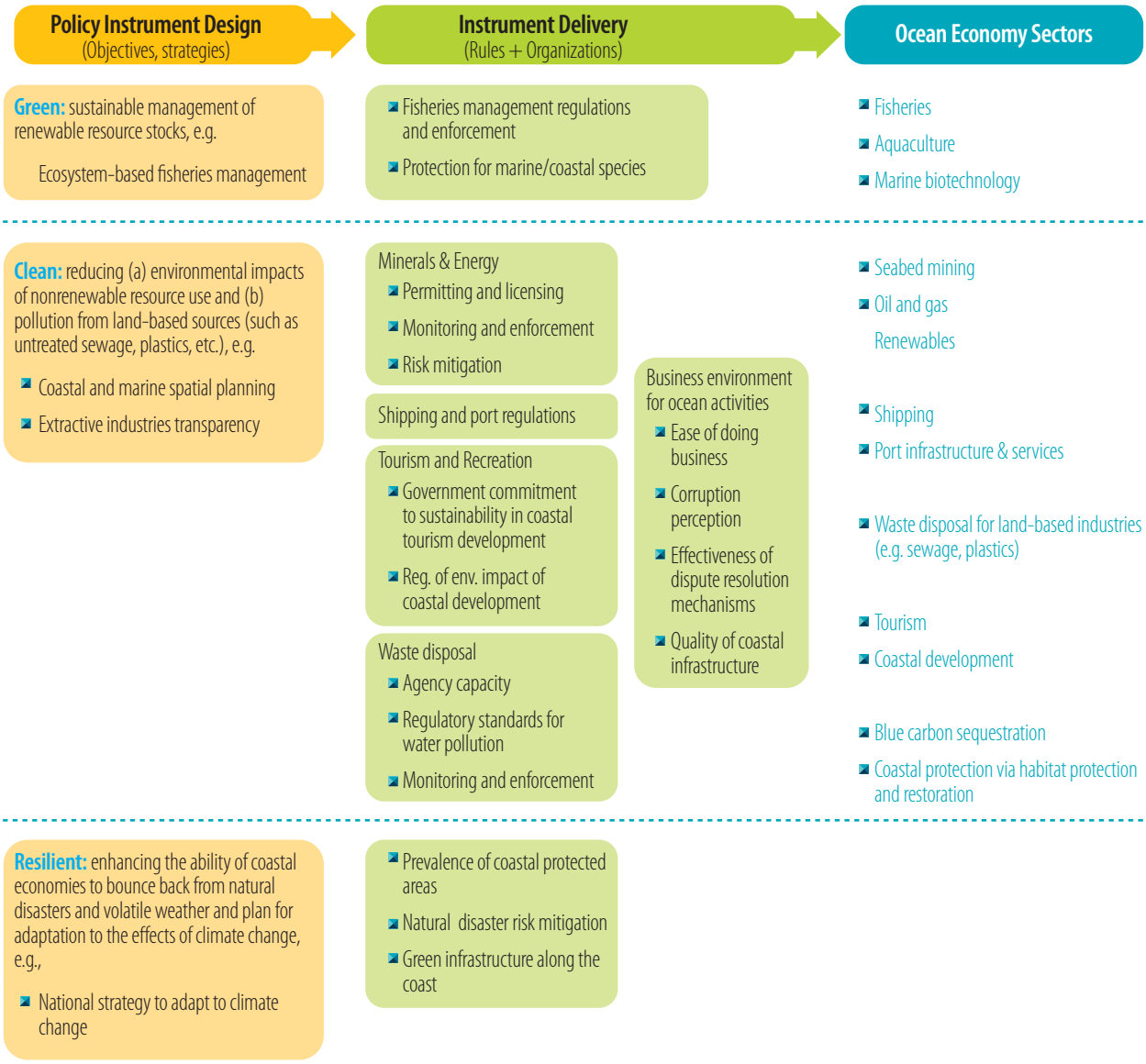
Tracking the transition. Putting the blue economy conceptual framework into action would measure both the ocean economy and the natural capital that underpins it, combined as the blue economy. Tracking metrics or indicators of growth in this economy together with the sustainability of its natural capital (for example, in a blue economy index), together with clear principles for investment, could help leverage greater investment in the blue economy with increased benefits for the global economy over the long term. Such a set of indicators could be used in the blue economy conceptual framework shown in Figure 3.5, to track the transition to a blue economy over time. For example, while it may be time-consuming and difficult to construct a full model that could predict changes to these indicators over time in various scenarios, more narrative or qualitative scenarios might suggest the future direction or magnitude of change in the indicators for a blue economy, or specific components. Additionally, the NPV of sector output at a given point in time from each of the sectors of the ocean economy could be aggregated into an 'Ocean Economy Index'.

Financing the blue economy. Similarly, to enable finance to support the transition to the blue economy, clear 'investment principles' that essentially screen all investments in the ocean economy, could help ensure that economic and environmental objectives are simultaneously met, consistent with internationally agreed principles on equity and social justice, and with a priority on poverty reduction. For example, over 70 percent of international project finance debt in emerging markets is provided by 83 banks and organizations that have committed to follow the Equator Principles for incorporating environmental and social considerations into finance[10]. This process has helped spur the development of more specific practices in the financial sector and banking industry, such as the Carbon Principles[11], and could be the basis for a set of 'Ocean Principles' for the blue economy. For example, the Seychelles recently highlighted the role that capital can play in helping to drive the transition to a blue economy, with agreement on a debt swap to allow the country to redirect a portion of current debt payments from Paris Club creditors to fund ocean conservation (including creation and management of over 400,000 square kilometers of new marine protected areas [MPAs]), together with the NatureVest arm of The Nature Conservancy[12].

Coastal and Island States' Efforts to develop a Blue Economy. SIDS have championed the blue economy in a number of international fora, for example putting forward a position paper for the Summit in Apia in 2014[13]. Seychelles has focused on the blue economy and created a Ministry of Finance, Trade and the Blue Economy, and neighboring Mauritius developed a 'roadmap' for the ocean economy in 2013, orienting the country's growth strategy around the development and use of its 2.3 million square kilometers of ocean space (Mauritius Prime Minister's Office 2013). The Mauritius roadmap focuses on development of seven components of the ocean economy: (a) seabed exploration for hydrocarbon and minerals; (b) deep ocean water applications

10 http://www.equator-principles.com/.
11 http://www.theclimategroup.org/who-we-are/our-members/our-member-principles/.
12 http://www.nature.org/newsfeatures/pressreleases/debt-swap-to-finance-marine-conservation-in-the-seychelles.xml.
13 Small Island Developing States, Blue Economy Concept Paper, www.sids2014.org/content/documents/275BEconcept.pdf.

Figure 3.6. Proposed Blue Economy Policy Framework for Aligning Ocean Health and Economic Growth



Source: *Adapted from World Bank (2012), Economist (2015).*

Box 3.2. Position Paper on the Blue Economy for the 2014 SIDS Summit

The Blue Economy conceptualizes oceans as "Development Spaces" where spatial planning integrates conservation, sustainable use, oil and mineral wealth extraction, bio-prospecting, sustainable energy production and marine transport. The Blue Economy breaks the mold of the business as usual "brown" development model where the oceans have been perceived as a means of free resource extraction and waste dumping; with costs externalized from economic calculations. The Blue Economy will incorporate ocean values and services into economic modelling and decision-making processes. The Blue Economy paradigm constitutes a sustainable development framework for developing countries addressing equity in access to, development of and the sharing of benefits from marine resources; offering scope for re-investment in human development and the alleviation of crippling national debt burdens (OECD 2016).

(DOWA) to draw deep water for cooling systems and other applications; (c) seafood from both fisheries and aquaculture; (d) port services and related activities; (e) ocean renewable energies; (f) other ocean-related activities linked to tourism and ICT for example; and (g) ocean research and innovation (Lattemann et al. 2010). In late 2014 Indonesia's President proposed a policy for the country as a 'global maritime axis', focusing on growth in the ocean economy based on four main objectives: (a) strengthening sovereignty over the country's waters and resolving maritime border disputes; (b) sustainably managing the natural resources and protecting the marine environment, notably by stepping up efforts to combat illegal fishing as well as aquaculture development (exponentially growing public revenues from the sector by 2019); (c) increasing tourism (doubling visitors by 2019) by building marinas along yacht routes for example; and (d) building science and research capacity for a blue economy, for example through construction of three marine science technology parks by 2019[14]. Similarly, the Commonwealth is supporting developing countries to pursue four interrelated objectives: (a) diversifying the existing economic base and increasing the proportion of GDP derived from ocean sectors; (b) focusing on strategies to create higher value jobs; (c) addressing the achievement of food security through marine sources of protein; and (d) supporting developing countries in sustainably managing ocean development (Roberts 2015).

The Blue Economy and the SDGs. As mentioned in Chapter 2, the international community has agreed on an SDG aimed at the conservation and sustainable use of the oceans (SDG 14), toward which the transition of the ocean economy to a blue economy would make a significant contribution. However, the ocean provides food, jobs, economic growth, carbon storage, and protection from natural disasters among others, and hence can

14 http://www.thejakartapost.com/news/2014/12/30/maritime-axis-development-boost-ri-s-gdp.html#sthash.ifwdCRi8.dpuf.

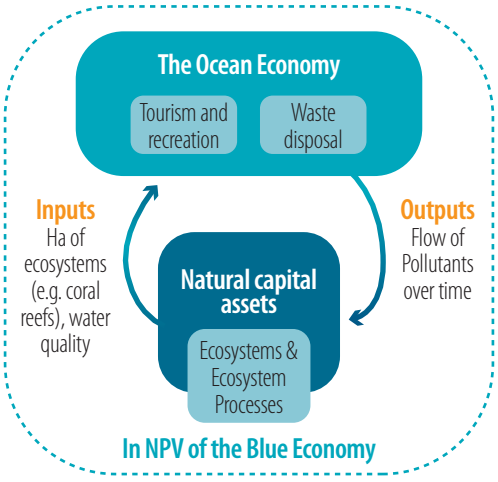
make a significant contribution toward achieving many more of the 17 SDGs than just SDG 14. For example, a quick scan of all 17 goals shows at least 10 other SDGs where the transition to a blue economy would be expected to contribute toward meeting some or all of the targets (see Annex 3).

3.4 A Caribbean Blue Economy: Aligning Economic Growth and Ocean Health

A growing number of Caribbean states have expressed their desire to explore policies for a blue economy in the region, notably during the inaugural Caribbean Region Dialogue with the G20 Development Working Group held in Washington, D.C. on April 13, 2015 at the International Monetary Fund headquarters. The dialogue was attended by the region's finance ministers and central bank governors and covered the opportunities and challenges around two interrelated themes: (a) 'Developing the Blue Economy in the Caribbean' and (b) 'Mobilizing Resources' in support. As the background document to the meeting stated: "by applying a blue economy approach many new opportunities arise for the region, which can create new jobs, achieve a higher rate of growth, reduce poverty, and secure international biodiversity and sustainability obligations" (Roberts 2015). Essentially the countries considered that the transition to a blue economy could contribute toward a number of broader policy objectives captured in the SDGs, including poverty reduction, food security, energy security, disaster risk reduction, climate change mitigation, and ocean conservation. As such, the Outcome Statement from the Caribbean Regional Dialogue notes that: "Developing the Caribbean Blue Economy offers strong potential for the Caribbean region and its member countries to help broaden output, exports, employment and revenue and to benefit from the array of assets and opportunities offered by the Caribbean Sea."

The fundamental hypothesis upon which this effort rests, is that the future growth and opportunity of the ocean economy in the Caribbean would be increased by transitioning to a blue economy in the region—with investments simultaneously in both natural and produced capital, and integrated policies that target the interrelationships between economic sectors in the water. The Blue Economy Conceptual Framework proposed in Figure 3.5 aims to help illustrate this hypothesis. For example, the waste disposal sector of the region's ocean economy, where the Caribbean Sea provides implicit or explicit services of disposal of wastes and particularly excess nutrients, provides a flow of outputs in the form of pollution to the ecosystems and ecosystem processes, that in turn reduces their ability to provide critical inputs or factors of production for the tourism and recreation sector of the ocean economy.

Figure 3.7. Example of the Blue Economy Conceptual Framework: Tourism, Waste Disposal, and Ecosystems



One specific example of the circular interaction between different sectors of the ocean economy and the natural capital of the Caribbean Sea is the above depiction of the waste disposal function of the ocean and its impact on ecosystems and ecosystem processes such as coral reefs, beaches, and water quality, all of which are inputs or factors of production for the tourism sector. While the value of the waste disposal segment has not been quantified, the tourism sector provides some US$47 billion in annual revenues to the islands alone (see Table 1.3), and depends heavily on the ocean ecosystems and ecosystem processes as an input (for example, Box 3.3).

Using the proposed Blue Economy Conceptual Framework to consider the ocean's natural capital and economic sectors together, suggests opportunities where the hypothesis could be tested and the overall economic value for the region would be greater with the development of those sectors of the ocean economy that maintained or enhanced the natural capital—that is, 'blue growth'. For example, emerging blue growth opportunities in the Caribbean have been proposed in aquaculture, marine renewable energy, tourism, and marine biotechnology, among others (Roberts 2015).

Box 3.3. Tourism and the Ocean Ecosystems


Beautiful Caribbean beaches now a smelly mess after massive seaweed invasion

In 2015, there were significant concerns for the region's tourism industry after large blooms of sargassum seaweed washed up on beaches from Mexico to Barbados, fueled in part by untreated sewage discharged into the Caribbean Sea.

https://www.washingtonpost.com/news/morning-mix/wp/2015/08/14/paradise-lost-caribbean-beaches-face-a-massive-seaweed-invasion-ahead-of-winter-tourism-season/

Marine renewable energy is one example of a sector often regarded as a model for the transition to a blue economy, where the ocean provides increased jobs and energy without drawing down the natural capital. Essentially the aim is to find new sectors of the ocean economy, or to promote changes to existing ones, that simultaneously enhance both the benefits generated and the natural capital. Green infrastructure along the coast is another example that can create both jobs and protect coastal development—enhancing the ecosystem processes. For example, a recent meta-analysis of various studies of coastal habitat restoration/engineering projects to increase defenses against storm surge and flooding showed significantly improved protection at lower costs than constructed alternatives such as breakwaters (Narayan et al. 2016). For example, depending on the water depth, mangrove projects in Vietnam can be three to five times cheaper than a breakwater, and salt-marsh projects across Europe and the United States

Box 3.4. Blue Growth Sector: Marine Renewable Energy

Currently, imported oil provides 90 percent of the energy consumed in the Caribbean, with electricity costs of up to US$0.20 and US$0.50 per kWh (World Bank 2015). For this reason CARICOM adopted a regional energy policy in 2013 calling on states to increase the use of commercially viable and sustainable renewable energy sources (CARICOM 2013). Efforts to date have focused on terrestrial renewable energy, for example in Bonaire where 12 wind turbines with a total of 11 MW of wind power capacity (backed by batteries and an additional 14 MW of diesel generation for peak loads and low wind) were constructed after a fire destroyed the diesel power plant in 2004 (Bunker 2015). In this case, the price of electricity in Bonaire dropped from US$0.50 per kWh to US$0.22 per kWh (Bunker 2015). While the ocean could be a source of additional renewable energy—for example, from wave, tidal, and ocean thermal energy conversion (OTEC)—many of the technologies currently remain in the early development stages, combining with the relatively low energy demand of the islands to deter development in the near term. However, as states in the Caribbean explore expanding renewable energy generation from the ocean, the region could be a candidate for locating marine renewable testing and demonstration projects.

Sources: World Bank 2015; CARICOM 2013; Bunker 2015.

vary from being just as expensive, to around three times cheaper (Narayan et al. 2016). These are examples of ocean economy sectors that fill the venn diagram of a blue economy—where economic growth and environmental health overlap. Another sector that has this potential in the region is aquaculture, depending on the policy and regulatory framework in place.

The Policy Framework for a Caribbean Blue Economy. A Blue Economy Conceptual Framework has been proposed in Figure 3.5 to help conceptualize an ocean economy that:

a) measures natural capital,

b) manages competing uses of the ocean space to conserve natural capital, enhance social benefits, and reduce conflicts, and

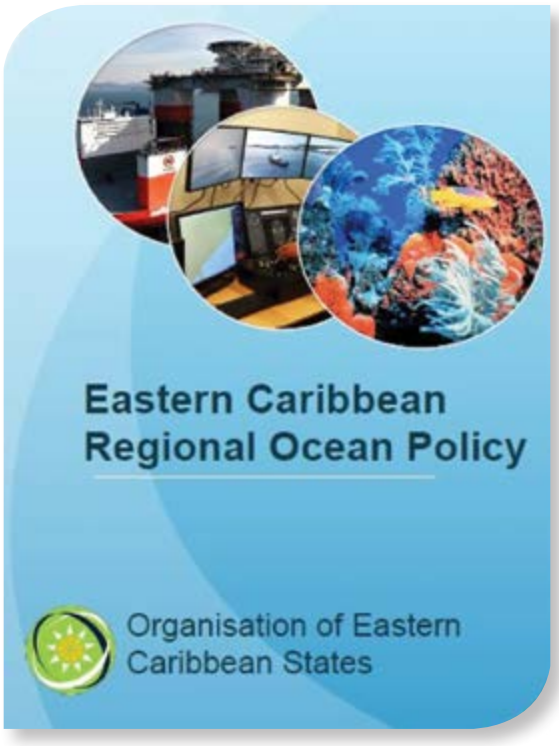
c) spurs innovation and investment in blue growth sectors and technologies that simultaneously increase economic benefits and natural capital.

Transitioning to such a blue economy in the Caribbean requires a policy framework that accounts for the ocean as a unique 'development space', shaped by its ecology. Such a policy framework may be driven by CMSP, generating maps to categorize the ocean space for a particular use or array of uses while taking into account ecosystem processes, and in some cases translating these categories into regulations via ocean zoning. Currently ocean governance in the Caribbean is relatively fragmented to support such integrated policies for the blue economy, with over 30 different regional and subregional organizations engaged to some degree and a collection of multilateral environmental agreements, political agreements, non-binding agreements, programs, projects, and national laws, all of which work at different levels and spatial scales. Across the region and at the national level, this framework is often focused on a sector-specific approach to the ocean economy, unable to respond to the cumulative and synergistic impacts and pressures from human activities in this shared space (Roberts 2015).

Governments and development partners have launched a number of regional initiatives to try to better measure and conserve the Caribbean Sea's natural capital, as a foundation for the transition to a blue economy. For example, since 2009 the GEF has funded a Caribbean Large Marine Ecosystem (CLME) Project implemented by the United Nations Development Programme (UNDP), to better assess the status of the ecological systems and the region's natural capital, and support policy recommendations for conservation[15]. Similarly, in 2013 nine Caribbean states and territories signed the Caribbean Challenge Initiative (CCI) Leaders Declaration committing to effectively conserve and manage at least 20 percent of the marine and coastal environment by 2020, together with sustainable financing mechanisms established to fund operating costs over

15 http://www.clmeproject.org/index.html.

Figure 3.8. Eastern Caribbean Regional Ocean Policy



the long term (Roberts 2015). These commitments follow a trend in the region to increase various forms of protection of ocean areas, that is, MPAs, with coverage growing from 6,463 square kilometers in 1983 to 143,096 square kilometers by 2014, or some 4 percent of the Caribbean Sea (TWAP 2015).

At the subregional level, in 2013 the members of the Organization of Eastern Caribbean States (OECS) adopted a policy framework that could provide the foundation for a blue economy in this area of the Caribbean Sea, the Eastern Caribbean Regional Oceans Policy and Action Plan (ECROP) (see Box 3.6). At the national level, a number of states have introduced policies to support the transition to a blue economy, such as in The Bahamas where an integrated policy framework aims to manage the ocean space and its resources jointly across some 34 different government bodies, as well as St. Kitts and Nevis, St. Vincent and the Grenadines, and Antigua and Barbuda. In the latter, the Barbuda Blue Halo Initiative is being supported by the Waitt Institute to develop a comprehensive, community-driven, and science-based plan for the island's coastal waters, including new fishing regulations and a zoning plan for coastal waters (Roberts 2015). Similar work is also being undertaken in countries like British Virgin Islands and Montserrat.

As the following section describes, Grenada in particular has introduced since 2014 a set of policies aimed at the development of a blue economy, as the pillar of the country's future growth.

Box 3.6. Transforming Governance in Oceans - The OECS Experience

Promoting Sustainable Oceans Governance in OECS

SITUATION ANALYSIS: The OECS is an economic subregion in the Caribbean with 10 member states, all of whom are SIDS which have challenges similar to those faced in the marine environment for example, pollution among others. The Revised Treaty of Basseterre establishing the Economic Union which stipulates in Article 4(0), among other things, that the Union shall pursue a common policy for oceans. In addition, all member states ratified the United Nations Convention on the Law of the Sea (UNCLOS). In 2013, the highest decision making body of the Union (the Authority) approved and adopted a regional ocean policy (ECROP) to promote a common approach to ocean governance in all member states and further mandated that each member develop the national ocean policy to support the regional policy. The competency for the implementation of the Oceans program including ECROP was given to the Commission for the OECS. The ECROP has a number of priorities and a number of goals, of which many find synergy with the SDGs.

PROGRESS MADE: In 2014, the implementation commenced and to date, a structure for research has been developed to support a stronger science policy interface (a marine research strategy, code of conduct for responsible marine research, a data platform to support greater access to information, a guideline of marine standards)and an oceans governance team, comprising one nominated representative of each member state who supports the connectivity and articulated the needs on behalf of the state, has been established. To date, five National Ocean Policies have been developed.

IMPACT: Prior to the implementation of ECROP, ocean spaces were managed in an ad hoc manner, with a large number of policies dealing mostly with conservation without significant implementation resources, all done solely within national jurisdictions with little bilateral or multilateral cooperation. Now, member states are including the ocean economy in their development models and many countries are also pursuing greater conservation efforts, such as the CCI of having 20 percent of their coastal area under conservation.

MAJOR PREREQUISITE FOR SUCCESS: Political will was the major driver; sound governance structure in both multilateral environmental agreements and political diplomatic agreement; polices; effective institutional structure and cooperation.

3.5 Case Study: Grenada: Translating Aspiration to Action in Its Transition to a Blue Economy

Country context. The state of Grenada consists of the three islands of Grenada, Carriacou, and Petit Martinique with a total land area of 345 square kilometers (133 square miles). As one of the nine members of the OECS, the island nation is nested between the Caribbean Sea and the Atlantic Ocean. Similar to many small island states, Grenada's economy is shaped by its remoteness, small land mass, limited natural resource base, and fragile ecosystems. Grenada supports a population of 106,300 (2014), with a gross national income (GNI) per capita of US$7,910 (World Bank 2014). Grenada is recognized for its natural beauty and cultural diversity. Over the last quarter century it has developed a tourism-based service economy, and it now brands itself as 'Pure Grenada: The Spice of the Caribbean'.

Figure 3.9. Map of Grenada

Grenada has a small, open economy, vulnerable to a wide range of exogenous shocks, and faces several development challenges. With a current GDP of US$911 million (World Bank 2014), Grenada has experienced low growth in recent years, and the weak dynamism of the private sector has contributed to high debt levels. The official poverty rate in Grenada is 37.7 percent, and the 2008 financial crisis increased the already high unemployment level to 10.2 percent, with youth unemployment over 30 percent.

Agriculture represents about 11 percent of the labor force, with nutmeg and mace being the country's main export. In the last two decades, however, the importance of traditional export crops has reduced, and the natural disasters have severely impacted the agriculture industry. Currently agriculture, including fisheries, represents 7.1 percent (World Bank 2014) of GDP in Grenada down from 13.4 percent in 1990. The country is now the world's second largest producer of nutmeg, accounting for 20 percent of global supply. While nutmeg remains a principal export crop, it is currently second to fisheries as a source of export earnings.

The tourism sector is the main pillar driving economy growth in Grenada. Over the years, the economy has shifted from one dominated by agriculture to one focused on the tourism industry—now considered the largest export sector in the country. The economic ramifications of the tourism industry have been profound with the increase in tourism development projects, employment, and investment on the island. The World Travel and Tourism Council (WTTC) estimates that the total contribution of tourism to GDP has increased from 15 percent in 2005 to 25.5 percent in 2015. The share of tourism to total employment increased from 13.9 percent to 23.3 percent from 2005 to 2015[16] (equivalent to 11,500 jobs). The reliance on tourism has resulted in numerous benefits. Tourism-related activities in the economy has made communities more economically stable, and has improved the health care and education system in the country. Moreover, tourism has brought the protection of the natural environment through funding from entrance fees and the maintenance and enhancement from government funding (Bhola-Paul 2015). While economic growth was moderate in 2015 because of structural challenges, the tourism industry is expected to remain strong and continue to grow.

Grenada is highly vulnerable to the adverse impacts of climate change and climate variability. Most of the island's infrastructure is located in the coastal zone, making the economy vulnerable to impacts of sea-level rise, inundation, erosion, and storm surges, while the steep slopes are vulnerable to landslides. Based on data from DesInventar[17], Grenada's damages and losses from hydro-meteorological disasters and earthquakes can be estimated at US$1.098 billion between 1994 and 2013. Hurricane Ivan, in particular, has caused direct and indirect losses of US$889 million, destroyed 90 percent of all property, affected 85 percent of the nutmeg

16 Source: World Travel and Tourism Council Data, 2016. https://www.wttc.org/-/media/files/reports/economic%20impact%20research/countries%202015/grenada2015.pdf.
17 EM-DAT, DesInventar, Caribbean Development Bank.

export and caused a decline of 24 percent in the 2004 GDP[18]. Hurricane Ivan rendered inoperable 70 percent of Grenada's hotel infrastructure in 2004, and the debt-to-GDP ratio increased to 94 percent (World Bank 2015)[19]. The damage was equivalent to 200 percent of the country's GDP at the time. The following year, the effects of Hurricane Emily further retarded recovery, especially with the inadequate insurance coverage. Therefore, the vulnerability of Grenada to these natural disasters has and can continue to cause costly damage to the infrastructure, socioeconomic sectors, environment, and local livelihoods.

Figure 3.10. Growing Tourism Sector

Greening Grenada's economy. Grenada has come a long way in its recovery process, giving a major focus on greening its economy. Grenada's progress is observed in the approach to stimulate key transformation sectors such as tourism and hospitality services; health, well-being and education services; agribusiness; ICT; and energy development (renewable and nonrenewable). In transitioning to a low-carbon economy, the national Energy Policy of Grenada aims to deliver a sustainable low-carbon approach through eight core principles: (a) ensuring energy security, (b) achieving energy independence, (c) maximizing energy efficiency, (d) promoting energy conservation, (e) pursuing environmental sustainability through 'green energy', (f) guaranteeing sustainable resource exploitation, (g) minimizing energy costs, and (h) energy solidarity[20]. Grenada has worked to create a new Electricity Supply Act with a view of going 100 percent renewable[21]. Such an economy would utilize base load geothermal and waste-to-energy, complemented by intermittent wind and solar in the energy mix by 2030. Several policies and programs have been implemented to meet the clean energy goals of renewable energy and energy efficiency[22]. A price on carbon through a fuel levy has also been introduced which is improving the fiscal space of the country[23]. Although Grenada's total emissions are not significant in the global context, Grenada has made its contributions to reducing greenhouse gas emissions at the conclusion of the UN Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) in Paris in December 2015. As per the (Intended) Nationally Determined Contributions submitted by Grenada, the government committed to reducing its greenhouse gas emissions by 30 percent of 2010 by 2025, with an indicative reduction of 40 percent of 2010 by 2030[24].

Mainstreaming climate change adaptation activities into national development planning is a priority. Grenada has adopted a Climate Smart Agriculture, integrating agriculture development with climate responsiveness. The largest agricultural production systems, nutmeg and spice production, are 'climate smart'[25]. These arboreal crops sequester carbon, make a vital contribution to soil and watersheds, and are drought resistant. The sustainable use of water resources is crucial for the future development of the country, and major actions such as a vulnerability assessment of the water sector and a national adaptation plan have been developed. Rainwater activities are underway to improve water collection and storage. To reduce the risk of hurricane damage, Grenada has also been a member of the Caribbean Catastrophic Risk Insurance Facility (CRIFF) since 2007. CRIFF was designed as a regional catastrophe fund for Caribbean governments to limit the financial impact of devastating hurricanes and earthquakes by quickly providing financial liquidity when a policy is triggered.

The emerging blue economy in Grenada. Broadening the scope past the limited reliance on the green economy, Grenada is now a leader in the transformation to a Blue Economy Ocean State in the Caribbean. In May 2014, the

18 Economic Commission for Latin America and the Caribbean. http://www.cepal.org/en/headquarters-and-offices/eclac-caribbean.
19 World Bank. Summary Diagnostic Report. Grenada Disaster Risk Financing Technical Assistance Project.
20 National Energy Policy of Grenada 2011. http://www.gov.gd/egov/docs/other/GNEP_Final_Nov_23_2011.pdf.
21 Statement by Dr. The Right Honourable Keith Mitchell at plenary meeting of the UN Summit for the Adoption of the Post-2015 Development Agenda.
22 Some of them include demand-side energy efficiency programs; Government Energy Efficiency Program, which targets a 10 percent reduction in government electricity use; Government programs to replace incandescent lights with fluorescent lights, and so on.
23 Statement by Dr. The Right Honourable Keith Mitchell at plenary meeting of the UN Summit for the Adoption of the Post-2015 Development Agenda.
24 Grenada's (Intended) Nationally Determined Contributions (I)NDC.
25 Most of Grenada's export crops are from trees that require no tillage. Farmers have also diversified into alternative export crops, including cocoa and tropical fruits to reduce the risk of hurricane damage on shallow-rooted nutmeg trees. Cocoa is a deep-rooted species that is resilient to tropical storms. These initiatives will sustainably increase productivity, enhance resilience, and reduce greenhouse gases

Government of Grenada announced its intention to undertake a number of activities to protect its 'blue space' and grow the island's blue economy[26]. As part of the transition to a blue economy, Grenada has established the National Ocean Governance Committee, which includes officials from the ministries of Agriculture, Foreign Affairs, Legal Affairs, Finance, Tourism, the Royal Grenadian Police Force, the Grenada Ports Authority, the Grenada Solid Waste Management Authority, and the National Disaster Management Agency. This Committee oversees the development of blue economy initiatives across the government.

Grenada is the first OECS member country to develop a vision for its blue growth economy. Grenada's blue growth vision is to optimize the coastal, marine, and ocean resources to become a world leader and international prototype for blue growth and sustainability. Because of the country's outward-looking geography, its ocean and coastal areas provide important resources for developing new ideas and innovation. This has opened up an opportunity for blue growth and the potential to harness the untapped potential of Grenada's oceans and coasts for jobs and economic growth. The potential is significant, provided the appropriate investments are made.

Grenada's ocean space is 75 times larger than its land area. Beyond the 345 square kilometers of green territorial land, Grenada has 26,000 square kilometers of blue ocean space—exclusive economic zone (EEZ). Such a large EEZ provides more space to diversify the country's economy, and by applying a blue economy approach, many new opportunities will arise to achieve a higher rate of growth, create new jobs, and reduce poverty. Some of the emerging opportunities in the blue economy with a strong potential in Grenada are aquaculture, marine renewable energy, marine biotechnology, and ocean-related tourism.

Figure 3.11. Grenada Exclusive Economic Zone

While the marine environment has great potential with regard to economic sustainable development, the country is facing increasing environmental pressures. Its large marine ecosystem is characterized by coral reefs, mangroves, sea grasses, sandy beaches, and rocky shores; and the high biodiversity associated with fauna and flora has resulted in high rates of national and regional endemism. These marine resources provide the basis for a range of economic and social activities, including the tourism and fishing industries. These natural systems underpinning the health of Grenada waters are changing at an alarming rate and scale, due largely to human action occurring in the context of weak institutions. Despite the value of the goods and services provided by the oceans, there are enormous challenges confronting this natural capital

26 NOW Grenada. Grenada's blue economy poised for rapid growth. http://nowgrenada.com/2014/05/pm-grenadas-blue-economy-poised-rapid-growth/.

asset, most notably (a) habitat change and loss, (b) pollution, (c) overfishing, and (d) climate change. Coastal development and marine-based pollution, for example, threaten 85 percent and 25 percent, of the reefs in Grenada, respectively.

Recognizing the rich marine ecosystem and increasing environmental pressures, Grenada has created MPAs and commits to create more. Grenada committed to effectively conserve at least 25 percent of its near-shore marine area and at least 25 percent of its terrestrial area by 2020 as a means to contribute to the sustainable livelihoods for its people and to contribute to protection of the world's biodiversity (Convention on Biological Diversity - COP8). The MPAs will help restore the productivity of the oceans, avoid further degradation, and offer sites for scientific study which can generate income through tourism, biotechnology, and sustainable fishing.

Grenada's strategic location in the world offers a number of significant factors that play into the development of a successful blue economy strategy. As examples, Grenada (a) is located in close proximity to both North and South America with convenient access to/from major cities throughout the world, (b) has an EEZ of 26,000 square kilometers of blue ocean space, (c) is the gateway to the Grenadine Islands and the best sailing in the Caribbean, (d) is one of the most politically stable countries in the region, (e) is recognized for its sound infrastructure and supportive investors, and (f) has excellent port facilities and an international airport. All of these factors, puts Grenada is a unique position to thrive on the pathway to a blue economy, and serve as a leader in implementing this agenda.

Figure 3.12. Grenada Underwater Sculpture Park

underwatersculpture.com

Globally, Grenada has achieved recognition for several blue economy activities. The world's first underwater sculpture park is recognized as the top 25 wonders of the world by the National Geographic. The park offers a collection of ecological underwater contemporary art located off the west coast of the country. The island has also been recognized as the best advanced diving and best wreck diving in the Caribbean by Scuba Diving Magazine. Moreover, the Kick'em Jenny is the most active volcano in the region and considered one of the first shallow vent biological communities ever found, which provides unique opportunities for research related to the growth of a submarine volcano.

The blue economy in Grenada is closely linked to the income generated by ocean-related tourism. As the largest industry in Grenada, tourism is heavily reliant on the coastal and marine environment with regard to cruise ships, beach side hotels and beaches, scuba diving, recreational and sport fishing, and recreational yachting. As previously mentioned, Grenada has been recognized as a sustainable tourism destination with the Pure Grenada brand, referring to its spices, pristine tropical rain forests, and coral reefs. The charming villages, towns, and harbors reflect the maritime heritage. In addition to providing berths for large cruise ships, Grenada is a major destination point for private yachts and mega yachts. The tourism sector is estimated to be worth US$230 million (2015). The diving segment alone contributes around EC$57 million. The economic impact of yachting on Grenada is over EC$230 million. The quality and status of the marine environment could therefore have a significant impact on the value of this sector, depending on how tourists perceive the quality of the marine environment and the experience it offers.

Figure 3.13. Tourism in Grenada

The growth of Grenada's fisheries exports is a major contributor to the blue economy. The contribution of fisheries to the national economy has been increasing, representing jointly with agriculture 7.1 percent (2014) (World Bank 2014) of GDP in Grenada. The characterization of Grenada's ocean waters has determined the nature of the fisheries in the country. Grenada has a large ocean space in relation to its terrestrial size, but the majority of this is deep oceanic water with a relatively small area of shallow shelf. Because of this characteristic, fisheries is dominated by large oceanic pelagic species like tuna, which constitute 75 percent of landings.[27] Yellow fin tuna, which is mainly targeted for export comprises 28 percent of total annual fish catch.[28] Other prime species include demersals (reef fish like snapper, grouper, and parrotfish) and small pelagics (mostly scads) which are caught in coastal areas. Overall, it is important to highlight that the oceanic pelagic fishery has been a major area of growth in the country's economy. Unlike other Eastern Caribbean countries, Grenada has a successful high-value seafood export business, which has significant and positive economic implications for the country. Factors contributing to this success include the following: (a) fresh tuna exports are sent by air to the United States and (b) the country achieved the quality standard required to gain an European Union 'number' to export fresh demersal fish (grouper, snapper, and so on) to Martinique (which is a Department of France).[29] Therefore, fisheries has played a major role in reviving the economy, and the expanding export of high-value fish (fresh tuna) has generated a significant level of foreign exchange, considering one of the major sources in recent years.

Grenada is actively pursuing opportunities for ocean aquaculture. This subsector has been discontinued in Grenada after its introduction in the 1990s (tilapia and fresh water prawns), mainly due to lack of an economy of scale and an inability to compete with the traditional capture fisheries. Grenada is part of the Global Blue Growth Network, which recognizes the need to better protect the marine environment and at the same time produce an additional 60 million tons of fish through sustainable aquaculture by the year 2030.[30]

Grenada has been an advocate for addressing climate change and building coastal resilience. Ocean issues are a critical part of any attempts to address climate change and major efforts have begun to build coastal resilience in the country. In the coastal zone, effectively addressing climate and disaster risks requires an integrated approach that looks at exposure to impacts from climate change and natural hazards. Grenada has now completed its integrated coastal zone policy in 2015 with a view to preserve, enhance, and strengthen resilience of coastal ecosystems while enabling social and economic development.[31] Moreover,

27 Fisheries Policy for Grenada 2012. http://acpfish2-eu.org/uploads/projects/id140/I1544%20-%20ACPFISH%20II%20-%20CAR%20-%201.2%20-%20B2b%20-%20Policy%20Grenada%20%20-01.pdf.
28 FAO Country Profile. ftp://ftp.fao.org/FI/DOCUMENT/fcp/en/FI_CP_GD.pdf.
29 Fisheries Policy for Grenada 2012. http://acpfish2-eu.org/uploads/projects/id140/I1544%20-%20ACPFISH%20II%20-%20CAR%20-%201.2%20-%20B2b%20-%20Policy%20Grenada%20%20-01.pdf.
30 Statement by Dr. The Right Honourable Keith Mitchell at the Interactive Dialogue 4 "Protecting our Planet and Combating Climate Change" Trusteeship Council Chambers on September 27, 2015.
31 Grenada's (Intended) Nationally Determined Contributions (I)NDC.

assessments of the national and local vulnerability have been undertaken[32] to provide a holistic picture of risk, thus helping design and implement locally relevant solutions. One initiative to be implemented is the establishment of a fisheries insurance to promote the resilience of the small-scale fisheries sector against the increasing climate-change-related disaster risks. Other efforts already under implementation include several community ecosystem based adaptation actions, in particular coral restoration, mangrove rehabilitation, alternative livelihood solutions, and so on, which will reduce the community's vulnerability to the threats and help inform actions and policies to further build resilience.

Grenada is the first country to initiate a proactive and comprehensive national coastal master planning approach to blue growth. The Government recently completed a high-level Blue Growth Coastal Master Plan for the islands of Grenada, Carriacou, and Petite Martinique. The plan not only summarizes key goals and objectives, but also identifies specific blue growth development incentive zones along the coast and documents preliminary site and facility concepts for desirable blue growth strategic projects to initiate a dialog with investors. The Grenada Blue Growth Coastal Master Plan, adopted by the Government, and in concert with their Integrated Coastal Zone Management Policy, is a roadmap for Grenada to become a world leader in the development of a sustainable blue economy that will generate new jobs, alternative livelihoods, and an expanded economy for the nation—while preserving the natural environment. A detailed description of the planning process and findings are highlighted in Annex 4.

On the pathway toward blue growth, Grenada further aims to establish a Blue Growth and Oceans Governance Institute. The institute will make Grenada a global example for Blue Growth as an Ocean State. It will house many of the leading global ocean research centers, and promote its vision to optimize the coastal, marine, and ocean resources around the Caribbean. In general, Grenada has put major efforts on education, which represents 20 percent of the GDP. It is home to St. George's University, the leading academic center in the Caribbean. Moreover, Grenada has joined Dominica and Marshall Islands to promote a new initiative called 'We are the Oceans' (WATO), inspired by the United Nations Global Goals. WATO is dedicated to educating the youth across the world about ocean sustainability and making it part of every school's curriculum by 2030.

Marine spatial planning (MSP) is a fundamental tool for developing Grenada's blue economy. Threats to Grenada's ocean space, and the entire Caribbean Sea, have not occurred in isolation, but often overlap and enhance impacts in the same physical space, which are often governed by different sector-based legal frameworks. Utilizing tools such as MSP, will help Grenada better understand and then reform governance of the diversity of ocean uses and economic activities, resulting in a more secure framework for sustained investment in the blue economy. To achieve blue growth aspirations, Grenada and other OECS countries are filling this capacity gap, which has become a priority in the Eastern Caribbean Regional Oceans Policy and the Three Year Strategic Plan (ECROP) approved in 2013. Drawing upon MSP, it will bring several benefits tied to the health of the marine ecosystems, which would include increased sustainable livelihoods from ocean-based tourism and from fisheries, enhanced food security from fisheries, and increased defenses and resilience to extreme weather events.

The way forward. The successful development of a blue economy will require governance and policies that integrate environmental and economic considerations. Good governance at local and regional levels is imperative to fully realize the transition to a blue economy. Grenada is well on its way through the several ongoing blue economy initiatives, and at the regional level, through the endorsement of the new Eastern Caribbean Regional Ocean Policy. The planning and management for multiple coastal and ocean uses requires the full range of uses, users and values to be considered, through an integrated, interdisciplinary and inter-sectoral approach. Trade-offs will need to be made where space is limited and the combination of all activities is not feasible. The mix of marine resource development will be determined by existing governance structures and will likely require new legislation, rules, strengthening institutions, and potentially the establishment of entirely new institutions (Roberts 2015).

By applying a blue economy approach many new opportunities will continue to arise in Grenada, also to the benefit of the Caribbean region. The blue economy approach allows countries to coordinate management across sectors and resources and integrates environmental management directly with economic

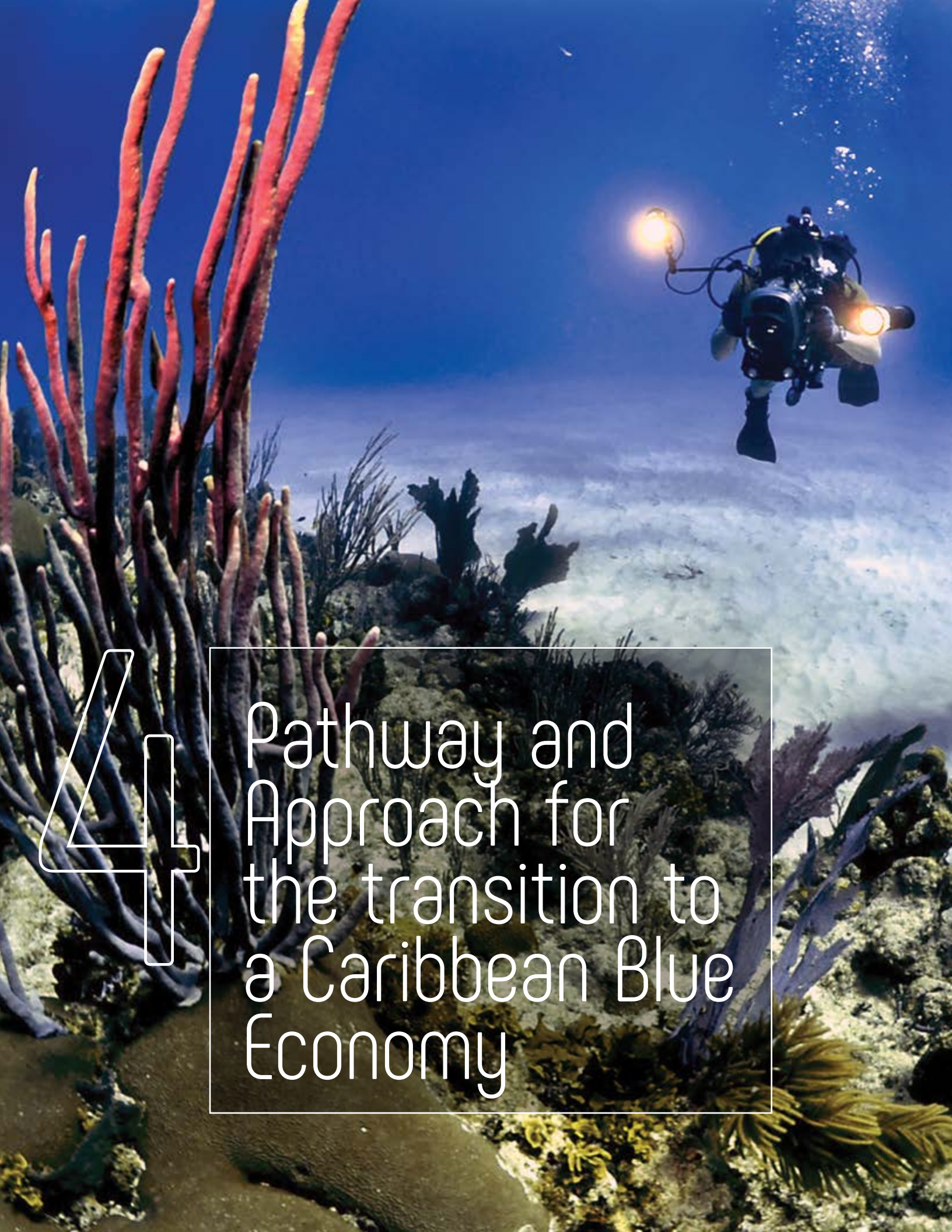
32 The Nature Conservancy. At the Water's Edge (AWE): Coastal Resilience in Grenada and St. Vincent and the Grenadines. An Integrated Approach to Adaptation and Disaster Risk Reduction.

development, fiscal policy, and social goals. The emerging opportunities will require investment in research and development, strengthening technical capacity, and creating the right enabling environment to attract and retain outside investments.

Some of the enablers that are vital to create the conditions for blue growth are (a) policies for a healthy, resilient, and productive marine environment; (b) infrastructure; (c) technology, research, and development; (d) business development, sustainable finance; (e) maritime surveillance, monitoring and enforcement; (f) education and awareness; and (g) institutions for integrated ocean governance. With these conditions, the blue economy will create new jobs, achieve a higher rate of growth, reduce poverty, and also secure international biodiversity and sustainability obligations.

To create the financing environment to advance the transformation to a blue economy, Grenada organized Blue Week 2016 to promote blue growth and investment to SIDS and least developed countries. This international conference was in response to the adoption of the Agenda 2030 by the UN in 2015, including the SDG on oceans and seas (SDG 14), and the Paris Agreement at the UNFCCC in December 2015. Blue Week 2016 focused on integrating ocean health and wealth, and bringing together ocean-related investment into a coherent package of bankable projects to increase the benefits of SIDS. In particular, the conference established a Blue Growth Network to (a) harness ocean-based investment initiatives; (b) recognize that integrated approaches are vital for sustainability of investments, to reduce pressure on marine habitats and ensure sustainable livelihoods; and (c) recognize that capacity development is essential to achieving blue growth.

In conclusion, this chapter suggests that the economic benefit to countries derived from their oceans is poised to increase at even higher rates as ocean industrialization continues. Countries like Grenada have recognized this fact and are preparing to better understand and ultimately harness the ocean's full potential in deriving growth for the future. However, the very ocean assets underpinning current and future ocean-based economic growth are under threat due to their unsustainable utilization. If ocean wealth rises and falls with that of ocean health, as purported in the report, better recognition of the interrelationship between maintaining the integrity of ocean assets (and indeed helping them to appreciate in value by better care of ocean ecosystems) becomes of greater importance. Based on early estimations on the ocean economy's contribution to GDP, quite a bit is at stake. As a result, the chapter provides a framework or entry point to undertake needed policy reforms to harness the ocean's full potential. The conceptual framework allows for consideration of boosting growth derived from the ocean economy and maintaining the health and therefore wealth of ecological systems together in policy design. The next chapter provides a suggested pathway and approach to undertake a transition to a blue economy.



4 Pathway and Approach for the transition to a Caribbean Blue Economy

Moving forward, of course infinite pathways are possible for the development of the ocean economy in the Caribbean from the current baseline described in Chapter 1. For example, in modeling the trajectory of the global ocean economy, the OECD described three future scenarios to 2030:

a) Unsustainable growth in the region's ocean economy;

b) Business-as-usual growth (and decline in the natural capital); and

c) Transition to a blue economy (OECD 2016).

While it is beyond the scope of this paper to model future pathways for the ocean economy in the Caribbean and quantify projections over time, some initial policy recommendations and actions can be proposed for initiating a transition to a blue economy, based on the general blue economy policy framework suggested in Chapter 3 from international experiences and recent work undertaken in the Caribbean by the Commonwealth. Of course, these policy recommendations are broad and provide a menu from which countries may choose as applicable to the local context, given that ocean governance arrangements are at different stages of readiness throughout the region. Some recommendations and cases may be applicable at a regional scale for shared natural capital assets and ocean industries, whereas others may be best pursued by sub-regional coalitions or at the national level.

Suggested Ocean Principles for the Caribbean Blue Economy. As a first step, a set of 'Ocean Principles' for the region's blue economy may be useful to help guide both policy and investment. Based on a review of selected international law, the Equator Principles, and Carbon Principles, and several initial attempts to indicate key principles for the use of the ocean and the transition to a blue economy, this report proposes some Ocean Principles for discussion and consideration in the region in order to help the transition to a Caribbean blue economy. In particular, relevant policy statements of principles included in international law can be found in, among others:

- *1982* UN Convention on the Law of the Sea Treaty;
- *1992* Rio Declaration on Environment and Development;
- *1995* Code of Conduct for Responsible Fisheries;
- *2002* Johannesburg Declaration on Sustainable Development;
- *2012* The Future We Want Outcome Document; and
- *2015* Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Reduction.

Of note in particular, the Future We Want Outcome Document from the Rio+20 Summit renewed international commitment to the principles of sustainable development articulated in 1992 at the first Earth Summit, and emphasized the need for sustained, inclusive and equitable economic growth in order to achieve sustainable development, introducing the concept of policies to promote a green economy that better aligns production and consumption patterns with conservation of ecological systems and processes (United Nations, 2012).

Box 4.1. Ocean Principles for Investment in a Caribbean Blue Economy

- Principle 1: Sustainable Development/ Sustainable Livelihoods
- Principle 2: Marine Ecosystem Health
- Principle 3: Integrated Ocean Governance
- Principle 4: Science-based, Precautionary, and Adaptive Decision Making
- Principle 5: Duty of Care and Accountability
- Principle 6: Inclusive and Transparent Decision Making
- Principle 7: Ecosystem-based Management
- Principle 8: Develop Ocean Solutions that will Reduce Climate Change Risks and Allow the Development of Climate Change-Related Opportunities
- Principle 9: Sharing of Benefits Derived from the Blue Economy
- Principle 10: The Right to Development

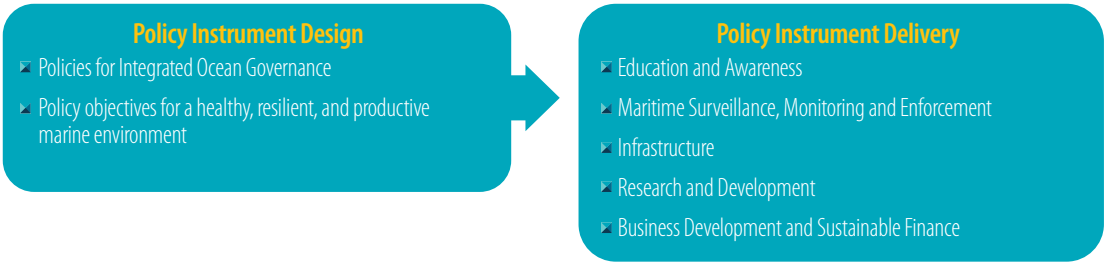
Additionally to international law, several recent international efforts have synthesized principles to guide investment in the ocean space with various objectives that may be helpful, including:

- International Union For Conservation of Nature (IUCN) Principles for High Seas Governance;[33]
- Blue Ribbon Panel to the Global Partnership for Oceans Principles (Blue Ribbon Panel 2013); and
- World Wildlife Fund Blue Economy Principles.[34]

Based on these efforts, the following Ocean Principles could be proposed for discussion and consideration in the region, with the objective of helping to guide public and private investment in transition toward a blue economy in the Caribbean (see Annex 2 for more detail).

Potential policy framework to enable the transition to a Caribbean blue economy. Building upon the generic blue economy framework proposed in Chapter 3 from international experiences in promoting governance for the integration of the environmental, social, and economic dimensions of the ocean economy with broad participation and innovation, and based on research undertaken with a number of Caribbean countries[35] by the Commonwealth Secretariat, this report suggests seven interrelated priorities for a policy framework to enable the transition to a blue economy in the region:

Figure 4.1. Potential Policy Framework for a Caribbean Blue Economy



Policy instrument design 1: Developing and strengthening regional and national policies to better integrate the governance framework for the Caribbean Sea. Although likely at different scales, a key priority may be to aim to review and enhancing the broad policies for integrated ocean governance in order to support design and enactment of more ocean-specific (rather than sector-specific) policy instruments, together with the capacity for delivery (that is, the rules and organizations to give effect to the policies). Robust and integrated governance (i.e. both policy instrument design and delivery) is the unique key to achieving adequate management of the ocean and is, therefore, an overarching theme for the transition to a blue economy. As the OECD notes, given the expected rapid future expansion of ocean industrial activity worldwide and the increasingly crowded ocean space, establishing effective integrated ocean governance in coastal countries is imperative (OECD 2016). The existing policy framework for ocean governance in most, if not all, developing Caribbean states emphasizes a traditional sector-specific approach to management and planning, and thus shows symptoms of the problem facing a large number of countries seeking to implement a blue economy approach—ocean governance remains highly 'balkanized' (McGinnis 2016). As Caribbean governments

33 See: https://cmsdata.iucn.org/downloads/10_principles_for_high_seas_governance___final.pdf
34 www.panda.org/wwf_news/?247477/Principles-for-a-Sustainable-Blue-Economy.
35 See for example the situation analysis completed in support of the development of a national maritime policy framework for The Bahamas (Commonwealth Secretariat 2013).

encourage economic development of marine areas in the future, value-based conflict between competing interests is likely to increase. Clear, coordinated institutional mechanisms for integrated coastal and ocean management established and implemented across relevant sectors such as fisheries, tourism, transport, energy and environment, will be essential to accommodate and resolve these conflicts, but this will be difficult to achieve without a more comprehensive and integrated approach to marine planning and decision making. At the same time, it should be recognized that trade-offs will need to be made where ocean space is limited and the combination of all activities is not feasible. New policies for ocean governance should produce change in management practices that enable a shift toward the sustainable use of ocean resources.

The components of a more effective governance system can be summarized as (a) a broad policy framework that creates the administrative mechanisms required for integrated management of the ocean, either formal (for example, the establishment of a Ministry of Department with functions and powers and duties for coordination) or informal (for example, an across government coordination committee with broad representation from different sectors) and incorporates local knowledge and leadership; (b) the more frequent policies and regulations that these administrations develop to govern the use and allocation of ocean resources and space, including capacity to enforce compliance with access and use rules (a number of countries in the region have embarked on the development and implementation of national ocean policy frameworks); and (c) tools to achieve the implementation and coordination of integrated ocean policy frameworks (for example, CMSP, administrative capacity for monitoring and enforcement, and so on).

With regard to the tools, the application of CMSP is particularly important for guiding decision making in a 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 (OECD 2016). Key practical issues for the use of CMSP in the Caribbean will be the appropriate spatial scale for planning to match uses to ecosystems and ecosystem processes, including the strong representation of protected areas (Hoegh-Guldberg et al. 2015), and ensuring greater leadership for the development of spatial plans (for example, at the national scale perhaps ensuring a single lead agency for marine spatial planning,

harmonizing associated legislation and policies). Additionally, 'Future Ocean Spatial Planning' (FOSP) has been suggested as a further framework to guide sustainable development of the ocean and coasts inspired by the MSP approach (EU-U.S. Conference Series 2011).

Fortunately, recent years have seen a significant increase in the number of countries and regions putting in place strategic policy frameworks and decision tools for better ocean management (OECD 2016). The ECROP in the eastern Caribbean is an example of a step toward more integrated ocean governance within the region, and a number of states have begun the development and implementation of integrated ocean policy framework at the national scale (for example, Antigua and Barbuda, The Bahamas, St. Lucia, St. Kitts and Nevis, and St. Vincent and the Grenadines).

Policy instrument design 2: Ensuring the implementation of policy objectives for a healthy, resilient, and productive marine environment in the Caribbean, as the basis for a blue economy. In addition to developing more integrated frameworks for ocean governance, policies should explicitly reflect the principle that the health of the oceans is inextricably linked to the sustainability of economic livelihoods for coastal communities and the economy generally. As noted in section 2.1, they also provide a range of essential goods and services that would be extremely costly to restore or replace once lost. For Caribbean countries in particular, the health of coral reefs and associated biodiversity are of critical importance from both their environmental and economic perspective due to the strong reliance of their economies on the tourism and fisheries sectors. Thus, effective management of the Caribbean marine environment and the maintenance and restoration of ecosystem health and integrity is fundamental to ecologically sustainable development in the region.

Policy instrument delivery 1: Carrying out education and awareness for the blue economy. The lack of education and training in many small Caribbean states leads to chronic gaps in the technical capacity for policy instrument delivery, notably in marine research, planning, and decision making across all sectors of the ocean economy. Identifying future skill needs, labor market supply, and demand trends and adapting and developing existing education, vocational, and professional training programs to meet them will be essential if the blue economy is to become a reality in the Caribbean. A key 'short cut' in many cases may be for cooperation between interested governments to share capacity on issues or sectors of the ocean economy of critical concern, in a creative, effective, and politically appropriate manner—for example, for maritime surveillance and monitoring. Such cooperation, coupled with greater coordination across governments, can help reduce costs and accelerate the transition to the integrated governance approaches needed for a blue economy. A more coordinated focus between the existing research and educational facilities in the region may well prove beneficial in addressing key gaps in research skills and capacity building, but ultimately a more comprehensive research strategy is likely to be required if Caribbean small states are to fully realize the opportunities presented by a blue economy. This would likely include regional cooperation or partnerships to more systematically identify and quantify the skills needed for the blue economy, and engaging local and regional universities to explore whether current curricula can meet these needs.

Policy instrument delivery 2: Ensuring maritime surveillance, monitoring, and enforcement, to enhance compliance with policy instruments. The Commonwealth's experience of undertaking stakeholder engagement in several SIDS, for example, highlights the difficulties associated with the enforcement of existing rules and regulations, particularly with regard to fisheries. In many countries, the issue of illegal, unregulated, and unreported (IUU) fishing by neighboring states[36] and poor enforcement of existing fisheries laws are key concerns for governments and marine users alike. In the context of a Caribbean blue economy, IUU fishing prevents governments from achieving their nationally and regionally agreed-upon fisheries management goals and objectives (FAO 2015). A key element of monitoring and enforcement is surveillance of a nation's ocean space and an awareness of the activities undertaken in the maritime domain. Improving the procedures for monitoring and enforcement and clearly defining the institutional and organizational responsibilities for the management or marine activities and resources between the various ministries and departments is a crucial issue that must be addressed. To this end, there is a need for Caribbean small states to enhance their capability to identify threats to their maritime space in a timely manner by sharing and integrating intelligence, surveillance, and navigation systems into a common operating picture to position decision makers to prepare for, prevent, respond to, and recover from a broad spectrum of potential maritime-related threats. Regional

36 Concerns were voiced to Commonwealth advisers during stakeholder consultation programs in The Bahamas and Antigua and Barbuda alike. The key concerns relate to foreign fishing vessels fishing illegally in those states' national waters with little or no possibility for enforcement action being taken by the respective coastal state.

cooperation in maritime domain awareness will also allow limited resources to be shared and more effectively deployed, for example around satellite-based remote sensing platforms to monitor large areas of ocean space in near real time, combined with innovative tracking and analysis tools[37], drawing for example upon facilities that already exist within the Commonwealth.

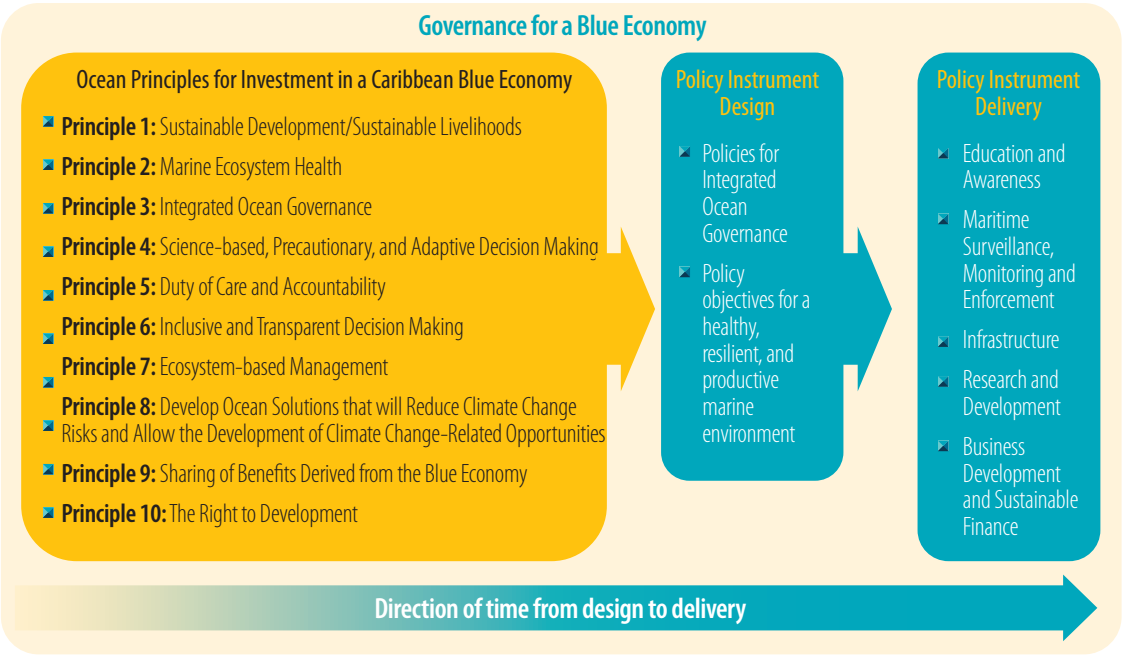
Policy instrument delivery 3: Providing the infrastructure for a blue economy. Coastal and port infrastructure are critical assets that serve as catalysts of economic growth and development in Caribbean small states, since these countries rely heavily on coastal tourism and are almost entirely dependent on maritime transport to facilitate global trade (UNECA 2014). A number of Caribbean small states are also positioning themselves as maritime hubs in the region in anticipation of future growth in that sector, as a key pillar in their future economic development strategies[38]. In many Caribbean small states, tourism resorts, coastal towns, and infrastructure are at risk, given their location at or near present sea level and their proximity to the coast. Relocation or fortifying coastal infrastructure for coastal protection will become financially burdensome for governments. Investment in coastal infrastructure improvements and a more integrated approach to planning could make the tools to help minimize hazards of flooding and erosion and investments in coastal infrastructure affordable and optimize performance.

Policy instrument delivery 4: Supporting research and development for a blue economy. Research and development and other knowledge-generating activities support sustainable economic growth and job creation through the development of new products and services; the generation of new knowledge about the marine environment; facilitation of better management and protection of marine ecosystems; and informing policy, governance, and regulation of the marine sector. Knowledge of the marine environment is also a critical need for effective decision making toward a blue economy. Translating new opportunities into productive sectors will require investment in research and development, building technical capacity, and creating the right environment to attract and retain outside investment as a fundamental principle of a blue economy. Identifying and defining ongoing strategic marine research and information needs, in an inclusive and adaptive manner, together with the appropriate funding resources and mechanisms, is essential for achieving economic development through a blue economy framework. This will ensure that the maximum value can be achieved from any resource through sound planning and management, ensuring that the best decisions can be made regarding the balance between economic development and sustainable resource use (Greenhill et al. 2015).

There is, however, generally a paucity of marine data relating to the offshore waters in Caribbean small states. Furthermore, indigenous marine research is not well developed in most small states due to a lack of funding and research institutions. Numerous international research cruises are undertaken in the Caribbean Sea. These might relate to the collection of hydrographic/bathymetric data, or biological sampling, or environmental characterization. Establishing a program for identifying marine data, in particular bathymetry, via a number of academic and other sources, and reviewing the process by which diplomatic clearance for marine scientific research are made to ensure that copies of all data collected are provided to the government upon research completion, would greatly enhance countries' ability to use what has and will be acquired, at

37 For example, see: http://globalfishingwatch.org/.
38 Notable examples include Jamaica, Antigua & Barbuda, and The Bahamas.

Figure 4.2. Summary of Potential Policy Framework for a Caribbean Blue Economy



considerable expense, for use in developing marine management plans (Evans 2015). To this end, the OECS has recently published a series of strategy documents aimed at facilitating and improving coordination on marine-related research among its member countries[39]. These could serve as a useful model for countries to develop their own approaches.

Policy instrument delivery 5: Supporting business development and sustainable finance. Many countries are developing and implementing strategic plans to stimulate growth in their ocean space (see, for example, the Grenada Case Study in section 3.4). Such plans generally include fisheries, aquaculture, ecosystem services, marine and coastal tourism with the potential for the future integration of other important sectors as appropriate (Ababouch 2015). These have the potential to significantly increase investment in the transition to a blue economy. Such strategic development plans focus on both existing sectors and new and emerging opportunities such as aquaculture and marine renewable energy. While it is clearly recognized that the ocean offers further potential for economic benefits to be derived from the sea—both from living and nonliving resources—it has not always been clear what a sustainable ocean economy should look like, and under what conditions it is most likely to develop (Economist Intelligence Unit 2015). The realization of these opportunities will require strategies that (a) further support investment in and development of existing sectors; (b) promote investment and innovation to support the development of new sectors; and (c) further develop the backward and forward links in the value chains of existing sectors. In Caribbean island states in particular, perhaps the greatest potential for value addition and job creation lies with the development of small and medium-sized enterprises within the blue economy value chains. There is, therefore, a need to examine the mechanisms necessary to encourage and finance start-up micro, small and medium enterprises (MSMEs) and to assist with capacity and technology development.

Approach for the transition to a Caribbean blue economy. While the above policy framework for consideration in the region to enable the transition to a Caribbean blue economy is easy to articulate at the level of political ambition, execution is highly complex, and the pathway from intent to action is uncharted (Greenhill et al. 2015). Many of the elements required to transition to a Caribbean blue economy do, however, already exist and the evolution of current approaches is both possible and realistic. Identifying and addressing some immediate actions for the above priorities could significantly drive and enable progress in this direction. Particularly for the island states and territories such actions would also be consistent with, and support

39 These include OECS Commission 2016; OECS 2016a; OECS 2016b; OECS 2016c. All documents are available at http://www.oecs.org/our-work/units/ogu.

Box 4.2. Approach for the Transition to a Caribbean Blue Economy

Strategy 1: Measure both the region's ocean economy and natural capital

- Improve the statistical and methodological base for measuring the scale and performance of the ocean economy
- Establish natural capital accounts for the Caribbean Sea at the national and regional level

Strategy 2: Manage the Caribbean ocean space in a more integrated manner

- Create/expand integrated approaches to ocean governance
- Apply marine spatial planning at the scale of EEZs
- Invest in restoration and maintenance of marine ecosystem function and integrity, with a focus on protecting critical ecosystems and ecosystem processes
- Build and strengthen the institutional and human capacity to act

Strategy 3: Invest in sustainable growth and key public goods

- Promote Ocean Principles to guide investment in the blue economy
- Advance key infrastructure investments

Strategy 4: Monitor the transition over time

- Continue to enhance knowledge of the Caribbean Sea
- Expand maritime domain awareness of the Caribbean Sea
- Track key indicators for the transition to a blue economy

Strategy 5: Repeat, and adjust as needed

implementation of, the program agreed at the Third International Conference on Small Island Developing States in 2014 and its SAMOA Pathway Outcome document.

Recognizing that progress on integrated ocean governance arrangements are at different stages of readiness across the Caribbean, this report proposes some potential immediate next steps for action that could serve as the basis for a practical approach (that is, medium-term strategies and actions) (Laffoley 2013) to help achieve a Caribbean blue economy. These actions are grouped under five strategies which, if pursued by national and regional authorities with the support of development partners, could help transform the promising concept of a Caribbean blue economy into a sustainable process of implementation.

In conclusion, this report and the above approach has aimed to provide a first-order estimate as a baseline for measuring the size of the current ocean economy in the Caribbean, together with a synthesis on the available information on the status of the natural capital underpinning that economy, and a conceptual framework and basis for countries to advance their stated aims to pursue a transition toward a Caribbean blue economy. Based on terrestrial experiences in the green economy as well as OECD's recent measure and models of the global ocean economy, the report has proposed some likely policy priorities and approach for advancing this transition. An important next step would be to develop the blue economy conceptual framework proposed here, into a blue economy model for the region that could project potential net economic benefits from various policy decisions and scenarios of transition—for example, modelling the net benefits of pursuing the approach suggested here, in line with internationally agreed principles for social equity and poverty reduction.

Annex 1. Summary of OECD Projections for Growth in the Ocean Economy

Globally, in the coming decades every sector of the ocean economy is likely to be affected by technological advances such as innovations in advanced materials, subsea engineering and technology, sensors and imaging, satellite technologies, computerization and big data analytics, autonomous systems, biotechnology, and nanotechnology. The OECD modeled the development of the ocean economy to 2030, projecting many ocean-based industries to outperform the growth of the global economy—indeed doubling its contribution to global value added from 2010. In particular, the OECD projects strong growth rates in shipping and transport, port services, marine aquaculture, offshore wind, and ocean-based tourism, among others, while marine renewable energy, marine biotechnology, and carbon capture and storage are also considered to have significant potential (though unlikely to be realized by 2030) (OECD 2016).

Table A1.1. OECD Projections of Changes in the Ocean Economy to 2030 under Business as Usual Scenario

INDUSTRY	SHARE OF OCEAN ECONOMY (%)		CHANGE IN OCEAN ECONOMY SHARE (%)	GROSS VALUE ADDED (US$, BILLIONS)		GROSS VALUE ADDED INCREASE (US$, BILLIONS)
	2010	2030	2010–2030	2010	2030	2010–2030
Tourism	25	26	1	375	780	405
Ports	13	16	3	195	480	285
Fisheries	6	11	5	90	330	240
Marine renewables	1	8	7	15	240	225
Shipping	20	17	-3	300	510	210
Offshore oil and gas	34	21	-13	510	630	120
Aquaculture	1	1	0	15	30	15
Total	100	100		1,500	3,000	1,500

Source: OECD (2016).

The OECD projected growth in the ocean economy under three different scenarios: (a) unsustainable growth, (b) business-as-usual, and (c) sustainable growth (a blue economy). The difference in the contribution to gross value added from these three scenarios by 2030 is relatively small (from US$2.8 trillion, to US$3.0 trillion, to US$3.2 trillion, respectively), though expected to widen significantly by 2050 (OECD 2016). The OECD's projection for the global ocean economy is instructive for the Caribbean, which constitutes a significant portion of this economy.

Annex 2. Detailed Description of Proposed Ocean Principles

S.NO.	PRINCIPLE	DESCRIPTION
1	Sustainable Development/Sustainable Livelihoods	This principle recognizes the importance of marine ecosystems in delivering essential goods and services that underpin the livelihoods of millions by contributing to food security, poverty eradication, livelihoods, income, employment, health, safety, equity, and political stability. Central to this principle is the need to align the use of resources to optimize the well-being of people today and in perpetuity.
2	Marine Ecosystem Health	The diversity, health, and productivity of marine ecosystems is fundamental to the management of both the oceans and the land. The diversity, productivity, and core functions of marine ecosystems must be maintained, restored, and protected with a desired end of maintaining or recovering natural levels of the natural capital upon which its prosperity depends.
3	Integrated Ocean Governance	Integrated governance is a commitment to planning and managing human activities in a comprehensive manner while considering all factors necessary for the conservation and sustainable use of marine resources and the shared use of ocean spaces. Inherent to this principle are initiatives that produce change in management practices to enable a rapid shift toward the sustainable use of marine and coastal resources. The goal is to support (or design) effective innovative governance systems that provide incentives to private and public sector leaders at all levels to engage and support a healthy ocean and community well-being.
4	Science-based, Precautionary and Adaptive Decision Making	Ocean planning and management decisions should be based as far as possible on the best available information on the natural, social, and economic processes that affect ocean and coastal environments. When adequate information and knowledge are not available, decision makers should take a precautionary approach, actively seek to develop such knowledge, and refrain from undertaking activities that could potentially lead to harmful effects. Adaptive management allows decision-making to respond to the availability of new information concerning risks and sustainable opportunities.
5	Duty of Care and Accountability	All users of the marine environment take responsibility for the impacts of their activities, by taking appropriate action, as well as by being transparent about their impacts so that stakeholders are well informed and can exert their influence.
6	Inclusive and Transparent Decision Making	Full stakeholder awareness and participation contributes to credible, accepted rules that identify and assign the corresponding responsibilities appropriately. A sustainable blue economy should therefore be based on active and effective stakeholder engagement and participation. It is also critical that decision-making processes are conducted in a manner that is transparent and accountable to minimize the likelihood of disputes and to promote international cooperation. For the Blue Economy to be a success, partnerships between government, the private sector, and civil society must be built to ensure co-responsibility for ocean management and to empower stakeholders to participate effectively.

S.NO.	PRINCIPLE	DESCRIPTION
7	Ecosystem-Based Management	There is a need to move away from the sectoral and species-based approaches, which characterize our current approach to managing the marine environment. Ecosystem approaches need to be further refined and made operational. Large-scale MSP and networks of MPAs, and other area-based management measures for biodiversity conservation purposes, should be integral parts of the Blue Economy. Such processes must be participatory, accountable, transparent, equitable, and inclusive, to be responsive to present and future human uses and needs, including the needs of minorities and the most vulnerable groups in society. To make informed trade-offs, such processes should also use appropriate tools and methods to capture the range of benefits that ecosystem goods and services can bring to different stakeholders.
8	Develop Ocean Solutions that will reduce climate change risks and allow the development of climate-change-related opportunities	Sustainable energy provision is fundamental to the transition to a low-carbon economy, and the basis for progressing toward sustainable development globally. It is critical in ensuring progress in areas such as food, water, health, gender equality, and poverty alleviation.
9	Sharing of Benefits Derived from the Blue Economy	The benefits from the use of common ocean resources, and the responsibilities for their continued health and productivity, should be shared by all citizens. Governments should govern marine resource use based on the interests of the whole community and the interests of intergenerational equity. Economic instruments such as taxes, subsidies, and fees can help by internalizing environmental and social benefits, costs, and risks to society of ocean use.
10	The Right to Development	Human development in harmony with the environment is fundamental to the achievement of sustainable development, so that individuals and societies are empowered to achieve positive social and environmental outcomes. The value of the resources provided by the oceans must be recognized and opportunities for their economic development optimized to meet society's needs and promote the well-being of coastal communities.

Annex 3. Contribution of the Blue Economy to Selected SDGs and Some of Their Targets

SDG 13: Climate Action

- Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters
- Integrated climate change measures into national policies, strategies and planning

SDG 12: Responsible Consumption and Production

- Achieve the sustainable management and efficient use of natural resources
- Reduce food losses along production and supply chains
- Reduce waste generation through prevention, reduction, recycling and reuse

SDG 11: Sustainable Cities & Communities

- Reduce the adverse per capita environmental impact of cities
- Increase the number of cities and human settlements adopting and implementing integrated policies toward inclusion, resource efficiency, mitigation and adaptation to climate change, and resilience to disasters

SDG 10: Reduced Inequalities

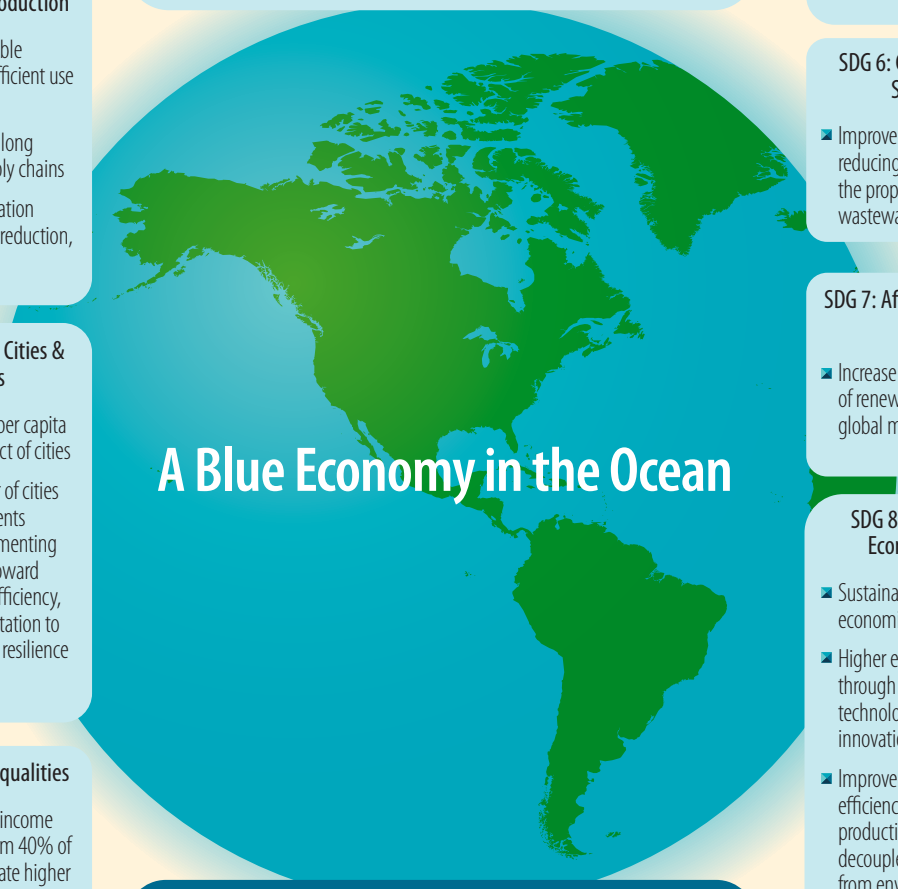
- Achieve and sustain income growth for the bottom 40% of the population at a rate higher than the national average
- Empower and promote the social, economic and political inclusion of all

SDG 9: Industry, Innovation & Infrastructure

- Quality, reliable, and sustainable infrastructure

SDG 1: End Poverty

- Eradicate extreme poverty
- Reduce by at least half the proportion of men, women, and children of all ages living in poverty in all its dimensions
- Ensure all have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technologies and financial services
- Build resilience of the poor and those in vulnerable situations
- Create sound policy frameworks based on pro-poor and gender-sensitive development strategies



SDG 14: Ocean Conservation & Sustainable Use

- Prevent and reduce marine pollution
- Protect marine and coastal ecosystems
- Effectively regulate fishing, and end overfishing, illegal, unreported and unregulated fishing
- Conserve at least 10% of coastal and marine areas
- Increase economic benefits to SIDS from sustainable use of ocean resources

SDG 2: End Hunger, Achieve Food Security & Improved Nutrition

- End hunger and ensure access by all people, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
- Ensure sustainable food production systems

SDG 6: Clean Water and Sanitation

- Improve water quality by reducing pollution, halving the proportion of untreated wastewater

SDG 7: Affordable and Clean Energy

- Increase substantially the share of renewable energy in the global mix

SDG 8: Decent Work & Economic Growth

- Sustainable per capita economic growth in LDCs
- Higher economic productivity through diversification, technology upgrading and innovation
- Improve global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation
- Achieve full and productive employment and decent work for all women and men

  Protect labor rights and promote safe and securing working environments for all workers
- Promote sustainable tourism

Source: United Nations (2016).

Annex 4. Grenada's Blue Growth Coastal Master Plan

The Government of Grenada's Blue Growth Investment Prospectus to generate investment, jobs, and growth is based upon a high-level coastal development master plan for Grenada, Carriacou, and Petite Martinique that outlines a 'Blue Growth' and 'Sustainable Nation' strategy. The 'Blue Growth' and 'Sustainable Nation' strategy outlines an approach for development that will improve sustainable productivity at land and at sea so as to benefit all economic sectors. Blue economic development must also be sustainable and respect the marine environment. The Blue Growth strategy is based on maritime clusters—groupings of industries, suppliers, and educational/research institutions that reinforce each other through their close proximity.

A 'Smart Growth' strategy for urban planning will concentrate growth in development centers with mixed-use components. Open spaces, farmland, natural beauty, and critical environmental areas will be preserved and enhanced. Specific Development Incentive Zones in Grenada, Carriacou, and Petite Martinique considered the following factors: (a) Development must be in harmony with the MPAs and (b) Development must enhance the existing cultural characteristics and activities of the area and promote its strengths in the global market. Development opportunities have been evaluated and prioritized to determine which projects could be combined for greater efficiency and investor interest, and which projects would have the most spin-off development opportunities. As a result, a number of strategic projects have been identified and included in an investment prospectus for global tourism, boutique tourism, fisheries/aquaculture, marine services, coastal residences, shipping, and industries. The Government of Grenada is encouraging investment into strategic projects via public private partnerships, and/or private development. Special development incentives for these projects were prepared.

Planning Process

Phase 1 planning process consisted of three stages of development:[40] *Stage A*: Data gathering, stakeholder meetings, vision; *Stage B:* Developing blue growth planning options; and *Stage C:* Documenting the final blue growth master plan. The planning process involved a series of meetings with Grenada key stakeholders, private sector entities, and community groups; visit to potential sites and identification of development alternatives; planning workshops; and preparation and presentation of reports to the Government for their review and approval.

Consultations with key government counterparts provided critical data and input into the process to assure that the report is comprehensive and addressed the key planning issues. Additional key stakeholders who participated in planning meetings and workshops provided insight and assisted in the evaluation of alternative development options. The 'consensus-building' process included stakeholder meetings and a blue growth planning forum. The principal consultant met with key stakeholders to review both the Stage A Report findings as well as to discuss key issues and/or potential planning opportunities. Key stakeholders

40 Raymond Moldenhauer, Director of RM STRATEGIES and the Principal Strategic Planning Consultant, led the Coastal Master Planning process and was responsible for the development of the Phase 1 reports and coordination with government advisors and government consultants.

Box A4.1. Three Stages of Development of Phase 1 Planning Process

STAGE A: Data Gathering, Stakeholder Meetings, Vision

- Island tours and meetings in Grenada with key stakeholders
- Gather planning data (topographic, infrastructure, demographics, planning, photos,…)
- Gather previous master plans and coastal development plans, as well as information on legacy projects, existing projects, and planned projects (to the extent that these are readily available).
- Discuss planning, infrastructure, and sustainability issues that a master plan must address with key stakeholders, government advisors and counterparts, consultants, and where feasible, community leaders.
- Prepare a preliminary report that summarizes key findings

STAGE B: Developing Blue Growth Planning Options

- Prepare preliminary planning concepts for key blue growth development zones
- Review preliminary planning concepts with key stakeholders, government advisors and counterparts during planning workshops in Grenada
- Determine high-priority initiatives and potential government blue growth policies
- Prepare a preliminary report that summarizes key conclusions

STAGE C: Documenting the Final Blue Growth Master Plan

- Refine planning concepts for strategic projects in Grenada, Carriacou, and Petite Martinique
- Develop market sector investment prospectuses
- Prepare the final report and presentation
- Present the blue growth conceptual coastal master plan to the government and key stakeholders

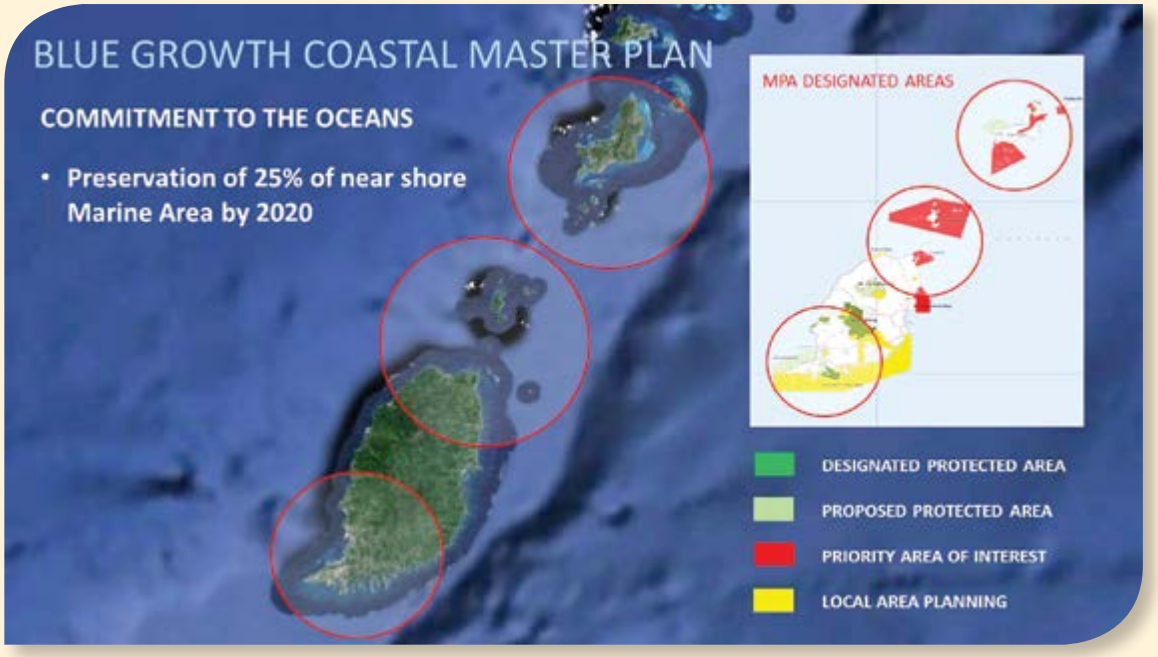
Figure A4.1. Stakeholder Meetings

represented Tourism, Forestry and Fisheries, Agriculture, Economic and Technical Cooperation, Physical Planning, and the Port Authority. Key discussion points were summarized.

As part of the blue growth development planning, the following objectives were agreed to: (a) Proposed development must consider conservation and protection of the environment. (b) The plan must reflect the 'Pure Grenada' brand. (c) Projects must consider the environment, traffic, and social implications. (d) The plan must integrate with Grenada's Strategic Plan and Coastal Zone Management Plan. (e) The plan should be 'transformative' and address three key areas of impact—Economic, Environment, and Social. (f) The plan should allow opportunities for local investment. (g) This effort is intended to provide a high-level assessment of which 'Blue Economy' projects can attract investment and become a reality. Moreover, the following criteria were established for determining strategic projects: (a) Project is sustainable; (b) Promotes economic, environmental, and social goals; (c) Addresses a global and/or Caribbean market; (d) Does not require a government infrastructure investment; (e) Has high potential for private investment; (f) Creates both short-term and long-term jobs; and (g) Likely to create 'spin-off' projects and opportunities.

As part of defining the vision, the Stage A Report summarized the Strengths, Weaknesses, and Threats for each of the islands, as well as identified where the existing blue growth economic activities and proposed blue growth projects were currently located. In addition, multiple coastal sites were identified, noting both the current as well as potential land use opportunities. The areas to be designated for blue growth development

Figure A4.2. Blue Growth Designated Areas



must also consider the sustainable livelihoods of the residents, while providing the 'right' opportunities to use the natural resources in the most sustainable manner. The plan also identified the current areas in Grenada, Carriacou, and Petite Martinique that are considered to be environmentally fragile and in need of protection.

All of the development concepts that were explored considered the following factors:

- Development must be in harmony with the existing and proposed MPAs
- Development must enhance the existing cultural characteristics and activities

Figure A4.3. Potential Projects Within Each Sector

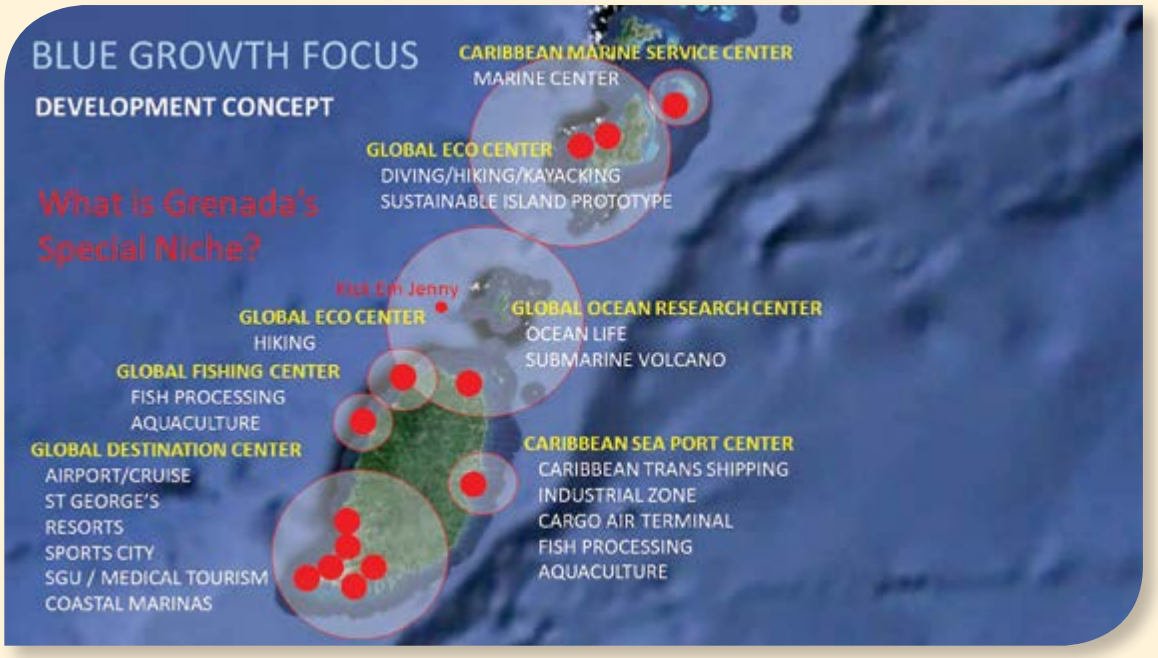


Figure A4.4. Marine Tourism

- Development should be specific to a region to best promote its attributes and strengths

Potential projects within each market sector were evaluated based on the potential market, environment, appropriate project scale, infrastructure, and support facilities available to achieve a 'smart growth' approach.

Figure A4.5. Blue Growth Economic Opportunties

Preliminary blue growth development zones were identified for each island, with the intent to strategically locate blue growth activities in the most appropriate regions and with the goal to promote economic activity throughout the islands to the extent feasible.

Nine focused Blue Growth Marine Centers of Excellence will promote Grenada in both the Caribbean and global markets:

Figure A4.6. Blue Growth Centers of Excellence

1. MARINE SERVICES - Development of new full-service marinas on Petite Martinique and Carriacou will enhance their strategic location as a 'Gateway to the Grenadines' and southern safe haven during the hurricane season. New jobs will help to boost the economy in those areas and allow residents to pursue work without having to leave the islands.

2. BOUTIQUE TOURISM - New smaller-scale resort hotels with high-end amenities will help increase the international tourism business to northern Grenada, Carriacou, and Petite Martinique. The relocation of the existing Lauriston Airport in Carriacou to Dumfries, with a longer runway that will accommodate commercial airlines, will open the door for new tourism opportunities.

3. MARINE RESEARCH - Northern Grenada, with access to the pristine ocean waters surrounding Ronde Island, the Leatherback Turtle nesting area near Levera, and the submerged volcano - Kick Em Jenny just off shore, should establish itself as the base of operations for significant marine research into the potential benefits from the ocean's biological resources and unique environment. Facilities that foster research activities by academic, private, government, and international institutions could include: Ocean Life Research, Turtle Research, and expanded Submarine Volcano Research.

4. ECOTOURISM - With its close proximity to Mount St. Catherine, the highest mountain peak in Grenada, and to numerous waterfalls, Victoria is a prime location to promote Ecotourism in Grenada. The scenery is breathtaking and the flora and fauna of the rain forest will be major draws for hikers. Development will highlight activities centered on Healthy People and a Healthy Planet, including Renewable and Efficient Energy.

5. FISHERIES/AQUACULTURE - The village of Gouyave is the 'Fishing Capital of Grenada' and host to weekly 'Fish Friday' festivals. Development here will further promote the fishing industry in Grenada with increasing exports to North America and Europe. CRFM members were also recently urged to reverse the decline in aquaculture. In addition to the promotion of the fishing industry, new development should advance Gouyave as a Fisheries and Aquaculture leader in the region.

6. GLOBAL TOURISM - The southwest quadrant of Grenada, with the international airport and cruise ship terminal will further promote development that will focus on Grenada as a world-class tourism center for hospitality, education, medical care, and sports. New facilities that will enhance the global market image include a Grand Anse Tourism Center, Medical Tourism Hospital, and Wellness Campus, Hotel/Casino, Regional Sports Center and Village, and the site for the proposed Blue Growth and Oceans Governance Institute.

7. SCIENCE AND TECHNOLOGY - This area, with proximity to the airport, major businesses in St. Georges, and St. George's University, is envisioned as a high-tech knowledge corridor for new international ventures and services in concert with the proposed new Google partnership.

8. COASTAL RESIDENTIAL - The southeast coast of Grenada, with numerous peninsulas and protected coves, is ideal for the development of marina communities for residents as well as retired expats. The developments will range from individual homes to villas and multi-family apartment complexes.

9. SHIPPING AND INDUSTRY - Relocation of the port to Grenville, in conjunction with a free trade industrial zone and cargo air terminal, will increase Grenada's role in the shipping industry as well as allow the development of light industrial activities and other new economic opportunities for Grenada's east coast.

Land within each of the proposed development zones was identified along with a list of potential projects that would be provided special Blue Growth Incentive Packages by the government.

Figure A4.7. Blue Growth Incentive Zones

Potential strategic projects were discussed based on the following criteria:

- The plan must consider conservation and protection of the environment.
- The plan must reflect the 'Pure Grenada' brand.
- The plan must integrate with Grenada's strategic plan and coastal zone management plan.
- The plan should be 'transformative' and address the economic, environmental, and social impact.
- The plan should allow opportunities for local investment.

From the list of strategic projects, the following criteria was used to determine priority projects:

- The project is sustainable.
- The project promotes economic, environmental, and social goals.
- The project addresses a global and/or Caribbean market.
- The project does NOT require a government infrastructure investment.
- The project has a high potential for private investment.
- The project creates both short-term and long-term jobs.
- The project is likely to create 'spin-off' projects and opportunities.

Preliminary design concepts were developed for the priority projects to best convey the vision to investors. These diagrams and benchmark images are indicative of the desired project scope and scale, but are not final designs. The investor is invited to discuss alternative concept plans and/or a project scale that may better meet their financial pro forma.

Figure A4.8. Blue Growth Strategic Projects.

The Blue Growth vision for St. George's Harbor takes advantage of three very prominent 'gateway' sites that will be developed with large-scale 'Anchor Projects' that will transform the harbor into one of the most desirable destinations in the Caribbean. Their success is expected to generate numerous 'spin-off' development opportunities around The Carenage and Esplanade for new commercial, retail and restaurants, and cultural event centers.

Figure A4.9. Blue Growth vision for St. George's Harbor

The project scale and architectural character are also described via the use of sketch-up 3D modeling and/or the depiction of other relevant 'Benchmark Projects'.

Figure A4.10. Blue Growth Vision and Architectural Character

Documenting the Plan: The blue growth strategic projects have been documented in market-based investment prospectuses that can be shared with key investors, in the following areas: Global Tourism, Boutique Tourism, Fisheries/Aquaculture, Marine Services, Coastal Residential, and Shipping and Industry. Each of the projects include the following key information: Site Location, Current Land Ownership, Program Summary, Project Description, Preliminary Site Plan, Concept and/or Benchmark Images and Preliminary Project Cost.

Figure A4.11. Blue Growth Vision and Architectural Character

Figure A4.12. Blue Growth Vision and World Trade Center

Figure A4.13. Strategic Projects

Integrating the Coastal Master Plan with Marine Transportation Planning

Blue growth development will be supported by the following marine transportation projects:

Dumfries Airport

The current airport runway in Carriacou does not allow for larger commercial jets to land and take-off. The relocation of the airport to Dumfries will allow for direct commercial flights to Carriacou, which will increase tourism and also open up land for the development of other economic activities including a Commercial Center, Fishing Village, Aquaculture Center, and Marine Housing.

West Coast Ferry Service

The blue growth master plan promotes the expansion of the current ferry service from St. George's to Hillsborough, Carriacou, and on to Town Dock in Petite Martinique to include Sandals, Gouyave, Victoria, and Sauteurs.

East Coast Highway

With the relocation of the port to Grenville, a new East Coast Highway will be built to move goods and services to St. George. This would also open up additional land along the Southeast Coast for the development of additional marine residential communities on the numerous peninsulas. A second phase of an East Coast Highway may include a Northeast Highway from Grenville to Sauteurs.

St George's Harbor Water Taxi Service

As St. George's Harbor is developed, a new market for regular scheduled water taxis would connect the Cruise Ship Esplanade, with Portofino, the Carenage, the proposed Central Harbor Development, the Lagoon, Port Louis Marina, and finally around the corner to the Port Louis Phase 2 development project.

Inter-Island Ferry Service

An Inter-Island Ferry Service might also be developed to include Trinidad, Union Island, St. Vincent, St. Lucia, Martinique, Dominica, and Barbados.v

Reference List

Ababouch, L. 2015. *Fisheries and Aquaculture in the Context of Blue Economy*. Senegal: UN Economic Commission for Africa.

Agardy, T. 2009. "Is Ocean Zoning the Solution to Dying Marine Ecosystems?" *Scientific American*. http://www.scientificamerican.com/article/is-ocean-zoning-the-solution/.

Agnew, D.J., J. Pearce, T. Peatman, T. Pitcher and P. Ganapathiraju. 2008. *The Global Extent of Illegal Fishing*. London: Marine Resources and Fisheries Consultants Ltd.

Barbier, E. B. 2012. *Moving Beyond GDP: How to Factor Natural Capital into Economic Decision Making*. World Bank. http://www.wavespartnership.org/sites/waves/files/images/Moving_Beyond_GDP.pdf.

Bhola-Paul, Helen M. 2015. "Tourism Challenges and the Opportunities for Sustainability:

A Case Study of Grenada, Barbados, and Tobago." *Journal of Tourism and Hospitality Management* 3 (9–10): 204–213. http://www.davidpublisher.org/Public/uploads/Contribute/55dc2c742d782.pdf.

Bhomia, R.K., J.B. Kauffman and T.N. McFadden. 2016. "Ecosystem Carbon Stocks of Mangrove Forests along the Pacific and Caribbean Coasts of Honduras." http://link.springer.com/article/10.1007%2Fs11273-016-9483-1.

Blankespoor, B., S. Dasgupta, and G. M. Lange. 2016. "Mangroves as Protection from Storm Surges in a Changing Climate." Policy Research Working Paper 7596. World Bank, Washington, DC.

Blau, J., and L. Green. 2015. "Assessing the Impact of a New Approach to Ocean Management: Evidence to Date from Five Ocean Plans." *Marine Policy* 56: 1–8.

Blue Ribbon Panel. 2013. *Blue Ribbon Panel Report to the Global Partnership for Oceans*. Washington, DC: World Bank.

Boonzaier, L., and D. Pauly. 20016. "Marine Protection Targets: An Updated Assessment of Global Progress." *Oryx* 50 (1): 27–35. http://journals.cambridge.org/action/displayFulltext?type=1&fid=10083426&jid=ORX&volumeId=50&issueId=01&aid=10083421&newWindow=Y.

Bowen, A., and C. Hepburn. 2014. "Green Growth: An Assessment." *Oxford Review of Economic Policy* 30 (3): 407–22. doi:http://oxrep.oxfordjournals.org/content/by/year.

Brakenhoff, R. 2015. "Outlook for Offshore Energy." *Oil & Gas Financial Journal*. http://www.ogfj.com/articles/print/volume-12/issue-4/features/outlook-for-offshore-energy.html.

Bremere, I., M. Kennedy, A. Stikker, and J. Schippers. 2001. "How Water Scarcity Will Affect the Growth in the Desalination Market in the Coming 25 Years." *Desalination* 138: 7–15. https://www.researchgate.net/profile/Jan_Schippers/publication/222551931_How_water_scarcity_will_effect_the_growth_in_the_desalination_market_in_the_coming_25_years/links/00b495390d106478db000000.pdf.

Bruckner, A.W. 2002. "Life-Saving Products from Coral Reefs." http://issues.org/18-3/p_bruckner/.

Bunker, Kaitlyn. 2015. "A Caribbean Island Says Goodbye Diesel and Hello 100% Renewable Electricity." *RMI Outlet*. http://blog.rmi.org/blog_2015_01_07_a_caribbean_island_says_goodbye_to_diesel_fuel.

Burke, L., and J. Maidens. 2004. *Reefs at Risk in the Caribbean*. Washington, DC: World Resource Institute. pdf.wri.org/reefs_caribbean_full.pdf. Last accessed on April 22, 2016.

Burke, L., K. Reytar, M. Spalding, and A. Perry. 2011. *Reefs at Risk Revisited*. Washington, DC: World Resources Institute.

Caribbean Desalination Association (CaribDA). 2016. http://www.caribda.com/.

Caribbean Maritime. 2014. "Trinidad - Concerns Over La Brea Post Development." http://www.caribbean-maritime.com/index.php/latest22/issue-23-october-2014-january-2015-the-year-ahead/258-trinidad-concerns-over-la-brea-port-development.html.

CARICOM. "Caribbean Community Energy Policy." Trinidad and Tobago, March 1, 2013. http://www.caricom.org/jsp/community_organs/energy_programme/CARICOM_energy_policy_march_2013.pdf.

CEPAL. 2009. *Maritime Sector and Ports in the Caribbean: The Case of CARICOM Countries*. http://repos-

itorio.cepal.org/bitstream/handle/11362/6344/S0900073_en.pdf?sequence=1.

CLME Project. 2011. *Caribbean Large Marine Ecosystem Regional Transboundary Diagnostic Analysis*. http://iwlearn.net/iw-projects/1032/reports/clme-regional-tda-1.

Commonwealth Secretariat. 2013. "The Development of a National Maritime Policy for the Commonwealth of The Bahamas: A Situation Analysis Prepared for the Ministry of Transport and Aviation on Behalf of the Government of The Bahamas." Unpublished Advisory Report.

Corbin, C., J. Daniel, and M. Vogeley. 2014. "Wastewater Policy Development in the Caribbean: The Way Forward." Paper presented at the 23rd Annual CWWA Conference and Exhibition "Water, Waste & Energy in the Caribbean," sponsored by the Caribbean Water & Wastewater Association, October 6–10, 2014. http://www.gefcrew.org/images/papers_and_presentations/CReW_C2_Regional_WWPolicyDevWayForward_CWWAPaper_CCorbin_Oct2014.pdf.

Costello, M.J., Coll M., Danovaro R., Halpin P., Ojaveer H., et al. 2010 A Census of Marine Biodiversity Knowledge, Resources, and Future Challenges. *PLoS ONE*, 5(8): e12110. doi:10.1371/journal.pone.0012110.

Diaz, R. J., and R. R. Rosenberg. 2008. "Spreading Dead Zones and Consequences for Marine Ecosystems." *Science* 321: 926.

Doney, S. 2010. The Growing Human Footprint on Coastal and Open-Ocean Biogeochemistry. *Science*, 328: 1512-1516.

Economist Intelligence Unit. 2015. "The Blue Economy: Growth, Opportunity and a Sustainable Ocean Economy." Briefing Paper for the World Ocean Summit 2015. http://www.economistinsights.com/sites/default/files/Blue%20Economy_briefing%20paper_WOS2015.pdf. Last accessed on March 8, 2016.

Ehler, C., and F. Douvere. 2007. *Visions for a Sea Change: Report of the First International Workshop on Marine Spatial Planning*. Integovermental Oceanographic Commission and Man and the Biosphere Program. Paris: United Nations Educational, Scientific, and Cultural Organization.

EIA (U.S. Energy Information Administration). 2015. www.eia.gov.

_____. 2016. International Energy Statistics. https://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=50&pid=53&aid=1.

ENI. 2015. "Eni Starts Production at Perla Giant Gas Field Offshore Venezuela." Press Release. http://www.eni.com/en_IT/media/press-releases/2015/07/Eni_starts_production_at_Perla_offshore_Venezuela.shtml.

EPA (Environmental Protection Agency). 2016. "Drinking Water Contaminants - Standards and Regulations." https://www.epa.gov/dwstandardsregulations. Cited in http://www.ct.gov/dph/lib/dph/drinking_water/pdf/dwc_fed_fund.pdf and http://opensiuc.lib.siu.edu/cgi/viewcontent.cgi?article=1063&context=ucowrconfs_2006.

EU (European Union)-U.S. Conference Series. 2011. *Sustainable Oceans: Reconciling Economic Use and Protection*. Conference Proceedings. http://www.draeger-stiftung.de/fileadmin/user_upload/konferenzen_2013/oceans_report_2013.pdf.

Evans, A. 2015. *Identification of Marine Data Availability for The Bahamas*. Desktop study prepared by Maritime Limits and Boundaries Services Limited for the Commonwealth Secretariat, London.

FAO (Food and Agriculture Organization). 2011. "Review of the State of World Marine Fishery Resources." http://www.fao.org/docrep/015/i2389e/i2389e.pdf. Last accessed on April 22, 2016.

_____. 2012. *The State of World Fisheries and Aquaculture*. ISSN 1020-5489. Rome: FAO.

_____. 2014a. *The State of World Fisheries and Aquaculture*. Rome: FAO.

_____. 2014c. *Global Blue Growth Initiative and Small Island Developing States (SIDS)*. http://www.fao.org/3/a-i3958e.pdf.

_____. 2014d. *Securing Fish for the Caribbean*. http://www.fao.org/3/a-ax904e.pdf. Last accessed on April 21, 2016.

_____. 2014e. *Small Island Developing States: The Sustainable Intensification of Caribbean Fisheries and Aquaculture*. http://www.fao.org/3/a-i3932e.pdf. Last accessed on April 25, 2016.

_____. 2015. *Combating IUU Fishing in the Caribbean through Policy and Legislation*. FAO Issue Brief # 15. http://www.fao.org/3/a-i5291e.pdf. Accessed on May 12, 2016.

_____. 2016. "FishStatJ." Application version 2.12.5. http://www.fao.org/fishery/statistics/software/fishstatj/en. Last accessed on April 20, 2016.

_____. 2016b. FishStatJ Database. Global Capture Fisheries Production - Tonnes.

GENI. 2003. *Caribbean Fact Sheet*. http://www.geni.org/globalenergy/library/national_energy_grid/cuba/carib.shtml.

Global Ocean Commission. 2014a. *From Decline to Recovery: A Rescue Package for the Global Ocean*. Report Summary. http://www.some.ox.ac.uk/wp-content/uploads/2016/03/GOC_Summary_2015_AUG-1.pdf.

Global Partnership for Oceans (GPO). 2014. *Water Quality Management Report for the Wider Caribbean Region*. Draft report.

Greenhill, L., A. Hughes, J. G. Day, and M. S. Stanley. 2015. "Blue Knowledge: A Strategic Approach to Developing Knowledge to Transition to a Blue Economy." *Island Studies: Indian Ocean*. Seychelles: University of Seychelles.

Hamilton, S. E., and D. Casey. 2016. "Creation of a High Spatio-temporal Resolution Global Database of Continuous Mangrove Forest Cover for the 21st Century (CGMFC-21)." *Global Ecology and Biogeography* 25 (6):729-738. doi:10.1111/geb.12449. http://onlinelibrary.wiley.com/doi/10.1111/geb.12449/abstract.

Hoegh-Guldberg, O. 2015. *Reviving the Ocean Economy: The Case for Action - 2015*. Gland, Switzerland and Geneva: World Wildlife Fund International.

IMF (International Monetary Fund). 2015. World Economic Outlook Database. http://www.imf.org/external/pubs/ft/weo/2015/01/weodata/download.aspx. Last accessed on September 4, 2015.

Intergovernmental Panel on Climate Change (IPCC). 2013. *Climate Change 2013: The Physical Science Basis*. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (Stocker, T., Dahe, Q. and Plattner, G.K., lead authors). Cambridge, United Kingdom and New York: Cambridge University Press.

InvesTT. 2012. "Government to Invest US$3 Billion In Maritime Projects." http://www.investt.co.tt/blog/investt-blog/2013/march/government-to-invest-us3-billion-in-maritime-projects.

Jabareen, Y. 2009. "Building a Conceptual Framework: Philosophy, Definitions and Procedure." *International Journal of Qualitative Methods* 8 (4):49–62.

Jakob, Michael, and Ottmar Edenhofer. 2014. "Green Growth, Degrowth, and the Commons." *Oxford Review of Economic Policy* 30 (3): 447–68. doi:http://oxrep.oxfordjournals.org/content/by/year.

Jambeck, J. R., R. Geyer, C. Wilcox, T. R. Siegler, M. Perryman, A. Andrady, R. Narayan, and K. Lavender Law. 2015. "Plastic Waste Inputs from Land into the Ocean." *Science* 347 (6223): 768–771. http://www.sciencemag.org/content/347/6223/768. Last accessed on April 22, 2016.

JMS (JŪRA MOPE SEA). 2013. "Jamaica Seeks Operator for 2.2 Million-TEU Kingston Container Terminal." http://jura.lt/en/news/9508-jamaica-seeks-operator-for-22-million-teu-kingston-container-terminal-.

Jouvet, Pierre-André, and Christian de Perthuis. 2013. "Green Growth: From Intention to Implementation." *International Economics* 134 (August): 29–55. doi:10.1016/j.inteco.2013.05.003.

Laffoley, D. 2013. "A New Approach to Ocean Governance: Practical Ways to Fast Track the Green Economy." Commonwealth Secretariat Discussion Paper 14. http://www.oecd-ilibrary.org/commonwealth/environment-and-sustainable-development/a-new-approach-to-ocean-governance_5k3w8fb-9p9hh-en.

Lattemann, S., M. D. Kennedy, J. C. Schippers, and G. Amy. 2010. "Global Desalination Situation." In *Sustainability Science and Engineering*, edited by Isabel C. Escobar and Andrea I. Schäfer, 7–39, Volume 2. Elsevier. ISSN 1871-2711, ISBN 9780444531155, http://dx.doi.org/10.1016/S1871-2711(09)00202-5.

Liquete, C., C. Piroddi, E. G. Drakou, L. Gurney, S. Katsanevakis, A. Charef, and B. Egoh. 2013. "Current Status and Future Prospects for the Assessment of Marine and Coastal Ecosystem Services: A Systematic Review." *PLOS ONE* 8 (7): e67737.

Lucintel. 2015. *Global Marine Port and Service Industry 2015-2020: Trends, Forecast and Opportunity Analysis*. http://www.researchandmarkets.com/research/df32nq/global_marine.

Mauritius Prime Minister's Office. 2013. The Ocean Economy: A Roadmap for Mauritius. http://www.oceaneconomy.mu/PDF/Brochure.pdf.

McGinnis, M. V. 2016. *Science and Sensibility: Negotiating and Ecology of Place*. California: University of California Press.

Millennium Ecosystem Assessment (MEA). 2005. *Millennium Ecosystem Assessment. Ecosystems and Human Well-Being: General Synthesis*. Washington, DC: World Resources Institute.

Miles, M. B., and A. M. Huberman. 1994. *Qualitative Data Analysis: An Expanded Source Book*. 2nd edition. Newbury Park: Sage.

Miloslavich, P., J.M. Diaz, E. Klein, J.J. Alvarado, C. Diaz, J. Gobin, E. Escobar-Briones, J.J. Cruz-Motta, E. Weil, J. Cortes, A.C. Bastidas, R. Robertson, F. Zapata, A. Martin, J. Castillo, A. Kazandijian, M. Ortiz. 2010. Marine Biodiversity in the Caribbean: Regional Estimates and Distribution Patterns. *Plos One*: http://dx.doi.org/10.1371.journal.pone.0011916.

Montaser, R. and H. Luesch. 2011. Marine natural products: a new wave of drugs? *Future Med. Chem*. 3(12): 1475-1489.

Narayan, S., M. W. Beck, B. G. Reguero, I. J. Losada, B. van Wesenbeeck, N. Pontee, J.N. Sanchirico, J.C. Ingram, G.M. Lange, K.A. Burks-Copes. 2016. "The Effectiveness, Costs and

Coastal Protection Benefits of Natural and Nature-Based Defences." *PLOS ONE* 11 (5): e0154735. doi:10.1371/journal.pone.0154735.

Narloch, Ulf, Tomasz Kozluk, and Ainsley Lloyd. 2016. "Measuring Inclusive Green Growth at the Country Level: Taking Stock of Measurement Approaches and Indicators." Working Paper 02, Green Growth Knowledge Platform. http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Measuring_Inclusive_Green_Growth_at_the_Country_Level.pdf.

Neumann, B., A.T. Vafeidis, J. Zimmermann, and R.J. Nicholls. 2015. *Future Coastal Population Growth and Exposure to Sea Level Rise and Coastal Flooding – A Global Assessment*. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0118571.

Nellemann, C., E. Corcoran, C.M. Duarte, L. Valdes, C. De Young, L. Fonseca, and G. Grimsditch, eds. 2009. Blue Carbon: A Rapid Response Assessment. UNEP, GRID-Arendal.

OECD (Organisation for Economic Co-operation and Development). 2011. *Towards Green Growth: A Summary for Policy Makers*. http://www.oecd.org/greengrowth/48012345.pdf. Last accessed on January 28, 2016.

_____. 2014. *Green Growth Indicators 2014*. Paris: OECD. http://www.oecd-ilibrary.org/content/book/9789264202030-en.

_____. 2016. *The Ocean Economy in 2030*. Paris: OECD.

OECD (Organisation for Economic Co-operation and Development), and ITF (International Transport Forum). 2015. *ITF Transport Outlook 2015*. OECD Publishing/ITF. http://dx.doi.org/10.1787/9789282107782-en.

OECS (Organisation of Eastern Caribbean States). 2016a. *OECS Marine Research Strategy*. Castries, St Lucia: OECS Commission. http://www.oecs.org/our-work/units/ogu.

_____. 2016b. *OECS Ocean Data and Best Practices*. Castries, St Lucia: OECS Commission. http://www.oecs.org/our-work/units/ogu.

_____. 2016c. *OECS Code of Conduct for Responsible Marine Research*. Castries, St Lucia: OECS Commission. http://www.oecs.org/our-work/units/ogu.

Olivier, and Slack. 2007. *Ports, Cities, and Global Supply Chains*. https://books.google.com/books?hl=en&lr=&id=PfOcUn9GCc4C&oi=fnd&pg=PR11&dq=ports+cities+global+supply+chains&ots=Eh52nGxpmy&sig=xegKjMA6sxR8ta4YV2r5a9nAyBo.

Park, K. S., and J. T. Kildow. 2014. "Rebuilding the Classification System of the Ocean Economy." *Journal of Ocean and Coastal Economics* 2014 (4).

PEi (Power Engineering International). 2010. "Bonaire: Island of Green Dreams." http://www.powerengineeringint.com/articles/print/volume-18/issue-5/features/bonaire-island-of-green-dreams.html.

Pendleton, L., D.C. Donato, B.C. Murray, S. Crooks, W.A. Jenkins, S. Sifleet, C. Craft, J.W. Fourqurean, J.B. Kauffman, N. Marba, P. Megonigal, E. Pidgeon, D. Herr, D. Gordon, and A. Baldera. 2012. *Estimating Global "Blue Carbon" Emissions from Conversion and Degradation of Vegetated Coastal Ecosystems*. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0043542.

PlasticsEurope. 2013. *Plastics - The Facts 2013*. www.plasticseurope.org/Document/plastics-the-facts-2013.aspx?FolID=2. Last accessed on September 4, 2015.

PwC. 2014. *Colombia Oil & Gas Industry 2014: An Overview*. https://www.pwc.com/gx/en/oil-gas-energy/publications/assets/pwc-colombia-oil-gas-industry-2014.pdf.

Roberts, C.M., J.C. McClean, J.E.N. Veron, J.P. Hawkins, G.R. Allen, D.E. McAllister, C.G. Mittermeier, F.W. Schueler, M. Spalding, F. Wells, C. Vynne, and T.B. Werner. 2002. Marine Biodiversity Hotspots and Conservation Priorities for Tropical Reefs. *Science* 295 (5558):1280-1284. http://science.sciencemag.org/content/295/5558/1280.

Roberts, J. 2015. "The Blue Economy: From Concept to Reality in the Caribbean Region." Discussion Paper for the Caribbean Regional Dialogue with the G20 Development Working Group.

Rodrigue, J.P., and A. Ashar. 2015. Transshipment Hubs in the new Panamax Era: The Role of the Caribbean. *Journal of Transport Geography* 51:270-279. http://www.sciencedirect.com/science/article/pii/S0966692315001842.

Rystad Energy. 2016a. "Cube Browser Data." Licensed software. http://www.rystadenergy.com/Products/EnP-Solutions/UCubeFree. Last accessed on April 20, 2016.

_____. 2016b. UCubeFree Database. Accessed on April 28, 2016.

Silver, J. J., L. M. Campbell, L. W. Fairbanks, and R. L. Gruby. 2015. "Blue Economy and Competing Discourses in International Oceans Governance." *Journal of Environment & Development* 24 (2): 135–160.

Smulders, Sjak, Michael Toman, and Cees Withagen. 2014. "Growth Theory and 'Green Growth.'" *Oxford Review of Economic Policy* 30 (3): 423–46. doi:http://oxrep.oxfordjournals.org/content/by/year.

Spalding, M., M. Kainuma, and L. Collins. 2010. *World Atlas of Mangroves*. London, U.K.: Earthscan.

Sukhdev, P., S. Stone, and N. Nuttal. 2010. *Green Economy: Developing Country Success Stories*. Nairobi: UNEP.

Sumaila, U.R., A.D. Marsden, R. Watson and D. Pauly. 2007. "A Global Ex-vessel Fish Price Database: Construction and Applications." *J Bioecon* 9 (39): 39–51.

Swartz, W., U.R. Sumaila, and R. Watson. 2012. "Global Ex-vessel Fish Price Database Revisited: A New Approach for Estimating Missing Prices." *Environ Res Econ* 56:467-480 doi:10.1007/s10640-012-9611-1.

The Government of The Bahamas. 2014. "PM Eyes $250 Million Expansion to Freeport Container Port." Press Release. https://www.bahamas.gov.bs/wps/portal/public/gov/government/news/pm%20eyes%20%24250%20million%20expansion%20to%20freeport%20container%20port/!ut/p/b1/vZHJbqNAElafJQ_g0E3TLMcGA2a12TEXhM1ig1kMjnF4-nGkOWRGmpnLJFWnkn7Vp_qKSqiYSrrsfq6y27nvssvHnLApAqpFCMNbvMISoAVIQdggSHUgFVHxZg9FuddmmXjpVB1xULW9JBclcY_jgWSW4meDrsRXbg53AKEhSLZZJPeTv4RRUd3NirECz2gBvRz1vDaLZiXlhndofNIU-nXnHT2bb4ouiOvwtnRTfNpJunvXRT2XvEo8eX1mXztp7fbRkNZRprhxNqYanYfFFlfuhYnfrknEMndY-7Anxdv2wWbtConTCgVwTN92WFRj2Lw8j90_jwV_KAL-7SL5NaKaBAMNbrGJDAU6Hv0z8BfE_hngPm3wQ_DcAIjrQQfwHEf5VAyY1KvfB21pFrdeHNqXaeDL2AAAGnYzRnZw0W3bg7YpWrAOzVvtAJ9TND_AhpXvdnnoBilheRCM1u_ALe0LT6AEWSPAwFPRVwNVvOWfGjl_RzD9VMB-NxB_FVDdWo70odQXP5SizYawJtrK8LuB__-HOpWcD-3rfGxfwStmIMYCpAWW5mgOclTY7dnHYbLmteymp8AC9IkzcquN7m5aJedLf2L2SiBqp2mIFwFHZtIlLpszLmMjxYjxxHW9rpprVDZ42Z15KArvi0Le-jFn1mjq9A3fixd4PZ758mCu5mJgJDwOQiow4pBJE3-Wveq4Lp1He3Ai_TS5aqWW41pky8DWvMlNyX0eL_6kGavZbrPbUijaEHrMHG3qlE_orgHo0JThStKS1dNFNDhZsp-QngtFcLmMnc6V2i29w4ewb12lp-xN3xbU0N5N1uXhp0YVeXn5AYPMxRA!/dl4/d5/L2dBISEvZ0FBIS9nQSEh/.

Transboundary Water Assessment Programme (TWAP). 2015. *Caribbean Large Marine Ecosystem: Transboundary Water Assessment*. UNEP, Kingston.

United Nations. 2012. *The Future We Want: Outcome Document of the United Nations Conference on Sustainable Development*. https://sustainabledevelopment.un.org/content/documents/733FutureWeWant.pdf

United Nations. 2014. *SIDS Accelerated Modalities of Action (SAMOA) Pathway*. Resolution Adopted by the General Assembly on 14 September 2014. A/RES/69/15. Sixty-Ninth Session of the United Nations General Assembly. New York: United Nations.

United Nations. 2016. *First Global Integrated Marine Assessment (World Ocean Assessment). Division for Ocean Affairs and the Law of the Sea*. New York: United Nations.

UNCTAD (United Nations Conference on Trade and Development). 2012. *Review of Maritime Transport*. http://unctad.org/en/PublicationsLibrary/rmt2012_en.pdf.

_____. 2016. *Review of Maritime Transport*. http://unctad.org/en/PublicationsLibrary/rmt2015_en.pdf. Last accessed on April 21, 2016.

UNECA (United Nations Economic Commission for Africa). 2014. *Unlocking the Full Potential of the Blue Economy: Are African Small Island Developing States Ready to Embrace the Opportunities?* Addis Ababa: UNECA. http://www.climdev-africa.org/sites/default/files/unsummit2014/Blue%20Economy%20-%20EN.pdf. Accessed on May 13, 2016.

UNEP (United Nations Environment Programme). 2011. "Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication - A Synthesis for Policy Makers." www.unep.org/greeneconomy.

_____. 2012a. *Green Economy in a Blue World*.

_____. 2012b. *Global Environmental Outlook 5: Summary for Policy Makers*. Nairobi: UNEP.

_____. 2014a. *Wealth in the Oceans: Deep Sea Mining on the Horizon?* http://www.unep.org/pdf/GEAS_May2014_DeepSeaMining.pdf.

_____. 2014b. "Using Indicators for Green Economy Policymaking."

_____. 2015a. *Indicators for Green Economy Policymaking: A Synthesis Report of Studies in Ghana, Mauritius and Uruguay*.

_____. 2015b. "The Green Economy Progress Measurement Framework - Working Paper." http://web.unep.org/greeneconomy/sites/unep.org.greeneconomy/files/publications/gep-working-paper-draft-for-consultation.pdf

UNEP-CEP (United Nations Environment Programme-Caribbean Environment Programme). 2010. *Regional Sectoral Overview of Wastewater Management in the Wider Caribbean Region*. CEP Technical Report 66.

Waite, R., M. Beveridge, R. Brummett, S. Castine, N. Chaiyawannakarn, S. Kaushik, R. Mungkung, S. Nawapakpilai, and M. Phillips. 2014. "Improving Productivity and Environmental Performance of Aquaculture." Working Paper, Installment 5 of Creating a Sustainable Food Future, World Resources Institute, Washington, DC.

WEF. 2016. The New Plastics Economy: Rethinking the future of plastics. World Economic Forum.

http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf

World Bank. 2006. *Where is the Wealth of Nations?* Washington, DC: World Bank.

_____. 2012a. *Toward a Green, Clean, and Resilient World for All: A World Bank Group Environment Strategy 2012–2022*. http://siteresources.worldbank.org/ENVIRONMENT/Resources/Env_Stratgy_2012.pdf

_____. 2012b. *Moving Beyond GDP: How to Factor Natural Capital into Economic Decision Making*. http://www.wavespartnership.org/sites/waves/files/images/Moving_Beyond_GDP.pdf.

_____. 2013. *Fish to 2030: Prospects for Fisheries and Aquaculture*. Washington, DC: World Bank.

_____. 2014. *World Development Indicators*. Washington, DC: World Bank. http://data.worldbank.org/country/grenada.

_____. 2015. "There's Tremendous Interest in Adopting Renewables across the Caribbean." http://www.worldbank.org/en/news/feature/2015/01/27/renewables-caribbean.

_____. 2016. "GDP at Market Prices (Current US$)." http://data.worldbank.org/indicator/NY.GDP.MKTP.CD.

World Bank and FAO (2009) The Sunken Billions: The Economic Justification for Fisheries Reform. Washington, D.C: World Bank.

World Ocean Council. Frequently Asked Questions. http://www.oceancouncil.org/site/faq.php.

World Travel and Tourism Council. http://www.wttc.org/-/media/files/reports/economic%20impact%20research/economic%20impact%202015%20summary_web.pdf.

WTTC (World Travel and Tourism Council). 2014. http://www.wttc.org/~/media/files/reports/economic%20impact%20research/regional%20reports/caribbean2014.ashx.

_____. 2015. *Travel and Tourism. Economic Impact: Caribbean*.

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