



WWF

REPORT

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REVIVING THE WESTERN INDIAN OCEAN ECONOMY

Actions for a Sustainable Future

in association with



BCG

The Boston Consulting Group

Front cover

A traditional fisherwoman gleans for octopus on a vast reef flat during low tide. Octopus fishing is a source of food and livelihood for many communities across the Western Indian Ocean.

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This report is available at: ocean.panda.org

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Traditional fishermen fishing on a reef with a net. Over the last three decades, demand from local and external seafood markets and the introduction of modern fishing gear (such as this net) have driven fishing to unsustainable levels in many parts of the Western Indian Ocean region.

FOREWORD

© Mervyn Marie, Seychelles News Agency



The 10 countries of the Western Indian Ocean are highly diverse, including small island states whose people and cultures are profoundly influenced by their large ocean territories and continental countries whose economies are only partially dependent on the sea. The countries vary in their reliance on agriculture, fisheries, tourism, service industries and banking, their cultures, religions and histories. But they all share one ocean, and this ocean realm is increasingly seen as a new frontier for development as a basis for economic growth and to lift lower-income countries out of poverty.

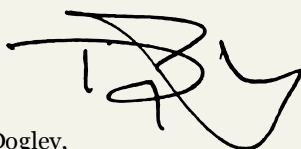
Established 30 years ago with a focus on marine environmental protection, the Nairobi Convention is designed to help countries use their critical natural ocean assets for sustainable development. Major initiatives funded by the Global Environment Fund under the Nairobi Convention in the last 15 years have produced strategic action programmes focused on coastal zone interactions and offshore ecosystems and fisheries. These initiatives have identified priority concerns and defined concrete actions and strategies to address them. The 2015 State of the Coast Report for the Western Indian Ocean established a baseline against which to assess development and sustainable growth into the future.

At the continental scale, the African Union's Africa Integrated Marine Strategy and Agenda 2063 provide an overarching vision for a blue economy, framing Africa's pivot toward the ocean to support long-term growth. They express the opportunity for generating wealth from the sea and outline principles for sustainability to avoid undermining ocean health and potential for income generation. A global focus on sustainability is further framed through the Sustainable Development Goals (SDGs).

The Seychelles has embraced and is pioneering the blue economy concept as a mechanism to realize the sustainable development of the country around an ocean-based economy. With its key economic sectors centred on the coastal and marine environment and resources (i.e. coastal tourism and fisheries) and with the ocean constituting over 99 per cent of its territory, a healthy ocean space is of critical importance to sustainable economic growth. With limited land-based resources, the Government recognizes that economic growth and development of the country should be geared towards the long-term and sustainable management of the marine environment and its resources. It has established a Blue Economy Institute - a department under the Ministry of Finance to help implement a roadmap which will provide the strategic direction for future investment and development of a sustainable ocean-based economy in the Seychelles.

By offering estimates of the economic value generated from the sea, this report is intended to motivate governments and economic sectors in the Western Indian Ocean to embark on a development pathway based on protecting the assets that deliver this economic value. The report emphasizes the essential role of regional integration to reflect the interdependence of marine systems on one another.

In short, this report aims to help Western Indian Ocean countries to achieve the SDG plan of action for 2016-2030 in the ocean sector and thus to realize the vision expressed under the regional strategic action programme, of **“people prospering from a healthy Western Indian Ocean”**.



Didier Dogley,
Minister of Environment, Energy and Climate Change
Government of Seychelles



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Traditional sailing pirogue in the Western Indian Ocean. It is increasingly only in the most remote parts of the coasts that traditional fishers can still find productive fishing grounds.

EXECUTIVE SUMMARY

The importance of the ocean to the people of the Western Indian Ocean region cannot be overstated. Over a quarter of the population, some 60 million people, lives within 100km of the shoreline and cultures based on fishing, maritime trade and marine resource use go back hundreds of years.

Today, healthy ocean and coastal ecosystems underpin the economies of the region, and offer huge potential for sustainable development. However, the region could suffer severe losses if current pressures on the ocean are not alleviated.

US\$333.8BN

THE VALUE OF THE
TOTAL OCEAN ASSET
BASE OF THE WESTERN
INDIAN OCEAN IS AT
LEAST US\$333.8 BILLION

This report provides an analysis of the economic value of the ocean assets of the Western Indian Ocean region (Comoros, France, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa and Tanzania). The annual “gross marine product” of the Western Indian Ocean region – equivalent to a country’s annual gross domestic product (GDP) – is at least US\$20.8 billion. The total “ocean asset base” of the Western Indian Ocean region is at least US\$333.8 billion.

These values are derived from direct outputs from the ocean (e.g. fisheries), services supported by the ocean (e.g. marine tourism) and adjacent benefits associated with the coastlines (e.g. carbon sequestration). Coastal and marine tourism make the largest economic contribution, accounting for 69 per cent of ocean output (US\$14.3 billion annually). Carbon sequestration accounts for 14 per cent (US\$2.9 billion) of the gross marine product and fisheries for 9 per cent (US\$1.9 billion).

The analysis did not measure important intangible values such as the ocean’s role in climate regulation and temperature stabilization, the production of oxygen, the spiritual and cultural enrichment the ocean provides, or the intrinsic value of biodiversity. Further, it is difficult to put a monetary figure on the contribution made by activities such as subsistence fishing where no sale point occurs. As a result, the numbers presented here are conservative estimates. Outputs that are not dependent on the ecological functions of the ocean – such as those from offshore mineral extraction or shipping – were excluded from these estimates, as were assets for which data is not yet available.

Ocean economic value is tied to assets that are in decline

As our current economic system ignores or externalizes most environmental costs, the ocean’s benefits are often perceived as being provided for free and are frequently taken for granted. Unless the ocean’s full contributions are recognized and strong action taken to preserve the natural assets that underpin them, the benefits it provides will diminish rapidly over the decades ahead. Despite the relatively intact coastal and marine ecosystems of the Western Indian Ocean, there are growing signs of distress in many parts of the region. The areas still in relatively good health owe this to currently low levels of population and economic development, but conditions are changing rapidly as the region’s populations and economies grow and develop. Coral reefs and mangroves are deteriorating from the combined impacts of local use and global threats such as climate change. Important fish stocks are declining due to overfishing and inadequate management. Coastal and urban developments are expanding rapidly with limited planning.

**THE NATURAL CAPITAL
OF THE WESTERN INDIAN
OCEAN REGION IS BEING
ERODED, UNDERMINING THE
OCEAN'S VALUE
FOR PRESENT AND
FUTURE GENERATIONS**

All this means that the natural capital of the Western Indian Ocean region is being eroded, undermining the ocean's value for present and future generations. This is a moment of opportunity to reset the agenda, before the "shared wealth fund" (i.e. total "ocean asset base") of the Western Indian Ocean is driven to collapse by unsustainable development. The United Nations 2030 Agenda which sets out the Sustainable Development Goals (SDGs) recently agreed by the international community, including goal 14 on sustainable ocean use, provides a pathway toward a better future for the countries and communities of the Western Indian Ocean.

CALL TO ACTION

The Western Indian Ocean can still count relatively healthy ocean assets amongst its greatest values, at a time when marine and coastal habitats have been highly degraded in much of the world. For centuries, the region's ocean assets have supported the cultures, traditions and livelihoods of its communities. Now, the considerable and growing economic and social benefits drawn from the ocean are becoming increasingly undermined by the intensifying pressures imposed on them.

60 million people already live in coastal areas in this region, and the population is projected to grow strongly. Managing the local and global demands on limited ocean resources, and securing these assets so that they continue to provide shelter, food, livelihoods and jobs, will be essential to the stability and sustainable future of the region.

There can be no healthy economic future for the countries of the Western Indian Ocean without protecting and restoring ecosystems and habitats that underpin industries like sustainable fishing and tourism. This report is a call to leaders within and outside the region to act together – with a strong sense of urgency – to take the necessary, tangible steps towards an inclusive, sustainable blue economy, in the interest of the people of the region and the environment that supports them.

Seven steps to secure the assets of the ocean

Africa is on the brink of transformational change and the use of the ocean is expanding faster than at any point in history. If the region pursues the resource-intensive pathways of the 19th and 20th centuries, characteristic of industrialized economies, there will be an acceleration toward "biocapacity¹ deficit" and environmental degradation, which will jeopardize long-term prospects and security. Yet there is an opportunity for the continent and adjacent islands to instead develop innovative resource-efficient pathways towards sustainable development. The ocean and its assets can play a leading role in achieving this.

Sustaining ocean ecosystems can lift people out of poverty and provide a stable foundation for healthy national economies. This report provides a framework for building an inclusive blue economy that prioritizes sustainable development through investing in natural assets and prudent economic management. This will ensure that the economic development of the Western Indian Ocean contributes to true prosperity for present and future generations. The report proposes seven essential actions:

¹ Biocapacity is the amount of biologically productive land and sea area that is available to regenerate the natural resources used.

ACTION 1 IMPLEMENT EFFECTIVE MANAGEMENT OF OCEAN ASSETS

Implement steps to achieve Aichi Target 11 and SDG 14 through new ecologically and socially coherent networks of marine protected areas (MPAs) and locally managed marine areas (LMMAs) in critical nearshore and offshore habitats, and ensure effective management.

ACTION 2 ENSURE SUSTAINABILITY OF SMALL-SCALE AND INDUSTRIAL FISHERIES AND AQUACULTURE

Implement legislation to apply FAO guidelines, and strengthen community-based approaches and benefit sharing in fisheries and aquaculture, to cover 50 per cent of all fish consumed by 2030.

ACTION 3 TRANSFORM TO 21ST CENTURY CLIMATE-RESILIENT AND CARBON-NEUTRAL ECONOMIES

Incentivize ecosystem-based climate resilience with sustainable finance and implement national strategies for carbon-neutral development by 2030.

ACTION 4 ADOPT A SUSTAINABLE, INCLUSIVE BLUE ECONOMY APPROACH

Apply policies and legislation that internalize environmental values in business practices, provide for more inclusive employment and meet the production and consumption needs of 50 per cent more people by 2030.

ACTION 5 IMPLEMENT INTEGRATED OCEAN PLANNING AND MANAGEMENT

Develop and implement plans for integrated ocean management through marine spatial planning processes at relevant scales (national, sub-regional, sub-national). These plans should align with one another and, by 2030, cover the entire Western Indian Ocean region.

ACTION 6 INVEST IN SOCIAL CAPITAL AS A CORNERSTONE OF FUTURE PROSPERITY

Integrate social, economic and environmental strategies through pursuing all SDGs with a focus on residents of the coastal zones of all Western Indian Ocean countries.

ACTION 7 BUILD PARTNERSHIPS FOR SUSTAINABLE DEVELOPMENT

Create enabling policies and promote best practices that support multi-stakeholder partnerships to secure social, environmental and economic benefits equitably. This should expand the number of partnerships and the proportion of natural assets that they govern.

These actions will help Western Indian Ocean countries to implement the SDGs as well as the 2015 Paris Climate Agreement. Financing these actions is an investment in human well-being, future security and sustainable development, analogous to investing in capital assets. In a rapidly changing region, this is a vital opportunity to ensure people gain social and economic benefits from their valuable ocean assets, now and in the future. **The time to act is now.**



PART ONE

THE IMPORTANCE OF OCEAN ASSETS FOR ECONOMIES AND COASTAL COMMUNITIES

The ocean is fundamental to life on Earth. Covering nearly three-quarters of our planet, the ocean produces more than half of the oxygen that we breathe. In the last 200 years, the ocean has absorbed around a third of the CO₂ produced by human activities and over 90 per cent of the extra heat trapped by the rising concentrations of atmospheric greenhouse gases. It provides people with food, income, transport, protection from storms, cultural and spiritual value, recreation, and much more.

The Western Indian Ocean is a coherent biogeographic, climatic and socio-political region encompassing the western part of the Indian Ocean, and is one of the regional seas identified by the United Nations Environment Programme (UNEP). It covers some 30 million km², equivalent to 8.1 per cent of the global ocean surface, with exclusive economic zones (EEZs) covering over 6 million km² and a combined coastline of over 15,000km (UNEP/Nairobi Convention Secretariat 2009b).

The Western Indian Ocean features warm tropical waters, coral reefs, mangroves, seagrasses and wide sandy beaches. The area contains a diversity of sub-regions, where the Northern Mozambique Channel represents a core region for high tropical marine biodiversity (Obura 2012) and the Mascarene islands have among the highest levels of marine endemism globally (Briggs and Bowen 2012). Zones of unique productivity are associated with the Somali and Agulhas currents in the north and south, and the Mascarene plateau and banks in the centre.

The Western Indian Ocean region comprises 10 countries – Comoros, France, Kenya, Madagascar, Mauritius, Mozambique, Seychelles, Somalia, South Africa and Tanzania (see map p. 21). Of these, five are mainland continental states, four are small island states, and one, Madagascar, combines elements of both. The total population of the region is estimated at 220 million, of which over a quarter (60 million) lives within 100km of the shoreline. Cultures based on fishing, maritime trade and marine resource use go back several hundred years in many parts of the region. But rapid population growth and geopolitical and cultural changes in the last 50 years have undermined traditional practices associated with the ocean.

Compared to most other regions of the global ocean, the Western Indian Ocean is relatively less impacted by human activity (Halpern et al. 2008, Stojanovic and Farmer 2013). However, many ocean-dependent communities in the region are facing increasing economic hardship from degradation of their resource base, due largely to growing pressures of development from infrastructure, extractive industries and population. Although there have been several studies conducted to estimate the socio-economic value of marine and coastal assets in the Western Indian Ocean, the economic data has often been patchy and insufficiently holistic to capture the broader benefits derived from the ocean (Box 1).

BOX 1 A CAUTIONARY NOTE: VALUING THE INVALUABLE

Our analysis is based on the value of marketed goods and services produced by certain sectors directly associated with marine ecosystems. It is a classical economic analysis of how ocean ecosystems support economic activity and associated benefits for people and industry. However, many assets defy formal economic assessment; it is very difficult at present to place a value on intangibles and non-market products. Intangible benefits include the role the ocean plays in atmospheric regulation, carbon storage and ecosystem services such as water filtration by mangroves, seagrass and wetlands, and the value of ecosystems to human culture and lifestyle.

Small-scale fisheries are difficult to value but nonetheless important to human well-being. Much of the catch from small-scale fisheries in the Western Indian Ocean is not sold in markets, and the high dependence on fish protein of some vulnerable demographic groups (a, b)* goes beyond current valuation methods. Local fishing is also important in maintaining social cohesion in coastal communities.

No approach can fully account for the value of the ocean ecosystem services that make life on our planet possible. At the same time, it is important to recognize that the key assets that support ocean economic productivity have been eroding for decades, so the ocean is producing far less than it potentially could. While there are areas of effective ocean resource management, the broad picture is one of widespread mismanagement and often escalating decline.

We use two new concepts to illustrate ocean value (c, d):

- The “gross marine product” is the annual economic output of all sectors related to the sea. We focus on sectors that depend on a living, healthy ocean. The gross marine product allows us to compare ocean output with national economies, in particular to GDP, which measures the total monetary value of goods and services produced by a country in a year.
- The “shared wealth fund” of the ocean addresses the total productive assets of the ocean. This is equivalent to the capital and properties of a large company, or to a wealth fund from which interest is drawn.

In very broad terms, we can see the shared wealth fund of the Western Indian Ocean as the value of all the productive biodiversity and ecosystem assets, and the gross marine product as the annual value of those outputs.

**These letters refer to sources that are listed in the literature section at the end of the report.*



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Beach scene at sunset. Bird Island, Seychelles.

1.1 The gross marine product of the Western Indian Ocean

This report draws on best available information to shed light on the importance of marine and coastal assets for the region's economies and people's livelihoods and well-being.²

We looked at three main categories of benefits: direct outputs from the ocean, services supported by the ocean, and adjacent benefits associated with the coastlines. These assets are often perceived to be provided for free by the ocean to humanity, but to remain productive they need to be effectively managed or their crucial benefits will diminish rapidly.

The economic value of ocean-related activities in the Western Indian Ocean, the "gross marine product", is estimated at US\$20.8 billion annually. Calculated in a way that is analogous to the GDP of a country, the gross marine product is the 4th largest economy in the region (Figure 1).

In absolute terms, the annual economic value may appear small compared with the global ocean economy estimated at US\$2.5 trillion (Hoegh-Guldberg et al. 2015). However, it is important to view the region's economic context in three ways. First, several of the countries of the Western Indian Ocean are among the poorest in the world. Any economic contribution is important in alleviating poverty, so the ocean's annual contribution of US\$20.8 billion is very significant. Second, this value is important in the context of the food and livelihood benefits that the ocean provides but which are not captured in conventional economic analysis. Third, like its national economies, the region's ocean economy has growth potential if ocean and coastal assets are managed sustainably, starting from relatively low levels of development.

The most productive components of the region's ocean economy

Three categories of goods and services have been included in the gross marine product. The largest component is the 'adjacent benefits' on the coastal zone (US\$14.6 billion annually), which includes coastal tourism, carbon sequestration and coastal protection. Second in value are the 'direct services' such as marine tourism which are enabled by the ocean (US\$4.3 billion annually).

Coastal tourism alone generates US\$10.4 billion annually. This tourism is highly dependent on both the physical assets of the coastline and beaches, and on functioning and healthy marine and coastal ecosystems (i.e. cultural/recreational services, as well as regulating and supporting services). Jobs in this sector are spread across businesses from five-star resorts to low-priced destinations, and are also found in a wide range of secondary businesses such as shops, restaurants, tour services and transport.

Carbon sequestration provides 14 per cent of the gross marine product, or US\$2.9 billion annually. The economic value of carbon sequestration has only recently been acknowledged and there is rising interest due to the increasing relevance of climate change globally, and of commitments to address it. But thus far it is hardly recognized in national policies and local practice, and its financial returns are not yet a real part of local or national economies.

The third category is 'direct outputs' of the ocean, which includes fisheries and aquaculture and totals US\$1.9 billion annually.³

² Details on the methodology can be found in BCG Economic Valuation: Methodology and Sources. Available at ocean.panda.org

³ Note that shipping and trade, oil/gas and other extractive sectors, and offshore wind are not included in the calculations here, as they are not dependent on the ecological functions of the sea. Some of these sectors are large and can also have significant impacts on the other sectors discussed here.

US\$20.8BN

THE WESTERN INDIAN OCEAN ECONOMY, WORTH AT LEAST US\$20.8BN, IS THE 4TH LARGEST ECONOMY IN THE REGION

US\$10.4BN

COASTAL TOURISM ALONE GENERATES US\$10.4 BILLION ANNUALLY

The multiple values of fish in the Western Indian Ocean

Fisheries, conventionally seen in the Western Indian Ocean as the most important economic sector dependent on the ocean (UNEP-Nairobi Convention 2015), generate 9 per cent of the gross marine product. Of this total value, 87 per cent is from large-scale commercial and industrial fisheries, of which tuna is the most important source of national revenue (Box 2).

Artisanal or small-scale fisheries contribute 13 per cent of formally accounted fisheries value, equivalent to just 1 per cent of the gross marine product of the Western Indian Ocean (US\$200 million). But this economic analysis only tells part of the story. This sector is estimated to support over a quarter of a million fishers throughout the region (Teh et al. 2013), although, due to scarcity of robust data, this could be an underestimate (Box 3). The high social and non-monetary value of small-scale fisheries is not captured in this analysis as these fisheries are spatially dispersed, poorly documented and under-reported, if at all. Also, trade and transactions occur at a local scale, and for household subsistence, and are often not captured in national statistics and accounts. However, small-scale fisheries are likely to make up the majority of fish catch by volume: a study from Madagascar shows that small-scale fisheries were responsible for 72 per cent of total fisheries landings (Le Manach et al. 2012). Small-scale fisheries are critical in supporting livelihoods, food and income security, particularly for the coastal poor. Fishery resources are traditionally viewed as public goods and characterized by open access, and so have often been poorly managed and sustained. Nonetheless, there is still the opportunity to reverse these trends and improve the overall condition of marine resources in the region for the benefit of the economies and local communities.

72%
IN MADAGASCAR,
SMALL-SCALE FISHERIES
CONTRIBUTE 72
PER CENT OF TOTAL
FISHERIES LANDINGS

BOX 2 TUNA: CROSS-BORDER CAPITAL WORTH PRESERVING

The Indian Ocean holds the world's second largest tuna fishery, offering significant potential for countries and fishing communities to benefit economically.

Highly migratory tuna and tuna-like species move through the ocean from one EEZ to another and into the high seas. While skipjack, bigeye and albacore tuna stocks are still considered healthy by the Indian Ocean Tuna Commission (IOTC), others, like the yellowfin tuna, are overfished (a). The Commission's scientific committee predicts that if immediate steps are not taken, there is a high risk of stock collapse within just five years. At the 20th Session of the IOTC in 2016, governments adopted harvest control rules for skipjack tuna and steps to reduce catches of yellowfin tuna (b).

The tuna catch in the Indian Ocean is worth US\$2.3 billion per year, representing 20-24 per cent of the world market supply (c). Of this, 70-80 per cent is caught in the Western Indian Ocean – around 850,000 tonnes valued at over US\$1.3 billion (d). Illegal, unregulated and unreported (IUU) fishing of all species causes significant economic leakage globally and in the Western Indian Ocean region, where countries are losing between US\$200-500 million annually (e).

Kenya, Mozambique and Tanzania are developing a set of minimum terms and conditions to provide a collective approach to granting fishing access for highly migratory and shared fish stocks under the Maputo Declaration (f). If the Declaration were effectively implemented, the potential income for these countries would likely be greater than the average income they receive today from licence fees from foreign fishing vessels (g).

Western Indian Ocean countries are also developing strategies to build domestic capacity in tuna production and trade. Providing these are following ecosystem-based management principles, and are not simply additions to existing foreign effort, these strategies – alongside programmes to protect marine ecosystems and ensure sustainable harvest of fish stocks – will go a long way to secure food, jobs and political stability in the region.

FIGURE 1 WHAT IS THE ECONOMIC VALUE OF THE WESTERN INDIAN OCEAN (WIO)?

OCEAN ASSET VALUE IN THE WIO - SHARED WEALTH FUND

Marine assets in the WIO provide considerable value and could provide even more if they are well managed.

US\$333.8 bn • TOTAL SHARED WEALTH FUND ASSET BASE



WIO GROSS MARINE PRODUCT

(data from 2015)

Gross Marine Product (GMP) is the ocean's annual economic value.

20.7%

DIRECT SERVICES ENABLED BY THE OCEAN

- 19.0% Marine tourism
- 0.8% Research & development
- 0.5% Security & control
- 0.2% Ocean survey
- 0.1% Cruise industry
- 0.1% Education & training

70.2%

ADJACENT BENEFITS OF THE OCEAN

- 50.0% Coastal tourism
- 14.0% Carbon sequestration
- 6.0% Coastal protection
- 0.2% Marine biotechnology

9.1%

DIRECT OUTPUT OF THE OCEAN

- 7.8% Industrial fisheries
- 1.2% Subsistence fisheries
- 0.1% Aquaculture / mariculture



MANGROVES, CORAL REEFS, SEAFOOD, FISHERS, TOURISM OPERATORS — THEY'RE ALL CONNECTED.


Across the WIO, peoples' livelihoods and income are often inextricably linked to healthy functional ecosystems. When these are damaged, all pay the price.



PRIMARY ASSETS

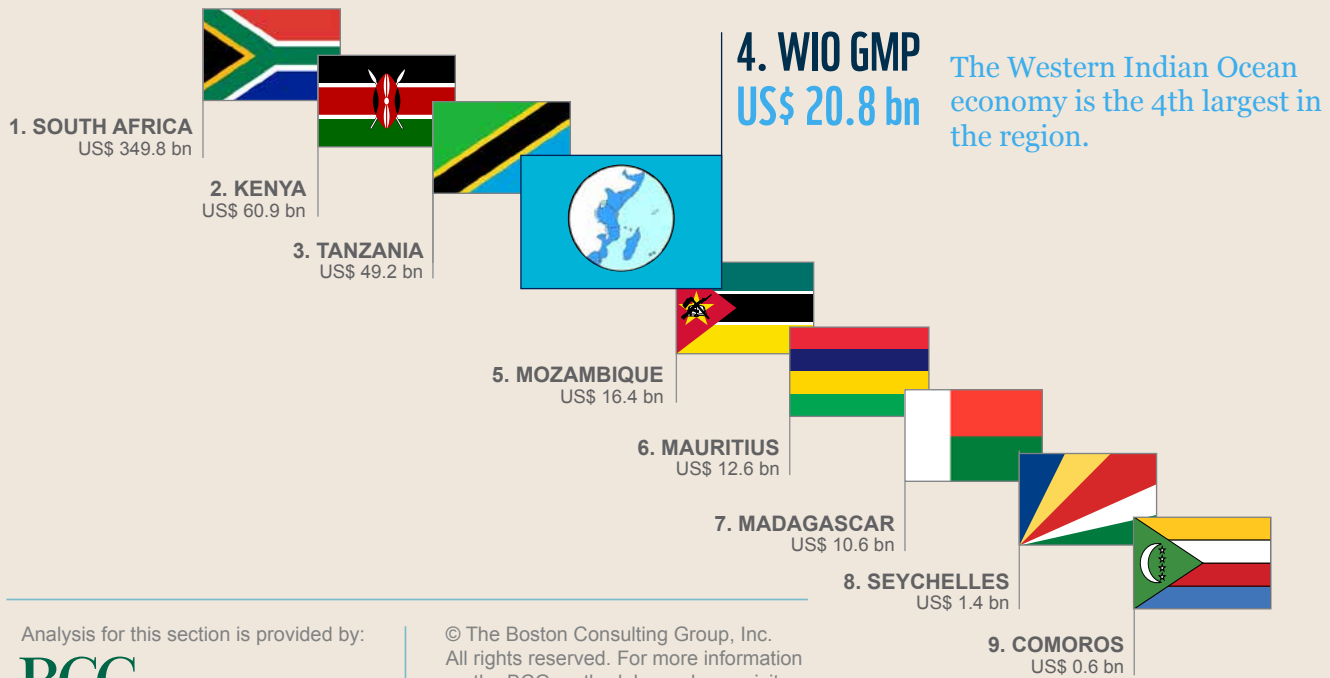
	Marine Fisheries	US\$ 135.1 bn
	Mangroves	US\$ 42.7 bn
	Coral Reefs	US\$ 18.1 bn
	Seagrass	US\$ 20.8 bn

ADJACENT ASSETS

	Productive Coastline	US\$ 93.2 bn
	Carbon Absorption	US\$ 24.0 bn

HOW DOES THE WIO GROSS MARINE PRODUCT COMPARE TO REGIONAL GDPs?

(World Bank 2014)



Analysis for this section is provided by:



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* Data not available for Somalia and France (regional GDP). Projections for 2015 based on World Bank 2014 data.

BOX 3 UNDERESTIMATION OF SMALL-SCALE FISHING IN THE WESTERN INDIAN OCEAN

Fish catches are under-reported across the globe, creating a disparity between figures reported by countries to the FAO (a) and the amount of fish actually extracted (b). This problem is greatest for small-scale fisheries, such as those of the Western Indian Ocean, for a set of reasons. First, a significant and highly variable proportion of the catch may be retained for local domestic consumption, and/or traded through non-financial mechanisms, for example for mutual support among community members. Second, infrastructure and systems for monitoring and reporting catch are often minimal, and methods for storing and analyzing data, basic and inadequate. Finally, illegal practices further undermine the reporting of fish catch: for example, illegal beach seines and spear guns are two of the most commonly used gears by small-scale fishers in Kenya (c), so they are reluctant for their catch to be monitored.

Studies of the small-scale fisheries sector in Madagascar illustrate this problem. In one study (d) the value of the small-scale fisheries sector was estimated at 1.5 times the national reports to the FAO, and in another (e), 4.5 times higher. This latter study suggests the small-scale fishery in one region (Velondriake) is of greater economic value than the access fees obtained at the national level from tuna vessels (f), and a sixth as valuable as the domestic commercial shrimp industry (d). Inaccuracies are also found in estimating the number of fishers, with the same study in Velondriake (e) estimating double the official number of fishers nationally (g). If this higher estimate was applied across the Western Indian Ocean, the total number of small-scale fishers would be closer to half a million people than the quarter-million figure we use in this report (g).



© Garth Cripps

Young girl returning from a fishing trip with her father.

For the small island states in particular, fisheries rank high in historical and cultural importance, as well as in their contribution to national economies. For example, 30 per cent of GDP in the Seychelles comes from industrial fisheries (Groeneveld 2015). Mariculture contributes only 1 per cent of total fisheries value and is as yet a nascent sector in the Western Indian Ocean (Box 4).

Ocean values that will grow in significance

US\$1.2BN

THE ECONOMIC VALUE OF COASTAL PROTECTION IN THE WIO IS ESTIMATED AT US\$1.2 BILLION ANNUALLY

The economic value of coastal protection provided by coral reefs, mangroves and salt marshes in the Western Indian Ocean is estimated at US\$1.2 billion annually. As coastal development, urbanization and industrialization progress in the Western Indian Ocean (for example, at tourism destinations in Mauritius and the Seychelles), the value of coastal property and infrastructure will grow rapidly, and the measured economic value of coastal protection will climb accordingly. This will be reflected in a higher gross marine product. However, this will only be sustained if such development does not degrade the condition of critical habitats and biodiversity, or of the physical assets that provide coastal protection (e.g. by sand mining off beaches, or clearing mangroves and coastal forests for development).

An ecosystem service value not considered in this report (due to lack of data) that will be a major contributor to future wealth is the regulating potential of coastal estuaries, wetlands and lagoons. These habitats process and recycle organic waste from domestic and commercial sources. Appropriate design and/or protection and restoration of wetland systems can greatly enhance this function. At present, a very small proportion of the population of coastal towns and cities in the Western Indian Ocean region has sewage systems. There is potential to address this, and the use of wetlands in bio-treatment of waste could represent a massive growth sector with economic, environmental and public health benefits (Mohamed et al. 2009).

1.2 Overall value of Western Indian Ocean assets - the shared wealth fund

US\$333.8BN

THE OVERALL VALUE OF THE WESTERN INDIAN OCEAN HAS BEEN CONSERVATIVELY ESTIMATED AT US\$333.8 BILLION

The ocean “shared wealth fund” can be understood as the total asset base of the ocean, from which annual economic production (i.e. the gross marine product) is drawn. For the natural assets of the Western Indian Ocean, this has been conservatively estimated at US\$333.8 billion. Six components were measured under two classes: adjacent assets include productive coastlines and carbon absorption, while primary assets of the ocean include mangrove, seagrass and coral reef benefits, and marine fisheries.

Fisheries represent the largest asset of the Western Indian Ocean, estimated at US\$135 billion, or 40 per cent of the natural assets. This matches the conventional wisdom in the region of fisheries being the largest contributor to ocean wealth (UNEP/Nairobi Convention Secretariat 2009a; UNEP/Nairobi Convention Secretariat/WIOMSA 2015), and emphasizes the need to see fish stocks as capital from which to draw sustainably, for the long term, rather than to be exploited to the maximum in the short term.

Beyond the numbers, intangible benefits such as security (of livelihoods, food, etc.), spiritual and cultural enrichment, climate regulation and recreational value should also be acknowledged and taken into policy consideration, even if they cannot yet be effectively captured in classical economic analysis. Even the methods and data we have used, measuring the most tangible benefits, are subject to debate among

BOX 4 FARMING THE SEA: MARICULTURE OPPORTUNITIES

In the past, agriculture and livestock rearing developed to feed increasingly populous societies more efficiently than hunting and gathering. Today, as wild-caught fish stocks become depleted and the global population increases, a similar shift is happening towards aquaculture, which now provides almost half of all marine and freshwater products consumed (a).

Mariculture is a specialized area of aquaculture, focused on the culture of marine species in seawater, and is less developed than freshwater aquaculture. African aquaculture is in its infancy, and mariculture even more so. Among Western Indian Ocean countries, Tanzania produces over 90 per cent by weight of the region's mariculture products, though this is made up primarily of seaweed for commercial uses (b), which has a much lower price (< 10 per cent) than other seafood products. Prawn farming takes place on an industrial scale in Madagascar, Mozambique and Tanzania, although still at levels far below international norms. Other farmed marine species include finfish, shellfish and sea cucumbers.

Labour-intensive methods and sale to local markets can build livelihoods for tens of thousands of men and women, and enhance food security in local households. Efforts to develop livelihood-oriented mariculture are spread throughout the region, as in Madagascar with sea cucumbers (c), Kenya with mangrove crabs (d) and Tanzania with seaweed (b). Governments, non-government organizations (NGOs) and donors are investing significantly in research on species and methods for mariculture, developing hatcheries to overcome insufficient seed stock for most marine species, and promoting reliable market links.

There are significant barriers to mariculture development. These include the lack of technical expertise to maximize efficiency, environmental and disease problems associated with monoculture and inappropriate methods, and market concentration by monopoly buyers, who can fix very low prices that minimize farmers' income (b).

Nevertheless, mariculture represents a significant opportunity for future food security and livelihoods, and to help relieve the pressure on overexploited coastal and marine resources. To be sustainable, mariculture practices need to be developed and embedded in local marine tenure and governance systems, and to fit within cultural mores. They must also ensure ecosystem assets that support productivity are not undermined (e).



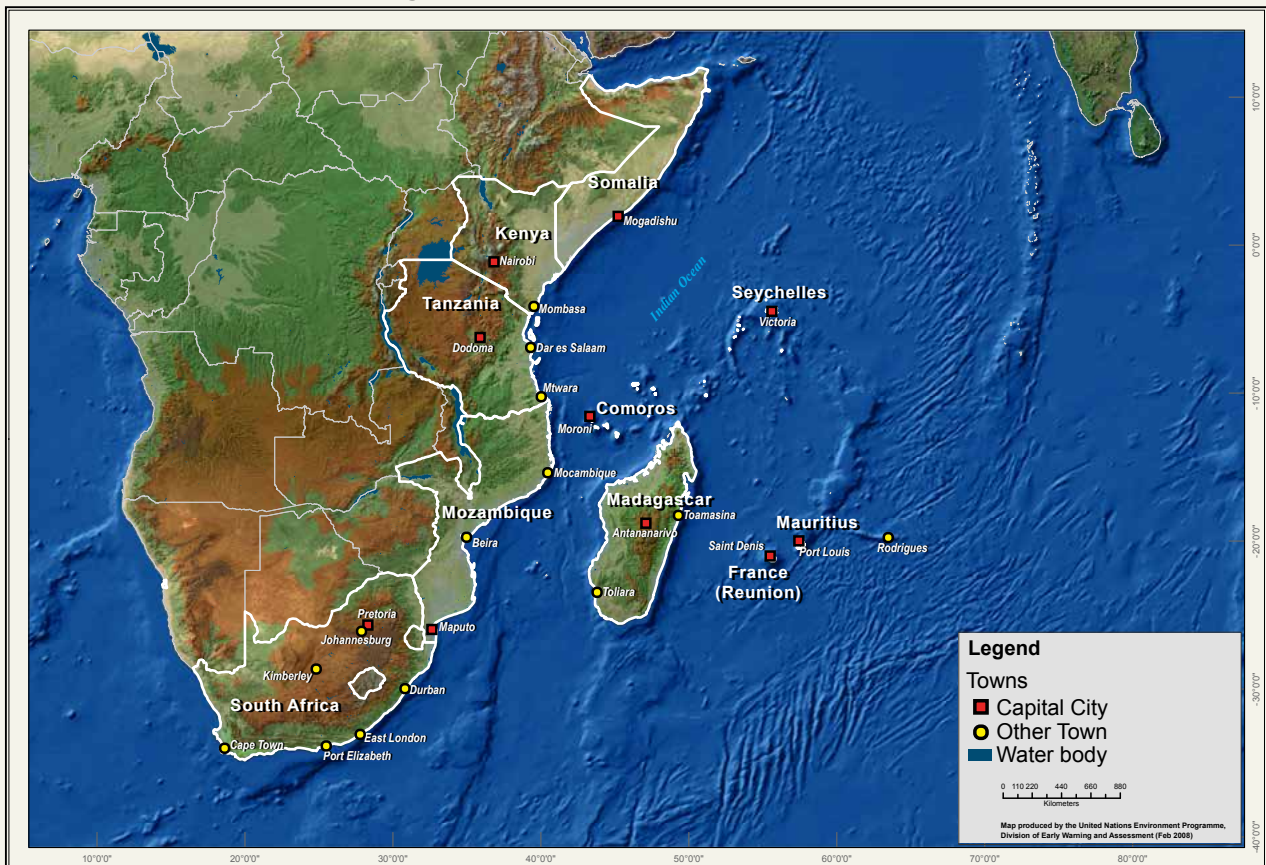
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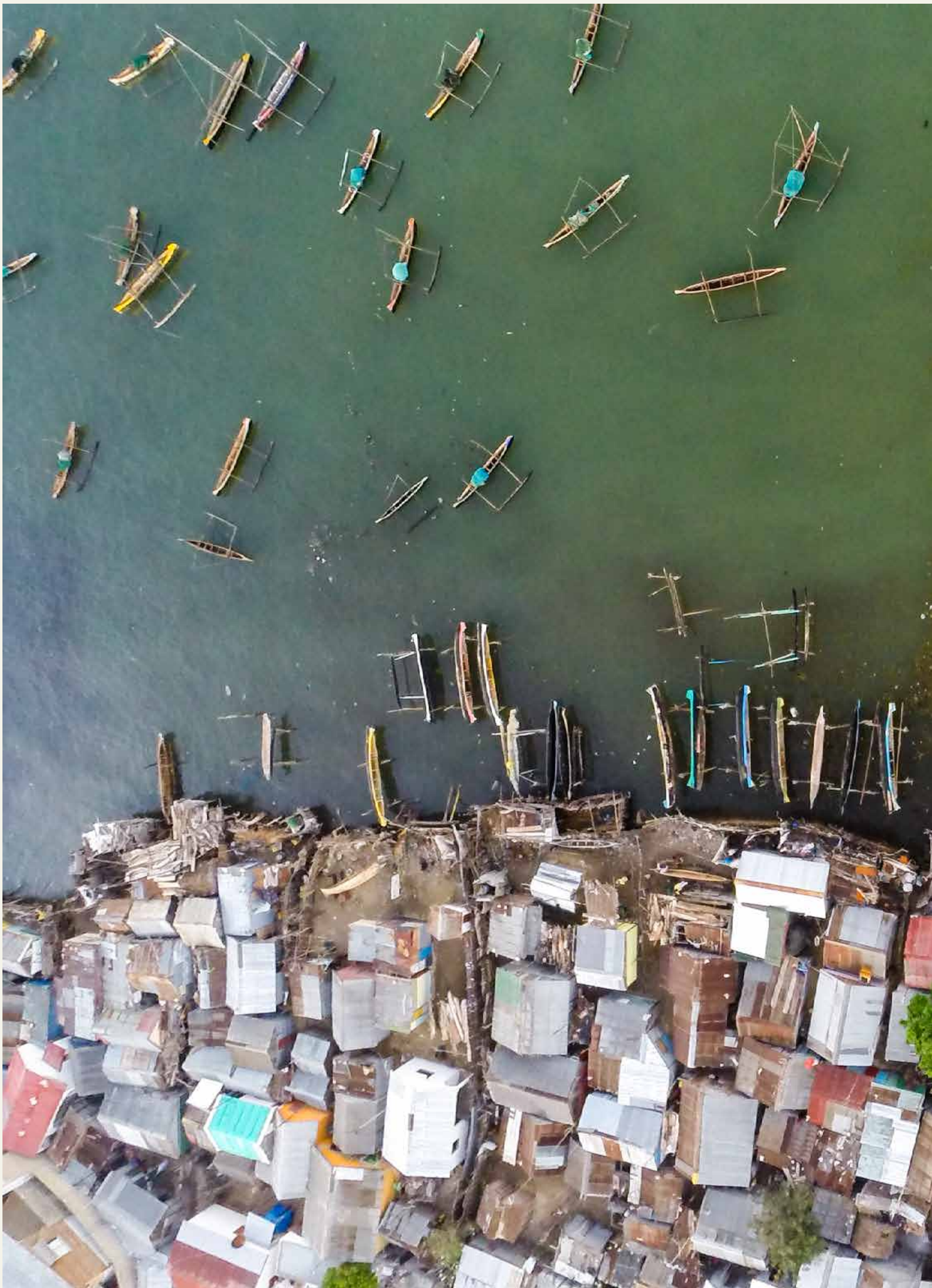
Women play a central role in mariculture.

economists. As a result, the values presented in this document are best understood as indicators of potential value, recognizing that they consistently underestimate the true value of ocean-derived benefits.

Further, the major natural ocean assets that generate so much wealth are public goods (Hoegh-Guldberg et al. 2013). As a result, some of the benefits they provide are not (yet) recognized in markets, and thus they are not fully accounted for in economic calculations. One goal of this report is to stimulate the dialogue between governments, business, communities and other stakeholders to recognize these public goods as assets to be cared for and to be invested in, built up and – if necessary – restored. The ocean goods and services are not “free” in reality; the costs of accessing, using and managing them need to be acknowledged and internalized to ensure their continued sustainability and capacity to provide returns.

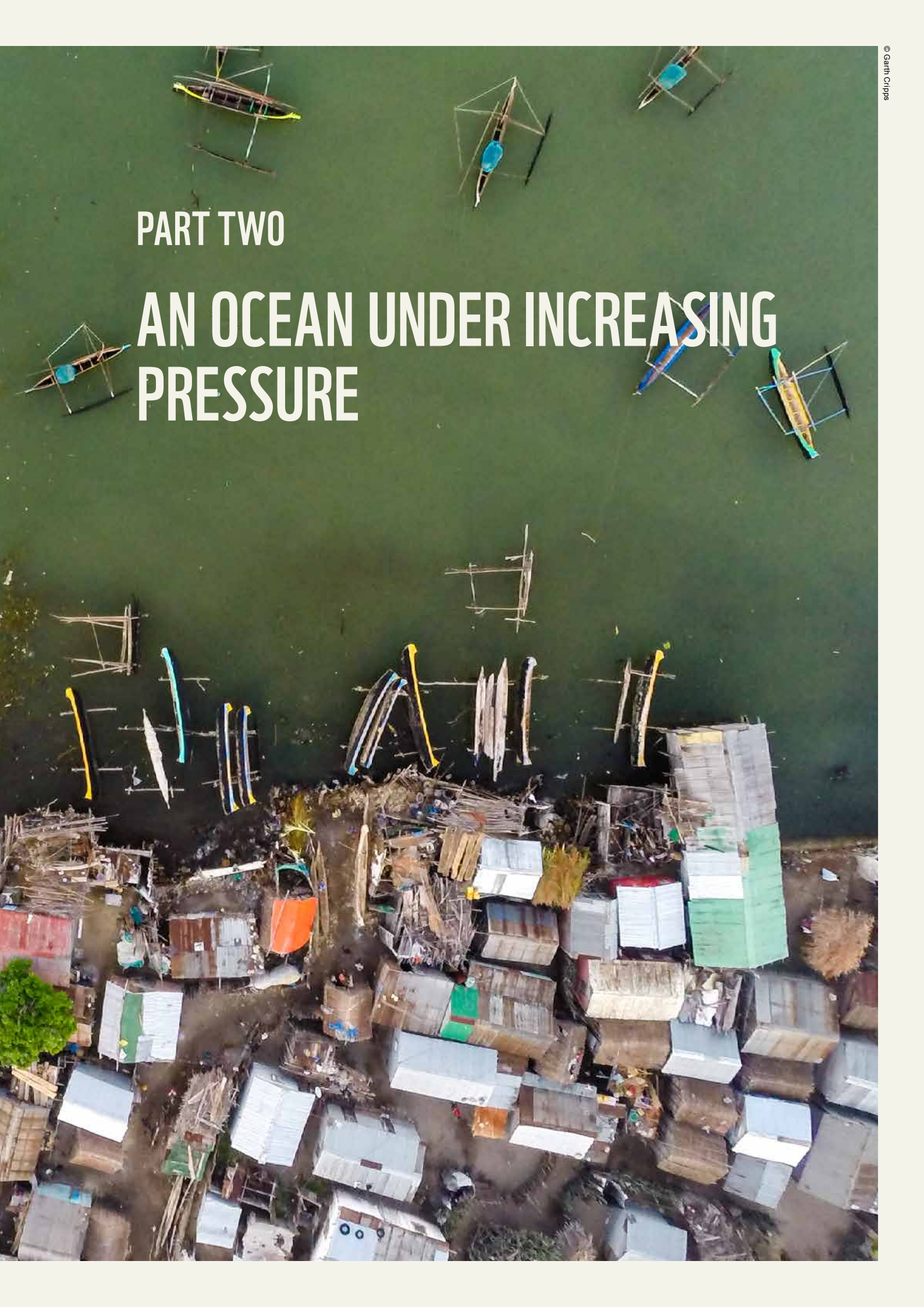
The Western Indian Ocean region





PART TWO

AN OCEAN UNDER INCREASING PRESSURE



The Western Indian Ocean has relatively intact coastal and marine ecosystems, although there are growing signs of distress in many parts of the region. The areas that are still in comparatively good health owe this to currently low levels of industrialization and economic development. However, these conditions may be rapidly changing as economies grow; activities such as expanded industrial fishing, shipping, oil and gas exploitation, agriculture and coastal development will likely impact the natural asset base.

THE WESTERN INDIAN OCEAN RANKS AS ONE OF THE MOST BIODIVERSE MARINE REGIONS IN THE WORLD

The Western Indian Ocean region is characterized by high diversity in both species and ecosystems, which ranks it as one of the world's richest ocean areas encompassing the world's second richest marine biodiversity hotspot (Obura 2012, Veron et al. 2015). Coral reefs, mangroves, salt marshes, seagrass beds, as well as pelagic and deep-sea habitats generate high biodiversity and productive waters which in turn support economies and livelihoods (Samoilys et al. 2015).

2.1 Natural assets under threat

-18% TO -27%
MANGROVES

KENYA AND TANZANIA HAVE LOST ABOUT 18% OF THEIR MANGROVES OVER 25 YEARS AND MOZAMBIQUE HAS LOST 27% OVER A SHORTER TIMEFRAME

The richness of the region's world-class ocean ecosystems is under threat from both direct and indirect pressures through resource exploitation and human-induced habitat degradation (Figure 2). For example, mangrove coverage is diminishing in most countries in the region – Kenya and Tanzania lost about 18 per cent of their mangroves over 25 years, and Mozambique lost 27 per cent over a shorter timeframe (Bosire 2015). This is largely due to overharvesting for firewood, timber and charcoal; clearing and conversion to other land uses; pollution; sedimentation; and changes in river flow. Coral reefs declined by 15 per cent in the 10 years after the 1997-98 El Niño climate event, which caused major coral bleaching and mortality (Atewerbehan et al. 2011). Warming, acidifying seas and increasingly frequent major climate-related events (like mass bleachings), coupled with the inexorable increase in pressures from local human populations, are rapidly ratcheting down the health of coral reefs (Box 5). As one-third of global oil tanker traffic passes through the Mozambique Channel, oil spills also pose potential risks to marine ecosystems (Obura et al. 2015). In addition to the oil tankers, about 6 per cent of the world's trading fleets travel to ports in the Indian Ocean (UNCTAD 2006), potentially leading to a destructive spread of invasive species.

The greatest impact of the decline of coral reefs, mangroves and seagrass beds is the loss of their ecosystem services, such as their function as a nursery for fish species: this translates into shrinking adult fish populations and declining fish catches (Diop et al. 2015). Other negative effects include decreased biodiversity, shoreline protection and tourism value, and increased organic carbon exported to the marine environment. Impacts on human well-being associated with the loss of these ecosystem goods and services include food insecurity and the loss of livelihoods, emphasizing the need for good management to maintain the health of ecosystem assets (Box 6).

For 161 Western Indian Ocean marine species identified as threatened by the IUCN Red List (which include corals, sea cucumbers, rays, sharks, marine turtles, marine mammals and fish), the overall trend is a continuing decline in populations. Many of these species are dependent on coastal habitats, such as seagrass beds and coral reefs, and are threatened because their habitat is being degraded or destroyed; or, in the case of many fish species, because they are overexploited (Richmond 2015).

BOX 5 MIGRANT FISHING: CAUSES, IMPACTS AND SOLUTIONS

Migrant fishing has long been a part of fishing culture on the East African coast. Travelling with the monsoon winds, migrants may spend weeks or months visiting their favoured fishing grounds before returning home (a, b).

Both push and pull factors can influence migrant fishing. Resource depletion in local fishing grounds may drive fishers to travel farther afield, pursuing greater catches and new markets. Often using methods that are more efficient than those used locally, migrants' methods are frequently rapidly adopted along their routes, ramping up pressure and expanding overfished zones. The attraction of high-value commodities that could be easily transported dry – sea cucumbers and shark fins – creates a strong incentive for migration (a). Increasing coastal populations, expanding markets and access to technology (such as engines) drive more and more fishers to migrate larger distances. Temporary camps on migrant routes have in many cases turned into permanent fishing villages, even on remote islands such as Barren Islands, Madagascar (a) and the Songosongo archipelago in Tanzania (c). In many cases the greater catches and income brought by migrant fishers are initially welcomed in destination regions, but this frequently turns to increased conflict once resource depletion starts to occur.

Migrant fishing represents an important economic opportunity for many poor fishers. This phenomenon will likely be increased by climate impacts compounding depletion at local fishing sites, and might also provide some relief from fishing for the source regions of the fishers. Thus, managing migrant fishing to relieve its negative impacts while enabling its benefits will be important to balance social needs and resource constraints. Importantly, more diverse and sustainable economic opportunities will be needed to provide alternatives to migration when the going gets tough (d).



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A camp of migrant Vezo fishers on a sandbar in the Mozambique Channel.

FIGURE 2 STATE OF MARINE ASSETS IN THE WESTERN INDIAN OCEAN (WIO)

RAPIDLY EXPANDING POPULATION



APPROXIMATELY

60 million

PEOPLE LIVE WITHIN 100 KM OF THE COAST ACROSS THE ENTIRE WIO, BUILDING STRESS ON NATURAL RESOURCES.²

Rapid increases in population and consumption levels – coupled with high reliance on coastal and marine resources for sustenance and livelihoods – are the key drivers of overexploitation and degradation of Western Indian Ocean coastal ecosystems.

SHRINKING MANGROVES⁵

↓ **18%** TANZANIA (1980-2005)
KENYA (1985-2010)

↓ **27%** MOZAMBIQUE (1990-2002)



LACK OF PROTECTION

ONLY 2.4%
OF MARINE AREA IS
UNDER SOME FORM OF
PROTECTION IN THE WIO.⁷



SOURCES: 1. Obura *et al.* (in review); 2. CIESIN (2015); 3. FAO (2013); 4. IOTC (2016); 5. UNEP-Nairobi Convention and WIOMSA (2015); 6. UNESA (2015); 7. WDPA (2016); 8. WRI (2011).

CORAL REEFS AT RISK



71-100%

OF REEFS ARE AT RISK IN ALL WIO COUNTRIES

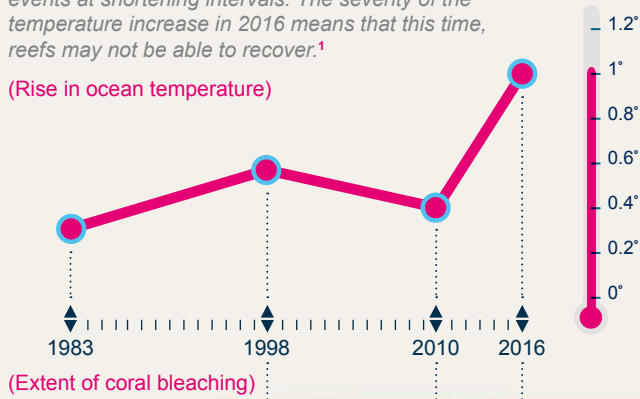
EXCEPT FOR THE SEYCHELLES.⁸

Mass coral bleaching is occurring more frequently in the region, causing large scale coral mortality. 2016 is predicted to be twice as hot as 1998, the worst event recorded so far.

CASE STUDY: CORAL BLEACHING IN MAYOTTE ISLAND

Reefs in Mayotte have suffered four severe bleaching events at shortening intervals. The severity of the temperature increase in 2016 means that this time, reefs may not be able to recover.¹

(Rise in ocean temperature)



(Extent of coral bleaching)



FISH STOCK DECLINE



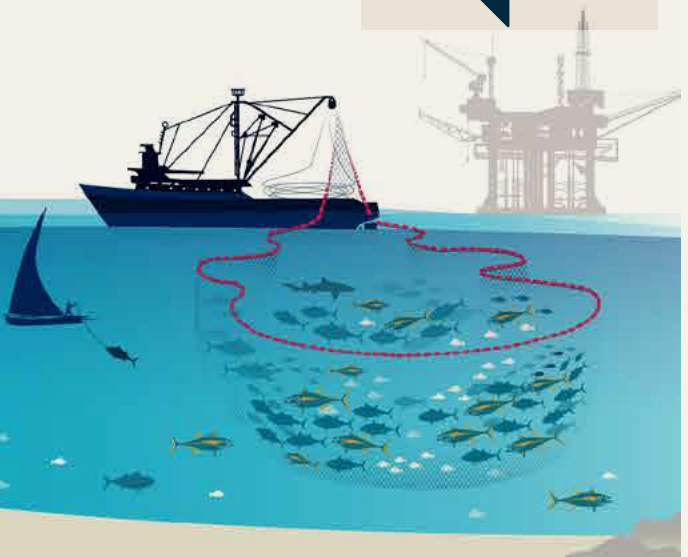
35%

OF THE STOCKS ASSESSED IN THE WIO ARE FULLY EXPLOITED.

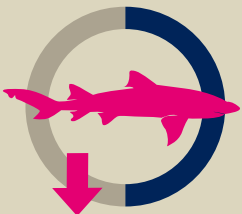
28%

ARE OVEREXPLOITED.³

Risk of damage to habitat from major spill



SHARKS UNDER THREAT



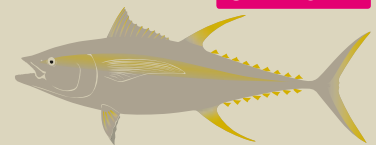
50%

OVER HALF OF 50 SHARK SPECIES ASSESSED IN THE WIO ARE CONSIDERED THREATENED.⁵

YELLOWFIN ON THE WANE

THE YELLOWFIN TUNA STOCK IN THE WIO IS IN DANGER OF COLLAPSE WITHIN A FEW YEARS IF NO ACTION IS TAKEN.⁴

OVERFISHED



BOX 6 IMPACTS OF CLIMATE CHANGE ON CORAL REEFS, FOOD SECURITY AND LIVELIHOODS

In 1998, the hottest year and the strongest El Niño recorded for the planet devastated coral reefs in the Western Indian Ocean. Many locations suffered mortality of 50–90 per cent of corals (a), and the region experienced the worst impact from this event anywhere in the world (b).

Coral bleaching events are expected to become more frequent and severe as a result of climate change. The damage from rising temperatures is exacerbated by acidification as a result of more carbon being absorbed in seawater. Feedback loops and multiplying local stressors caused by population growth compound the problem. The result is an inexorable decline of the health of coral reefs (c), and their fish communities (d).

Following the major bleaching event of 1998, minor bleaching events have been reported in the region (e), revealing a worrying trend of reduced intervals between larger events and rising temperatures. A major global bleaching event impacted the Western Indian Ocean in 2016 (f) and the outcome will need to be assessed in months and years to come.

The recovery of benthic and fish populations can vary greatly. Healthy coral populations may recover within 15 years, although over twice as long may be necessary in compromised communities (g). Fish populations could take 10 to 50 years or more to recover, depending on the key species and impacts (h) – although recovery would be contingent on improvements in fisheries management.

The loss of coral reef biodiversity and ecological function has severe consequences for countries bordering the Western Indian Ocean. Coral reef-associated fisheries sustain the livelihoods, food security and protein intake of many small-scale fishers in the region. Further, coral reefs are the primary asset for the coastal tourism sector, providing coastal protection, recreation areas and seafood worth US\$18.1 billion annually.

Tackling climate change is a global challenge, but countries in the region must take urgent action to protect reef health. This includes reversing the rise in those threats under their control, such as destructive fishing and pollution, and taking a proactive approach to improve reef conditions and identify reef-specific management actions and options (i).



© Jürgen Freund / WWF

Coral reefs degraded from bleaching are less able to provide the ecosystem services on which human communities depend.

POPULATION GROWTH RATES IN COASTAL ZONES TEND TO BE DOUBLE THE NATIONAL AVERAGES

ECOLOGICAL FOOTPRINT CALCULATIONS FOR THE WESTERN INDIAN OCEAN COUNTRIES INDICATE THAT AS OF 2012, TOTAL IMPACT WAS ALREADY GREATER THAN THE ENVIRONMENT CAN SUSTAIN IN AT LEAST FIVE COUNTRIES

2.2 Human population and demographic change

A rapid increase in human populations, a high reliance on coastal and marine resources for sustenance and livelihoods, and demand from distant markets, are key pressures driving overexploitation and degradation of coastal ecosystems. In 2015, the 10 countries of the Western Indian Ocean had a population of 220 million, an increase of 280 per cent since 1975 (UNESA 2015).⁴ The population is projected to grow to 306 million by 2030 (an increase of nearly 50 per cent), quadruple to 818 million by 2100, and continue to increase into the next century (Gerland et al. 2014).

Population growth rates in coastal zones tend to be double the national averages (Creel 2003, Neumann et al. 2015). Although there is some variation between the situation in large coastal states versus their small island neighbours, these growth rates tend to be amplified by migration driven by a range of ‘push’ factors (such as climate change and overpopulation driving migrants from their homes) and ‘pull’ factors (such as economic growth and jobs attracting migrants to coastal cities). Some 60 million people live within 100km of the coast across the entire Western Indian Ocean⁵. This adds pressure to coastal resources and near-shore fisheries as communities rely on those same resources for economic and food security as well as for their social and cultural identity. The human population that directly impacts the coastal zone is even greater, estimated at over 130 million,⁶ as the drainage basins of the region’s large rivers extend thousands of kilometres into the continent. Global trade also adds to the pressure on coastal resources, such as fish, to supply markets on other continents.

People’s demands on nature are a function of population size, economic activity and consumption levels. The Ecological Footprint⁷ of all African countries taken together increased by 238 per cent between 1961 and 2008, and it is projected to double again by 2040 (WWF, ZSL, African Development Bank 2012). Ecological Footprint calculations for the Western Indian Ocean countries indicate that as of 2012, total impact was already greater than the environment can sustain in at least five countries (National Footprint Accounts 2011). Only the largest and least developed countries (Madagascar and Mozambique) show a positive reserve of biocapacity. This highlights the urgent challenge of transforming national development models to minimize impacts and restore the biocapacity necessary for sustained development (WWF 2014).

2.3 Economic growth and potential impacts

As with the entire continent of Africa, the countries of the Western Indian Ocean are expected to enter into a period of rapid economic growth, enabled by their current low baseline, rapid demographic growth and access to new energy sources (AEO 2015, APP 2015). The population growth rates anticipated for the coming decades will result in an even larger increase in the workforce, from 42 per cent of the population now to 51 per cent in 2100, potentially providing a demographic dividend to help lift the countries out of poverty (UNFPA 2014, WEF 2012). Investment in the region by corporations, and in major infrastructure and transport corridor projects, is

4 For South Africa, only the province of KwaZulu-Natal was used, and Somalia has been omitted, as reliable statistics have not been published.

5 Calculations based on a 100km coastal buffer to extract population from CIESIN (2015).

6 Calculated from the Global Runoff Data Centre (www.bafg.de/GRDC/EN/Home/homepage_node.html) database on global river basins and CIESIN (2015).

7 The Ecological Footprint is a measure of how much biologically productive land and water (biocapacity) an individual, population or activity requires to produce all the resources it consumes, and to absorb the waste it generates, using prevailing technology and resource management practices.

>50% BY 2100

THE WORKFORCE IN WESTERN INDIAN OCEAN COUNTRIES WILL GROW FROM 42% OF TOTAL POPULATION TODAY, TO >50% BY 2100

increasing. Much of this is driven by the expected increase in regional consumption and demand, as well as greater participation in global trade.

In parallel with these factors, there are plans to exploit petroleum and gas reserves throughout Eastern Africa – although low prices, volatility, the development of renewable energy sources and climate change commitments make it difficult to predict the sector’s potential development (APP 2015). Similarly, there have been discoveries in mining, such as coastal titanium sands.

While these resource sectors are not dependent on a healthy ocean, they could have a significant impact by increasing maritime transport and the associated risks to the ocean, and pose a considerable direct threat to ecosystems and livelihoods if poorly managed. Robust regional coastal planning and careful infrastructure management – and thorough consideration of cumulative impacts – will be fundamentally important for mitigating development impacts. How the countries regulate their growth and manage development will be critical to maintaining their ocean assets and the value these provide.

2.4 Status of protection of natural assets

2.4%

ONLY 2.4% OF MARINE AREAS ARE UNDER SOME FORM OF PROTECTION IN THE WESTERN INDIAN OCEAN

Western Indian Ocean countries have protected in various forms about 2.4 per cent or 155,500km² of their marine area (Annex 1). Protected areas have been a principal tool of marine management in the region since the first was established in Mozambique (Inhaca Island) in 1965. Initially, the conservation and environment sectors led the development and management of MPAs, with some investment in small private protected areas around resort islands. In the last decade, co-management and direct management by communities and resource users has grown, along with recognition of the need to vastly expand the area under marine management and conservation – now the aim is that this should cover at least 10 per cent of EEZs by 2020, through the Convention on Biological Diversity’s (CBD) Target 11 and under SDG 14 (target 14.5). With only four years to this deadline, the region is only one-quarter of the way there. Many countries are ramping up efforts to expand both the area under protection, and to enhance the effectiveness of management, particularly enforcement, to protect biodiversity and maintain the ecosystem services that underpin the economic value of marine systems.

Area-based protection is just one set of tools for protecting natural assets. Effective management of the over 97 per cent of the Western Indian Ocean’s EEZs that are currently not protected will be critical to ensure sustainability of use and benefits from those assets, including in areas beyond national jurisdiction. Improving fisheries management is a major focus at national and regional levels, with multiple collaboration and assistance projects conducted in recent years (ASCLME/UNDP 2012b). National fisheries policies are increasingly being aligned with FAO standards for ecosystem-based management, and regional connectivity among fish stocks, fishers and industrial fleets is stimulating increasing cooperation among countries and management agencies. Further, with increasing development pressure from multiple sectors, countries are also putting in place processes for environmental impact assessment, integrated coastal zone planning and MSP to manage the complex interactions among different users and stakeholders, and the natural assets that support them.

2.5 Climate drivers and ecosystem change impacts

Global climate change is impacting ecosystems around the world, from the mountains to the deep ocean. The surface waters of the ocean have warmed by 1°C since about 1880 (US EPA 2016), with resulting impacts on climate phenomena such as the El Niño Southern Oscillation, and on rainfall and storm patterns. Climate effects can compound one another: for example, the combined impact of warming waters and ocean acidification on coral reefs is predicted to be greater than either would have in isolation (Box 6).

There have been relatively few studies on the economic and social impacts of climate change in the Western Indian Ocean, with little consistency among methods and objectives (Mander et al. 2014). Nevertheless, those studies that do exist begin to give some idea of the scale of the impact of climate change. The economic costs to dive tourism in Zanzibar and Mombasa from the 1998 coral bleaching event were respectively estimated at US\$1.88–2.82 million and US\$10.06–15.09 million (Westmacott et al. 2000). The value of coastal assets in Dar es Salaam, Tanzania, exposed to a one-meter sea-level rise and more intense storms was estimated at US\$5.3 billion (Brown et al. 2011). Sea-level rise of 43cm by 2100 could affect a projected 913,500 people in Tanzania, and 2,271,000 in Mozambique (Brown et al. 2011). Social impacts of climate change include the migration of people, often due to habitat loss and degradation, and loss of livelihoods. Climate refugees are likely to increase along the coastlines of the region, with significant repercussions on fisheries as they turn to fishing as a source of food (Box 5).

Coral reefs of the Western Indian Ocean are still recovering from the major El Niño climate event of 1997–98, almost 20 years later. The “ratchet effect” of repeated El Niño events combined with increased human pressure and local threats prevents the recovery of coral reefs to their pre-1998 state. Similar impacts, although apparently less severe, have occurred in mangroves and seagrass beds, although these are less well documented than for coral reefs (Lugendo 2015).

The ongoing loss of productive habitat will likely result in diminished fish catch for coastal communities and reduced protection from storms and rising seas, putting coastal families in peril. It also reduces adaptive capacity and communities’ resilience to cope with varied natural, social and economic challenges. This can lead to a “socio-ecological trap” from which resource-users may not be able to escape without significant assistance and better stewardship of their resources (Cinner 2011). Strong leadership from local to national levels is needed to mitigate the impacts on marine ecosystems of climate change, combined with local threats.

COMBINED CLIMATE AND LOCAL IMPACTS CAUSE A RATCHET EFFECT ON CORAL REEFS, MANGROVES AND OTHER SYSTEMS, DESTROYING THEIR ABILITY TO SUPPORT LIVELIHOODS

2.6 Possible futures for the Western Indian Ocean

Africa is on the brink of transformational change (APP 2015, AEO 2015). Pursuing the resource-intensive pathways taken by many Asian, European and American countries will accelerate its path to “biocapacity deficit”, with associated environmental degradation. Yet the continent is well placed to develop resource-efficient pathways, combining known and cost effective approaches, new technologies and innovative thinking to become a trend setter for a new socio-economic system (WWF, ZSL and African Development Bank 2012). We describe two broad pathways for the region’s future.

BUSINESS AS USUAL SCENARIO

The first scenario, “Business As Usual”, prioritizes short-term growth in profit and wealth, powered by fossil fuel extraction and use, with low regulation and inadequate investment to protect environmental and social assets.⁸ The consequences of this scenario for the assets that underpin ocean wealth are severe. Habitat and species losses that are currently accelerating worsen, so that natural asset values (i.e. the shared wealth fund) decline, along with the gross marine product. As a result, the economic sectors focused on in this study will be undermined. While some increase in profit may occur in the short term through technology fixes and monetary/financial changes, real wealth will decrease. As human population increases, sectors with low financial but high socio-economic value – such as artisanal fisheries – and all those that depend on healthy ecosystems – such as tourism – will face potentially significant impacts. The Business As Usual scenario will also undermine achievement of the UN 2030 Agenda for Sustainable Development.

SUSTAINABLE AND INCLUSIVE BLUE ECONOMY SCENARIO

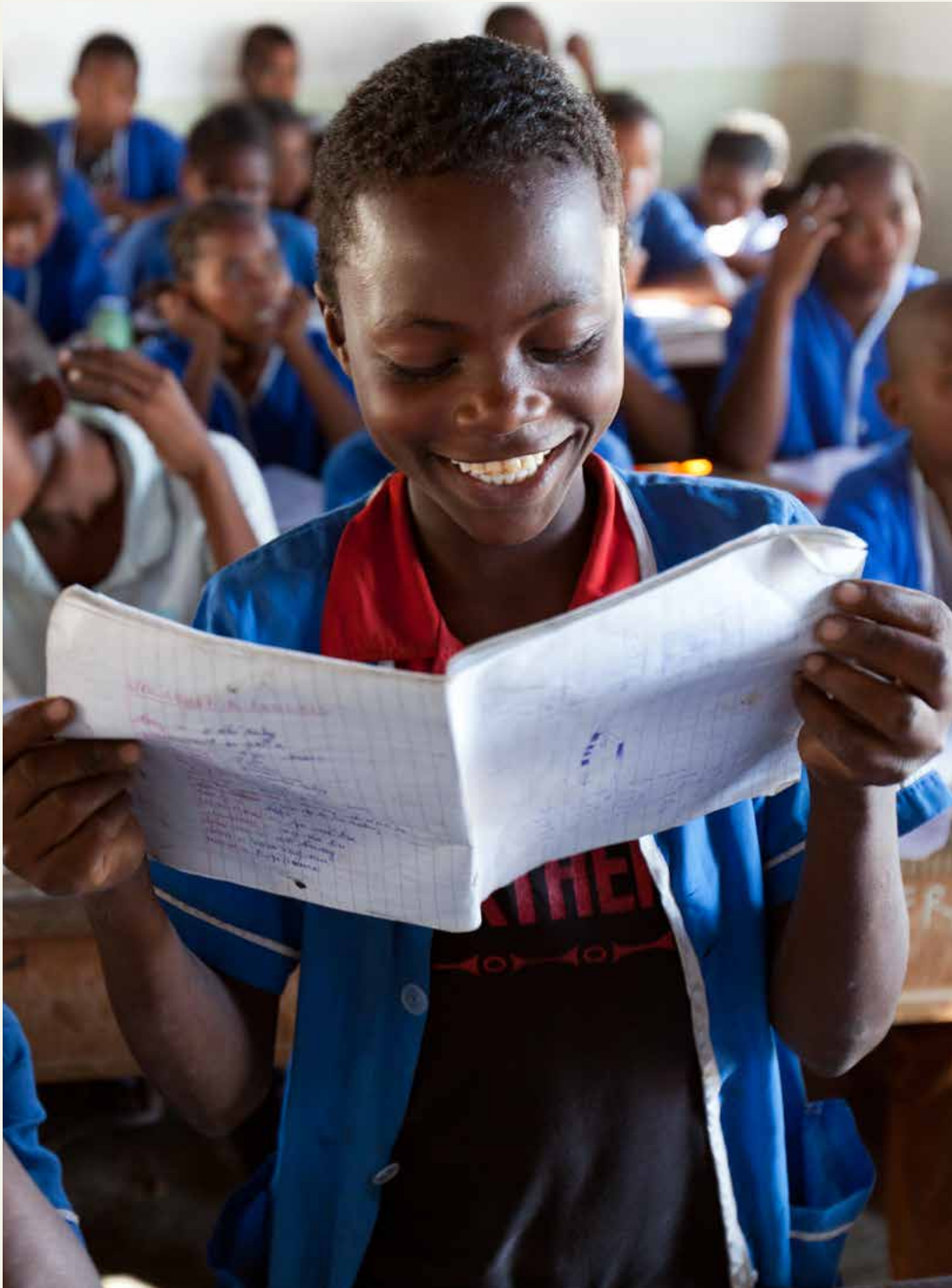
The alternative scenario, “Sustainable Blue Economy”, prioritizes sustainable economic development through asset conservation and prudent economic management. Policies support welfare, education, health, and other aspects that enable more equitable sharing of benefits.⁹ This scenario prioritizes protection and enhancement of natural assets and ecosystem resilience. It positively contributes to those sectors based on living ocean resources and habitats. Both the annual income (gross marine product) and long-term asset values (shared wealth fund) will increase due to being sheltered from damage. Further, ocean assets will benefit from investment that enhances and restores those that are degraded (e.g. dynamited reefs or degraded mangroves), and from value-added technologies and practices that emerge through innovation. Growth in economic sectors will be geared toward longer-term sustainable pathways that offer more equitable distribution of resources among people and across generations.

A KEY FEATURE IN THE GREAT VALUE OF THE SUSTAINABLE BLUE ECONOMY SCENARIO IS IN THE HIGH SOCIAL VALUE SECTORS, SUCH AS ARTISANAL FISHING, THAT PROVIDE SECURE LIVELIHOODS

A key feature in the Sustainable Blue Economy scenario is the high social value sectors, such as artisanal fishing, that provide secure livelihoods. In these sectors, this scenario maximizes the public good, addressing health and welfare alongside the environment. The Sustainable Blue Economy scenario directly implements the SDGs. It provides a blueprint for Western Indian Ocean countries to plan concrete actions to address the targets under each SDG while keeping an eye on the overall vision of sustainable development. Although some SDGs are more relevant and specific to the ocean, the 15-year Action Plan laid out in the next section offers guidance toward their holistic implementation in the context of existing regional commitments and frameworks.

⁸ This scenario has been called different names: Markets First (UNEP 2008, 2012), Market Forces and Fortress World (UNEP/AMCEN 2013), Going Global (WWF/AfDB 2015), Conventional World (UNEP-Nairobi Convention 2015) and Fuelled Business as Usual (Obura et al. 2015, 2016)

⁹ Similarly, this scenario has been variously labelled: Sustainability First (UNEP 2008, 2012), Policy Reform and Great Transitions (UNEP/AMCEN 2013), All in Together (WWF/AfDB 2015), Sustainable World (UNEP-Nairobi Convention 2015) and Blue or Green Economy (Kelleher 2015, African Union 2014, Obura et al. 2015, 2016)



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Learning with joy, against the odds. By ensuring the integration of social, economic and environmental strategies, the UN Agenda 2030 (Sustainable Development Goals) aims at creating a better future for all.



PART THREE

RECOMMENDATIONS: A 15-YEAR ACTION PLAN FOR LONG-TERM PROSPERITY



The SDGs express an unprecedented focus by the global community of states on the natural, social and economic rights and governance dimensions of healthy and vibrant societies. Achieving the SDGs will help countries meet their national and international commitments to support development and improve welfare for their citizens, while sustaining the environment, minimizing the impacts of climate change and delivering benefits to all sectors of society.

The recommendations proposed in this section focus on protecting and enhancing the value of the ocean assets that support the economies of Western Indian Ocean countries (Figure 3). We use the 15-year timescale to 2030, corresponding to the timeline set for the SDG agenda, and present concrete steps to implementing the SDGs for ocean-dependent sectors. Under each action, we identify concrete short-term actions that will build momentum and commitment toward 15-year outcomes.

A first step for all countries is to **implement the SDGs at the national level by:**

(1) identifying and adapting national policies and development plans to accommodate them, (2) identifying the means to achieve SDG targets and (3) developing methods to measure progress toward those targets.

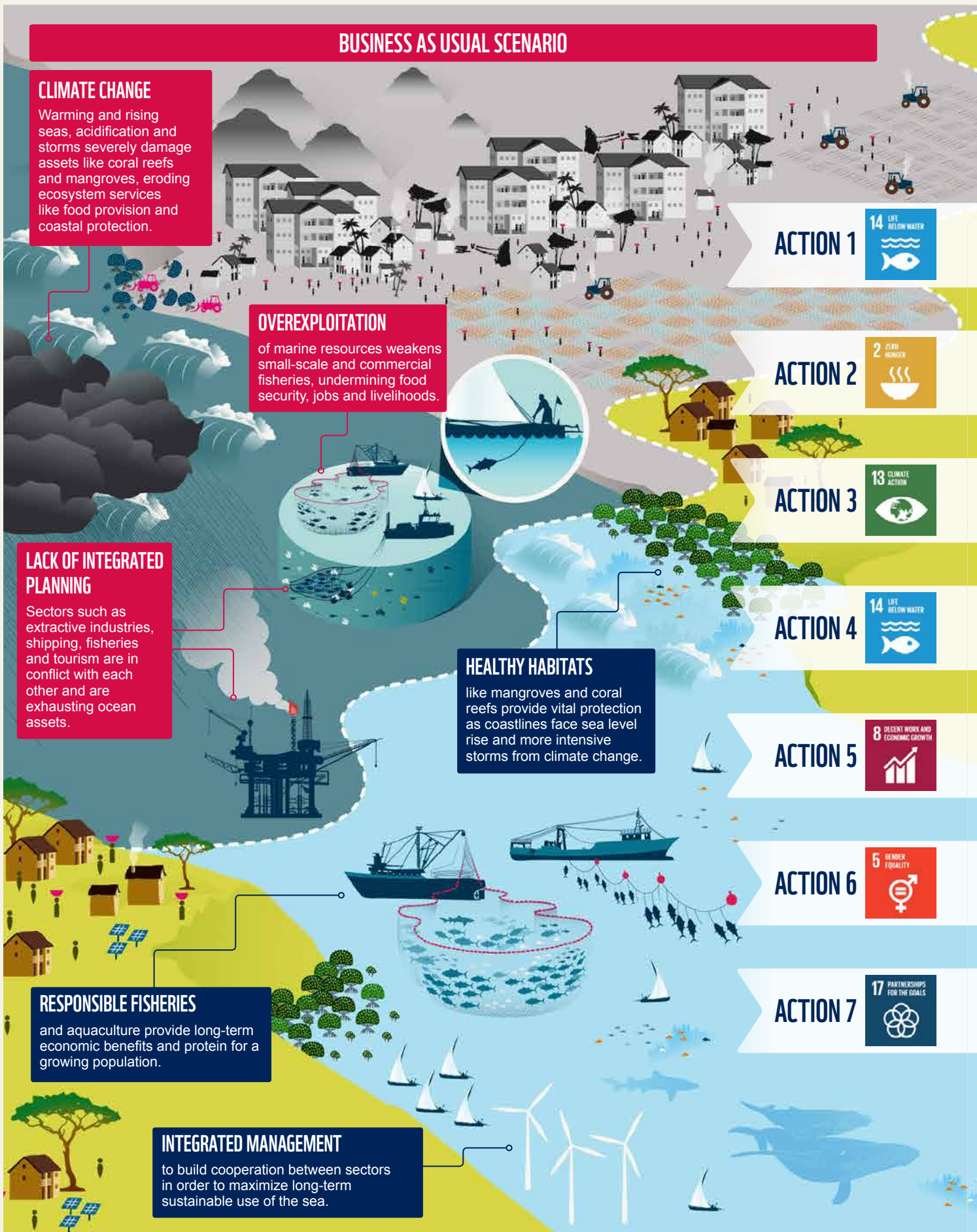
Each country will approach the SDGs from its own perspective and priorities, as expressed in national development plans and strategies. Countries should also build on existing conventions and commitments, such as the CBD Strategic Action Plan (2011-2020), and the regional vision for sustainability and prosperity (Western Indian Ocean Strategic Action Programme or WIOSAP) developed through intergovernmental programmes under the Nairobi Convention (UNEP/ Nairobi Convention Secretariat 2009a, 2012). It will also be essential to engage with the development sector, in particular regional blocs such as the Southern African Development Community (SADC), and the overarching sustainable development and blue economy visions of the African Union to mainstream the SDGs into all levels of business and development practice. Sustainable development in the Western Indian Ocean is going to require strong partnerships involving governments, institutions and businesses investing in natural assets and prudent economic management to generate shared value for the broader population.



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New horizons: with integrated ocean management that delivers sustainability of fisheries and other ocean uses, fishers can confidently take to sea to feed their families and secure an income.

FIGURE 3 TWO FUTURE SCENARIOS FOR THE WESTERN INDIAN OCEAN



SUSTAINABLE BLUE ECONOMY SCENARIO

Implement Effective Management of Ocean Assets

Ensure Sustainability of Small-Scale and Industrial Fisheries and Aquaculture

Transform to 21st Century Climate-Resilient and Carbon-Neutral Economies

Adopt a Sustainable, Inclusive Blue Economy Approach

Implement Integrated Ocean Planning and Management

Invest in Social Capital as a Cornerstone of Future Prosperity

Build Partnerships for Sustainable Development

WELL-MANAGED PROTECTED AREAS

enhance the health of ecosystems and help maintain food security, income and jobs.

LOCALLY MANAGED MARINE AREA (LMMA) / MARINE PROTECTED AREA (MPA)

HEALTHY AND EDUCATED FAMILIES

contribute to an inclusive blue economy and a sustainable future.



ACTION 1

IMPLEMENT EFFECTIVE MANAGEMENT OF OCEAN ASSETS

Action 1

Identify and implement steps to achieve Aichi Target 11 (and post-Aichi targets to 2030) through new MPAs and LMMAs in critical nearshore and offshore habitats, and effective management.

Protecting natural assets so that they deliver benefits to society underpins the strategic action programmes developed under the Nairobi Convention and is a core recommendation of the UNEP Regional State of the Coast report.

Protected areas, including multiple-use MPAs where some forms of fishing and other activities are allowed, are the most well developed and widely implemented spatial management tool both in the Western Indian Ocean and globally. Their contribution is recognized under CBD Aichi Target 11, which calls for at least 10 per cent of coastal and marine areas to be conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures by 2020 (CBD 2012). So far, it is estimated that MPAs cover 2.1 per cent and LMMAs 0.3 per cent of EEZs in the Western Indian Ocean (see Annex 1). This gives a total coverage of 2.4 per cent, with a gap of 7.6 per cent to achieve Aichi Target 11. In other words, MPAs should cover four times more space than they currently do by 2020 (and many scientists and institutions recommend much higher levels of protection in the longer term), and all of this should be effectively managed. Annex 1 provides details about each country's "Aichi Target 11 gap" and suggests priorities for closing the gaps.

Increasing national coverage of well-managed MPAs to at least 10 per cent by 2020 should be a priority in all countries. This requires the highest political as well as community engagement, as shown by Madagascar's Promise of Sydney, South Africa's Operation Phakisa and Seychelles' Debt Swap for Marine Conservation and Climate Adaptation. Priorities for implementation will vary with each country, building on current status, commitments and plans.

Countries can reach their commitments by increasing protection of both coastal and offshore waters. Offshore areas, currently under-represented, are important for maintaining and protecting sensitive deep-sea habitats, fisheries and ecological processes at a relatively large scale (Obura 2015). On the other hand, LMMAs are rapidly gaining support (Box 7); although generally small in scale, collectively they add over 11,000km² across the region in 2014 (Rocliffe et al. 2014). They are a critical tool to provide coastal communities with sources of food and livelihoods, and the ability to manage their own resources. MPAs and LMMAs should be designed within coherent networks built on the connectivity of ecological processes and key marine species to maximize resilience and effectiveness. Initial steps have been taken to identify the most ecologically and biologically significant areas for protection (WWF-EAME 2004, RAMP-CIO unpublished, CBD Secretariat 2012). More advanced planning should build on this, focusing on potential connectivity.

The requirement of "effectively and equitably managed areas" in Aichi Target 11 is essential to ensure protected areas deliver benefits for biodiversity and people. Improving management through capacity building and local community involvement is a priority (UNEP/Nairobi Convention Secretariat 2009a, 2012). Efforts are also being made to identify effective management tools that are culturally and socially acceptable, and economically relevant, resulting in higher voluntary compliance both within and outside protected areas.

Decisions on where to locate protected areas are influenced by many factors, requiring complex spatial planning processes and integrated ocean management approaches (see Action 5). A broad range of actors needs to be involved, including local authorities, national agencies and those involved with regional institutions such as regional fisheries management organizations (RFMOs) and intergovernmental conventions.

ACHIEVING AICHI TARGET 11 WILL REQUIRE THE HIGHEST POLITICAL ENGAGEMENT, AS SHOWN BY MADAGASCAR'S PROMISE OF SYDNEY, SOUTH AFRICA'S OPERATION PHAKISA AND SEYCHELLES' DEBT SWAP FOR MARINE CONSERVATION AND CLIMATE ADAPTATION

BOX 7 PILOTING AND SCALING UP LOCALLY MANAGED MARINE AREAS

In the early 2000s, local fishers in the Kenyan village of Kuruwitu were in desperate straits. Catches had diminished due to overfishing, the aquarium fish trade and the steady erosion of the ecosystem, putting their livelihoods in jeopardy.

In response, the Kuruwitu Conservation and Welfare Association was formed with the twin aims of protecting the area and bettering the lives of the local community. The Association prepared a vision document, including the views of experts and local community members, which was presented to and accepted by over 60 local fishermen. The Association was officially launched in 2003, a core protected area on the reef demarcated in 2006 and a management plan adopted in 2010: the first coral reef LMMA in Kenya.

Since then, the Association has launched several projects to build awareness and capacity within the community for marine conservation and management, to better enforce the protected area, to establish alternative livelihoods through nature-based enterprises, and to undertake biodiversity assessments. By 2015, 24 LMMAs had been established along the coast of Kenya, with Kuruwitu playing a key role in stimulating at least 10 of these (b).

Madagascar's first LMMA was established in the Andavadoaka area in the south-west of the island (c). Here, the Vezo fishing community are among the poorest in the world, relying on fishing for food and income. With population doubling every 10-15 years, and no means of survival other than extracting what the sea can offer, fish stocks had reached the point of collapse. Combined with climate change, sedimentation from upstream deforestation and destructive fishing practices, this had led to the widespread degradation of coral reefs.

Working with Blue Ventures, a non-profit organization, the 25 villages in the area came together in 2005 to create the Velondriake protected area, spanning 650km² and including permanent and temporary fishing reserves for octopus recovery. This grassroots movement has spread across Madagascar and led to the formation of a national LMMA network called MIHARI (d), founded on principles of peer learning and exchange among the members. The MIHARI network now includes 128 registered management associations and more than 70 LMMAs, covering an area of over 12,000km² (c,d).

News of LMMA success has spread beyond these two countries (e), and there is growing interest in and support for a regional LMMA network.



A newly caught octopus on a reef flat.

ACTION 2

ENSURE SUSTAINABILITY OF SMALL-SCALE AND INDUSTRIAL FISHERIES AND AQUACULTURE

Action 2

Implement legislation to apply FAO guidelines, and strengthen rights-based approaches and benefit sharing in fisheries and aquaculture, to cover 50 per cent of all fish provision by 2030.

**FISHERIES AND
AQUACULTURE NEED
FUNCTIONING, PRODUCTIVE
ECOSYSTEMS**

Fisheries are a primary economic sector dependent on healthy oceans. Small-scale fisheries provide protein and livelihoods for a large proportion of coastal people in the Western Indian Ocean, while commercial and industrial fisheries contribute significantly to GDP (and gross marine product). Aquaculture production is also growing as demand increases and wild fish stocks become depleted. All three sub-sectors - small-scale fisheries, industrial fisheries and aquaculture – are important, and will be critical to reducing hunger and improving nutrition in coastal societies. However, they can conflict with one another, and other values and uses, and require very specific management.

Fisheries and aquaculture need functioning, productive ecosystems. The asset management approach advocated here can secure their long-term sustainability, integrating social, economic and environmental goals. **Countries should take immediate and strategic action to build more resilient and secure food provision from the sea.** The key next steps are to:

- Implement the FAO's Ecosystem Approach to Fisheries, Code of Conduct on Responsible Fisheries and Voluntary Guidelines on Small-scale Fisheries. Most countries already recognize these in national policies and legislation, but need to identify immediate actions to implement them locally.
- Develop and implement fishery-specific management plans that address the dynamics of the target species and of fishery stakeholders. For small-scale fisheries, implement local co-management approaches grounded in community-based resource management principles, build adequate capacity, and where applicable, ensure equitable sharing of benefits from offshore industrial fisheries (Box 8).
- Design and implement MPAs and LMMAs that support sustainable fisheries production by protecting key habitats and fish species, and strengthening connectivity and recruitment.
- Invest in improved monitoring, control and surveillance of fisheries activities to prevent IUU fishing and ensure the effectiveness of fisheries management plans, and support fiscal reforms to direct resources to support this.
- Run fisheries improvement projects that strengthen stock protection and sustainability, remove pressure by developing alternative income and food products, empower local communities, mitigate ecosystem impacts, and address post-harvest handling and sanitation.
- Explore innovative ways to increase the value of fisheries, e.g. to higher-value products, optimizing the value that small-scale fishers are able to draw from fisheries, including through multi-stakeholder initiatives and public-private partnerships.
- Facilitate access to high-value markets to increase the livelihood benefits of small-scale fisheries and address the issue of monopoly price fixing on the part of buyers.

BOX 8 ENHANCING SMALL-SCALE FISHERIES THROUGH HOLISTIC APPROACHES

In South Africa, depleted fish stocks are one of the most serious challenges facing the long-term survival of small-scale fishers. WWF is working with these fishers and their families in the Overberg region (a,b) to help develop sustainable and cooperative management approaches for the local coastal resources in the hope of bringing back healthy, productive fisheries. Through convening all stakeholders, from local communities, municipalities, regulators and conservation agencies to restaurants and retailers, WWF has enabled them to develop a seven-point plan aimed at improving both local livelihoods and the management of coastal marine resources, in accordance with the new national policy on small-scale fisheries (c).

Recognizing that the community's well-being is inextricably linked to the health of the marine environment, the work plan not only incorporates improvements to local fisheries regulations and MPAs but also addresses important social concerns. These include improved market opportunities, fair labour conditions and alternative livelihoods. If the plan is successfully implemented, communities in the area will be able to continue living off the sea.

In Cabo Delgado, northern Mozambique, both community and government are searching for solutions to sustainable management of small-scale fisheries, through local institutions or community fishery councils (CCPs in Portuguese). The "Our Seas Our Life" project (d), involving the community fishers, Zoological Society of London, local NGO Associacao de Meio Ambiente and other international partners including CORDIO, is working to define the best management options for local fisheries. The project will build capacity within the CCPs to design and manage their own LMMAs and to quantify the fisheries sufficiently to design funding mechanisms such as payment for ecosystem services (e) to finance the LMMAs sustainably.



© Mark Chippis

Small-scale fishermen bringing home their snoek catch in South Africa.

ACTION 3

TRANSFORM TO 21ST CENTURY CLIMATE-RESILIENT AND CARBON-NEUTRAL ECONOMIES

Action 3

Incentivize ecosystem-based climate resilience with sustainable finance, and implement national strategies for carbon-neutral development by 2030.

The Paris Agreement forged in December 2015 marked a watershed, as all countries acknowledged their role and shared responsibility for addressing climate change.

A first priority for developing countries is to build climate resilience.

Climate-resilient pathways are development trajectories that combine mitigation and adaptation to realize the goal of sustainable development and help avoid dangerous interference with the climate. They include strategies, choices and actions that reduce climate change and its impacts, and improve risk management and adaptation (St. Clair 2013). For the coastal zone, several key actions build climate resilience:

- Design and manage MPAs and LMMAs to build ecosystem-based resilience of coastal communities (Belokurov et al. 2016).
- Improve people's ability to cope with climate hazards through greater and diversified income at household levels (ENN 2014).
- At central and local government levels, build capacity to facilitate access to funds for climate adaptation and disaster risk reduction, particularly for pre-emptive actions that increase resilience (UNISDR 2011).

Looking to the future, Western Indian Ocean countries should invest in carbon-neutral policies to enhance their development potential. Although the region has abundant fossil fuel reserves, countries must avoid the risk of becoming fossil fuel-dependent while the rest of the world is moving to more efficient and cleaner new energy sources. Countries that make the transition to low-carbon energy infrastructure earlier will reap the greatest rewards and incur fewer financial, environmental and social costs. Actions include:

- Incentivize innovative projects in small-scale renewable energy (such as wind, solar and biogas, and in the future, wave and tidal). These entail a fraction of the financial and environmental costs of conventional electricity generation and distribution. Decentralized, off-grid plants can be replicated rapidly.
- Innovate with carbon finance mechanisms that capitalize the value of living natural capital assets such as payments for ecosystem services schemes for coastal habitats that sequester carbon and protect coastlines. Mangrove forests and seagrass beds are among the most efficient of all ecosystems for sequestering carbon: a clear investment priority for all Western Indian Ocean countries (Box 9).

COUNTRIES THAT MAKE THE TRANSITION TO LOW CARBON ENERGY INFRASTRUCTURE EARLIER WILL REAP THE GREATEST REWARDS AND INCUR FEWER FINANCIAL, ENVIRONMENTAL AND SOCIAL COSTS

BOX 9 BUILDING CLIMATE RESILIENCE THROUGH CARBON FINANCE AND LOW-CARBON FUTURES

Building climate resilience is a key concern for Western Indian Ocean countries. The Intended Nationally Determined Contributions (INDCs) submitted by regional countries to the United Nations Framework Convention on Climate Change (UNFCCC) contain references to building resilience in many sectors as well as commitments to reduce carbon emissions and build up carbon sinks through natural (including coastal) assets. The region's relatively intact coastal ecosystems provide an important advantage in this area.

The challenge for Western Indian Ocean countries is to maximize the contribution of natural assets to climate resilience (a) and minimize impact to them by avoiding high-carbon pathways of development (b). Intact coastal fringe ecosystems – coral reefs, mangroves, seagrass beds, coastal forests – can contribute significantly to climate resilience. They provide food and materials, protect coastal communities, property and infrastructure, and help regulate the climate through carbon sequestration. These benefits are accrued directly by adjacent users, as well as remotely through their impact on the climate.

In southern Kenya, for example, the Mikoko Pamoja mangrove restoration and conservation project is benefiting almost 500 households, while also providing wider climate benefits. Set up through the Plan Vivo Foundation, the community-led project involves Earthwatch International, Kenya Marine and Fisheries Research Institute and the Gazi community (c,d). Covering 117 hectares of mangrove forest, it aims to develop community-based land-use projects with long-term carbon, livelihood and ecosystem benefits.

The importance of investing in the health of coastal ecosystems has been highlighted by studies of climate vulnerability (a) and tsunami impact (b). It forms the core of, for example, the Mangroves For the Future and Resilient Coasts approaches to building ecosystem and social resilience (e,f). Funds to secure these natural assets can be obtained in a variety of innovative ways beyond donor grants, such as through fees on extraction (fishing, forestry), payments for ecosystem services (nursery and coastal protection functions) and carbon markets.

Significant finance is emerging for least developed countries for what the United Nations Development Programme calls “green, low-emission and climate-resilient development strategies”, including through the Green Climate Fund and other UN climate processes. Finance for developing, scaling up and mainstreaming coastal climate resilience projects should be viewed as an investment rather than a cost, as these activities will reap benefits at multiple scales.



Mangroves provide vital coastal protection, particularly as communities face sea-level rise and more intensive storms from climate change. They also help regulate the climate through carbon sequestration.

ACTION 4

ADOPT A SUSTAINABLE, INCLUSIVE BLUE ECONOMY APPROACH

Action 4

Apply policies and legislation that internalize environmental values in business practices, provide for more inclusive employment and meet the production and consumption needs of 50 per cent more people by 2030.

OCEAN-BASED ECONOMIC GROWTH WILL BE CALLED UPON TO PLAY A SIGNIFICANT ROLE IN MEETING THE NEEDS OF THIS GROWING POPULATION

The annual economic production of ocean ecosystems (the gross marine product) is already larger than some national economies in the region, and has potential to grow significantly. At the same time, the 50 per cent growth in total population expected by 2030 represents a significant increase in demand (consumption), labour (production) and potential for innovation. The coastal zone will face up to double the growth rates, particularly of working-age adults who are drawn by economic opportunities. Ocean-based economic growth will be called upon to play a significant role in meeting the needs of this growing population, but to do so will require that:

- **Ocean assets be valued and protected as national assets.** The natural capital of the ocean should be valued and internalized in government decision-making processes, with clear policies supporting “blue infrastructure” (e.g. ecosystems, living resources) as distinct from “grey infrastructure” (e.g. engineering structures, roads). No asset should be undermined by its unsustainable exploitation, or the exploitation or development of another asset. To improve stewardship of major assets, significant levels of profit should be reinvested into the asset base, including from one asset to another (Kelleher 2015).
- **Incentives be provided to internalize environmental values into business practices and processes.** Tools that capture the value of natural capital can encourage the private sector and civil society to opt for environmentally friendly technologies and practices. Examples include payment for ecosystem services and applying the polluter-pays principle. “Circular economy” policies that promote reducing, reusing and recycling waste, internalize environmental values in the manufacturing sector, and can create productive recycling sectors out of solid waste management challenges, particularly in small island states (Payet & Obura 2004). In the sprawling cities and slums of mainland East Africa, the recycling sector could provide an opportunity to tackle youth unemployment. Soft-incentive approaches such as certification schemes (e.g. Blue Flag beaches, being trialled in KwaZulu-Natal, South Africa, or seafood certification schemes) can be effective in changing public behaviour and building the important tourism sector.
- **The production and consumption needs of 50 per cent more people be met sustainably in 2030.** Continuing today’s development path might result in greater wealth in the short-term, but concentrated in fewer hands and inequitably shared with the poor majority. To ensure people’s livelihoods and food security remain a high priority in national policies, sustainable, people-centred approaches are needed. Metrics such as the Human Development Index, the World Happiness Index (Helliwell et al. 2015), the Sustainable Economic Development Assessment (BCG 2015) and the broad suite of indicators proposed for measuring the SDGs (Sachs et al. 2016) will help to promote and document this trend.

Western Indian Ocean countries are taking steps in this direction. Several countries have adopted blue economy (Mauritius, Seychelles, South Africa) and green economy (Mozambique, Kenya) principles as national priorities (Box 10). Kenya, Madagascar, Tanzania and Mozambique have also developed legislation strengthening community participation and empowerment in natural resource governance. A commitment to putting inclusive, people-centred approaches at the heart of these policies is needed. These will help individual countries pursue the policies and interventions required to attain the SDGs.

BOX 10 BLUE ECONOMY STRATEGIES IN WESTERN INDIAN OCEAN COUNTRIES

The term “blue economy” is analogous to the concepts of “green economy” and “sustainable development” (a,b), where “economic activity is in balance with the long-term capacity of ocean ecosystems to support this activity and remain resilient and healthy” (c). A robust and sustainable ocean economy, as described in WWF’s Principles for a Sustainable Blue Economy (d), is a marine-based economy that:

- Provides social and economic benefits for current and future generations, by contributing to food security, poverty eradication, livelihoods, income, employment, health, safety, equity and political stability;
- Restores, protects and maintains the diversity, productivity, resilience, core functions and intrinsic value of marine ecosystems – the natural capital upon which its prosperity depends; and
- Is based on clean technologies, renewable energy and circular material flows to secure economic and social stability over time, while keeping within the limits of one planet (d).

A sustainable blue economy identifies synergies across sectors: for example, income from non-renewable sectors is used to invest in and build other sectors, infrastructure and social services (e). Cost-benefit analysis and choices have an inherently long-term perspective, follow the precautionary principle, and are consistent with concepts of integrated ocean management.

Three Western Indian Ocean countries have initiated blue economy policies:

Seychelles’ Blue Economy, championed by President Michel, seeks to harness local marine, land and other resources in a responsible, sustainable and connected manner as a mainstay of long-term development (f). The multi-faceted approach includes high-level summits and cooperation hosted through the United Arab Emirates, and an innovative “debt for adaptation” swap which seeks to forgive part of Seychelles’ national debt in exchange for strictly protecting 30 per cent of the EEZ to support climate adaptation.

Mauritius’ national Ocean Economy strategy, launched by the prime minister in December 2013, is intended to take Mauritius to the next stage of development as a “high-income country, with a large geographic territory and the competencies, technologies and systems to manage this territory”. Already in 2012, the ocean economy was estimated to provide about 10 per cent of Mauritius’ GDP. The strategy has included strong international engagement, promoting regional blue economy approaches (g).

South Africa’s Blue Economy model is labelled “Operation Phakisa” which means “hurry up”: the objective is to unlock the economic potential of South Africa’s oceans over a timescale of five years (h). Ordered by President Jacob Zuma, Operation Phakisa includes components on extractive industries, aquaculture, transport and marine governance and protection.



© Peter Chadwick / WWF

De Hoop Marine Protected Area, South Africa.

ACTION 5

IMPLEMENT INTEGRATED OCEAN PLANNING AND MANAGEMENT

Action 5

Develop plans for integrated ocean management at relevant scales (national, sub-regional, sub-national). These should align with one another and, by 2030, cover the entire WIO.

Implementing the SDGs in the ocean and shepherding the complex transformation called for here requires investment in innovative, complex yet robust planning processes over ocean space (e.g. van Tatenhove 2011), which we call integrated ocean management (IOM). This requires a multi-stakeholder policy process that brings all key actors together under common goals. Multi-stakeholder processes require an agreed vision and acknowledgement by all actors that a negotiated solution is in their best long-term interest (Ehler & Douvère 2009, Sale et al. 2014). Continental priorities for development and engagement (e.g. the African Union's Africa Integrated Marine Strategy, African Union 2014) and the latest regional policy efforts, such as the Nairobi Convention's draft protocol on Integrated Coastal Zone Management, are examples of this approach.

Several tools are available to initiate IOM. Strategic environmental assessments, complemented by ecosystem (or natural capital) valuation, help identify constraints and opportunities provided by the environment, and potential conflicts and synergies among uses. MSP aims to specify actions, regulations and policies to enable stakeholders and users to share the value of the ocean, over spatial and temporal dimensions (Ehler & Douvère 2009). **Countries should implement aligned strategic environmental assessments and capacity building for MSP within five years, to provide a governance framework to support the other Actions listed here.** IOM is an iterative and long-term process, so repeated cycles of planning and management will be needed throughout the 15-year timescale.

MSP is already happening in the Western Indian Ocean, with the Seychelles (Box 11) and South Africa using it as a primary tool for defining ocean use and protection. New intergovernmental projects are expected to pilot MSP at scales ranging from the relatively local (approaching the traditional scale and land-based impacts focus of integrated coastal zone management) to cross-border (dealing with transboundary and marine ecosystem-based issues such as fish stocks) (UNEP/Nairobi Convention Secretariat 2009a, UNEP/Nairobi Convention Secretariat 2012).

The Western Indian Ocean is too large and politically complex for effective MSP at the regional level, so a sub-regional approach is necessary to address larger-scale issues. One such approach is being developed in the Northern Mozambique Channel, where the geology, oceanography and biological systems form a coherent unit for planning (Obura et al. 2015, 2016). Countries have registered their interest through the Nairobi Convention to pursue an IOM approach, to be developed through an MSP process (CBD-SOI 2016, Obura et al. 2016).

THE WESTERN INDIAN OCEAN IS TOO LARGE AND POLITICALLY COMPLEX FOR EFFECTIVE MSP AT THE REGIONAL LEVEL, SO A SUB-REGIONAL APPROACH IS NECESSARY TO ADDRESS LARGER-SCALE ISSUES

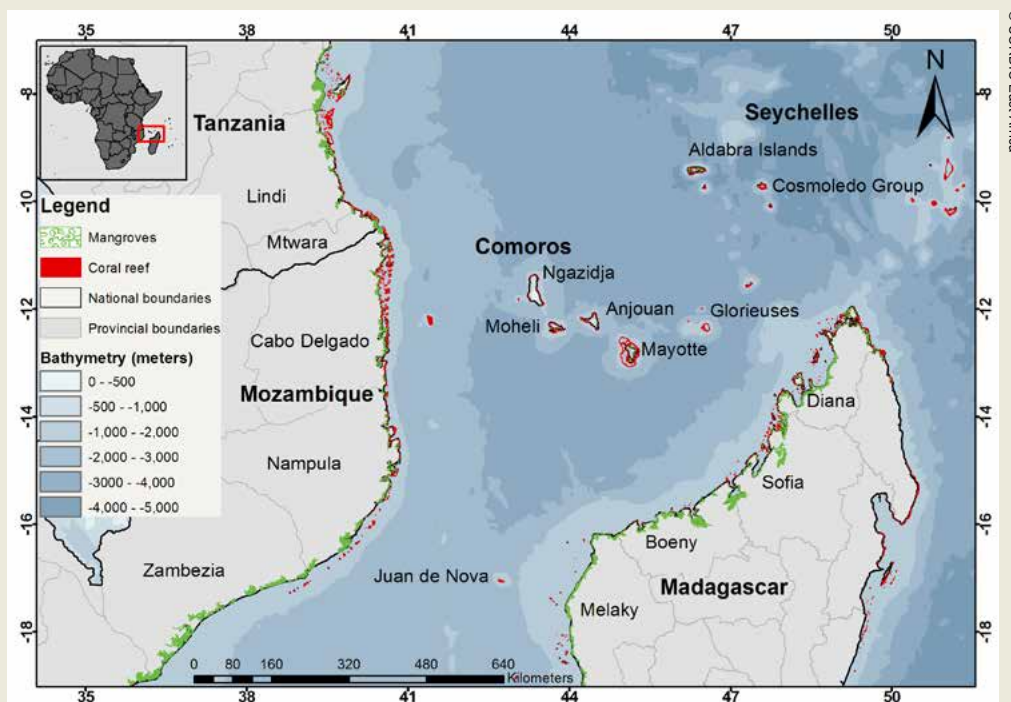
BOX 11 ESTABLISHING MARINE SPATIAL PLANNING AT THE NATIONAL AND REGIONAL SCALE

The Seychelles MSP Initiative, launched in February 2014, is a government-led process to plan and manage the sustainable, long-term use and health of the 1,374,000km² Seychelles EEZ, in partnership with The Nature Conservancy and the United Nations Development Programme (a). It will provide a basis for an integrated multi-use marine zoning and climate change adaptation plan, including effective protection of 30 per cent of Seychelles' EEZ. The plan aims to optimize the sustainable use and effective management of the Seychelles' marine environment while improving the social, cultural and economic well-being of its people. The multi-use plan will guide the strategies and decisions of the Seychelles Conservation & Climate Adaptation Trust (SeyCCAT), established as part of the government-led "debt for adaptation" swap.

At the regional scale, the Northern Mozambique Channel initiative (NMCi) aims to deliver large-scale conservation impact, sustainable economic development and prosperity, through promoting sustainable practices and integrated management of marine-based activities such as fishing, tourism, extractives and shipping (b). To help develop the complex institutional arrangements that need to be established between the countries and relevant stakeholders, an MSP platform is the focus of initial fundraising and project development (c). The MSP platform will build capacity in stakeholder engagement and participation across all sectors including the government, private sector and civil society, and in the comprehensive data and technical skills needed to support decision-making.

MSP supports integrated ocean management by providing policy and governance cohesion and information on which to base decisions. The "capitals approach" adopted by the NMCi focuses on building the social, economic and natural capital assets of the sub-region, to deliver the regional aspirations of "people prospering from a healthy Western Indian Ocean"(d).

Map of the Northern Mozambique Channel area



ACTION 6

INVEST IN SOCIAL CAPITAL AS A CORNERSTONE OF FUTURE PROSPERITY

Action 6

Ensure the integration of social, economic and environmental strategies through improved indicators on SDGs 3-5 for residents of the coastal zones of all WIO countries.

Citizens who lack access to education, health services, and stable and well paid employment cannot fully contribute to building the prosperous future envisioned by a blue economy. With population and workforce expected to grow by 50 per cent in 15 years, Western Indian Ocean countries must urgently address the social needs of their populations, and even more so in the coastal zone where both will grow faster than national averages.

Actions here broadly support SDG targets linked to meeting basic needs, including goals 3-5 (good health and well-being; quality education; gender equality), and all the actions will play a fundamental role in reducing pressure on limited and overstretched natural resources:

- **Meeting the health and welfare needs of rapidly growing coastal populations** will further tax already strained systems in all the countries. Vulnerabilities associated with the coastal zone – e.g. to ocean storms and cyclones, coastal erosion and flooding – will need to be addressed. The Madagascar Population-Health-Environment (PHE) case study (Robson 2014; Box 12) is a good example for further replication, and on which to model other health and social interventions in the coastal zone.
- **Education is essential to social and economic development**, and to keep up with the increasingly rapid cultural and behavioural changes facing Western Indian Ocean countries. Implementing all the Actions identified here will require capacity building in technical fields, so a capacity building strategy needs to be developed at national and regional levels. An area of direct relevance to the sea is to improve education of small-scale fishers to enable them to participate in commercial fishing and other sectors.
- **Increased gender equality in Africa results in greater social and economic benefits**, for children, families, businesses and society (Blomqvist et al. 2014). For example, improving gender balance in community management institutions (e.g. of beach management units in Kenya and Tanzania) is a key objective to improve the management of natural and financial assets in fishing communities. Further, empowering girls and women, especially through education, provides a strong impetus for maintaining stable and healthy populations.
- **Keeping population growth rates to the lower boundary of projections is both a key outcome of development, and a target for sustainability.** Within the 15-year time span of the SDGs, population in Western Indian Ocean countries is projected to grow to between 294 and 317 million people (UNESA 2015) (see Section 2.2). By 2100, these estimates vary from 561 to 1,156 million people, i.e. from 2.5 to five times today's population. Ensuring access to sexual and reproductive health services, as well as to education and empowerment to reduce family size, will be fundamental contributors to lowering growth rates and maximizing the potential for sustainability.

CITIZENS WHO LACK ACCESS TO EDUCATION, HEALTH SERVICES, AND STABLE AND WELL PAID EMPLOYMENT CANNOT FULLY CONTRIBUTE TO BUILDING THE PROSPEROUS FUTURE ENVISIONED BY A BLUE ECONOMY

BOX 12 INTEGRATING MARINE ENVIRONMENTAL WORK WITH SOCIAL CAPITAL

Community health and marine conservation come together in the Madagascar “Population-Health-Environment” (PHE) Network, providing an example of how interventions on natural and social capital can enhance one another. Established in 2014, the PHE Network unites more than 40 conservation and health organizations, policy makers and donors to combine voluntary family planning and other health services, diversification of livelihoods to improve food security, and conservation of marine and terrestrial ecosystems (a). This multifaceted approach has several benefits for marine conservation:

- Healthy communities are more able to engage in management efforts.
- Immediate health service benefits can bolster long-term community support for relatively “slower-burn” progress of conservation initiatives.
- Upholding women’s reproductive rights can empower them to play a more active role in management efforts.
- In isolated areas where family sizes are larger than desired, family planning can reduce pressure on marine resources (b).

In the Velondriake LMMA, a PHE partnership led to a fivefold increase in the proportion of women of reproductive age using modern contraceptive methods (from 10 per cent to 55 per cent between 2007 and 2013). This resulted in an estimated reduction of over 800 unintended pregnancies in a population of approximately 15,000.

On the island of Anjouan in Comoros, the local NGO Dahari focuses on integrating agricultural development and natural resource management to “shape sustainable and productive landscapes with Comorian communities” (c). Dahari works with local farmers to increase and diversify production and improve access to markets while protecting forests and the environment (d). Dahari is now turning its attention to land-sea interactions by developing a reef-to-ridge conservation model for the Comoros. Dahari has teamed up with the Madagascar-based NGO Blue Ventures and WWF to support local associations such as UMAMA in managing fisheries, establishing a LMMA and coral reef monitoring, and aspects of the PHE approach.



© Earth Clips

Mother and baby in fishing community, south west Madagascar.

ACTION 7

BUILD PARTNERSHIPS FOR SUSTAINABLE DEVELOPMENT

Action 7

Support multi-stakeholder partnerships to secure social, environmental and economic benefits equitably in each country.

“PUBLIC-PRIVATE PARTNERSHIPS” CAN BE A VALUABLE TOOL TO GENERATE INCOME FROM NATURAL ASSETS AND SUPPORT DEVELOPMENT

Partnerships will be important to assist governments to ensure aligned and mutually supportive action across the SDGs and across countries. We identify three types of partnership that are critical for ocean solutions:

- **Partnership or cooperation among countries**
- **Public-private partnerships that unlock the productive potential of assets**
- **Co-management partnerships between government, communities and civil society**

These provide the governance framework under which the other six actions prescribed above can be developed.

Cooperative action among countries can be coordinated through regional and intergovernmental institutions in the Western Indian Ocean, with a focus on more effective engagement across sectors and with economic institutions. For example, setting up regimes for the governance of shared marine living resources is a priority (UNEP/Nairobi Convention Secretariat, 2012), needing engagement with the relevant management and economic institutions, such as RFMOs, as well as across countries and non-state actors.

Partnerships that help unlock the productive potential of assets can use private sector finance to generate shared benefits. “Public-private partnerships” with national governments can be a valuable tool to generate income from natural assets and support development, although they must avoid the danger of privatization of common pool resources (Hoegh-Guldberg et al. 2013, Ostrom et al. 1999). Smaller in scale, partnerships between private sector actors and communities can be instrumental in unlocking economic potential in community-owned assets, while also requiring a framework that protects the rights and interests of both parties.

Finally, partnership at local levels between rights owners and government in the management, exploitation and stewardship of local resources is already happening – for example through co-management and community-based management in many LMMAs. A recent assessment undertaken by WWF in cooperation with UNEP-WCMC (Knights et al. 2014) reveals that community-based management regimes generally render better conservation and social outcomes than their purely state-run equivalents.

To implement such partnerships, countries must put in place policies and legislation that support complex negotiations among actors. Initiating smaller-scale actions for trials will likely deliver greater success than overly ambitious projects. A target over the 15-year period of SDG implementation could involve piloting partnership approaches, replicating successful partnership actions, and expanding the economic value of the natural assets that they manage.

CONCLUSION

With 60 million coastal inhabitants, an estimated annual economic value of US\$20.8 billion and an ocean asset base estimated at US\$333.8 billion, the Western Indian Ocean's productive potential is comparable to the largest national economies in the region. Even so, this value is undoubtedly an underestimate. It excludes the intrinsic value of biodiversity, and leaves out many potential resources that are not being used or measured yet. Even for those sectors that are included, significant data (for example on small-scale fisheries) is often missing.

The potential for the countries of the region to achieve their vision and prosper from a healthy Western Indian Ocean is high. Through wise management, ocean assets can help lift countries out of poverty and achieve the SDGs. But the risk is also high that unsustainable practices may destroy the very assets that would contribute to a healthy future. Like other parts of Africa, the Western Indian Ocean region and its countries are at a turning point where rapid economic development and population growth may considerably increase pressures on the assets that provide a source of livelihood and prosperity.

Taking the path of sustainable development will require committed and visionary leadership. Leaders will need to make a broad array of supportive decisions and take bold, strategic action. The Actions identified here, within a broader fabric of sustainability policies and practices from regional through national to local levels, can assist the countries of the Western Indian Ocean to secure and maximize the long-term potential of their ocean resources. The power of this approach is that it would simultaneously build enduring economic prosperity, community resilience, and long-term environmental health:

- Action 1** **Implement effective management of ocean assets**
- Action 2** **Ensure sustainability of small-scale and industrial fisheries and aquaculture**
- Action 3** **Transform to 21st century climate-resilient and carbon-neutral economies**
- Action 4** **Adopt a sustainable, inclusive blue economy approach**
- Action 5** **Implement integrated ocean planning and management**
- Action 6** **Invest in social capital as a cornerstone of future prosperity**
- Action 7** **Build partnerships for sustainable development**

The time is now for a transformation to economic practices that value and nurture the natural asset base of the Western Indian Ocean. Leaders in the Western Indian Ocean are poised to demonstrate in their vitally important and fast-changing region how the world can navigate towards a sustainable, inclusive blue economy.

ANNEX 1 WESTERN INDIAN OCEAN MPA AND LMMA STATUS AND NEW PRIORITIES

Note that this table is not an exhaustive update of MPA and LMMA area and number as both are in flux in many of the countries¹. Data is primarily derived from the World Database on Protected Areas (WDPA) as well as literature and regional sources. “Aichi gap” refers to the difference between the current coverage of protected areas and the Aichi Target of 10 per cent of a country’s EEZ (i.e. ‘-’ indicates percentage points under the Aichi Target, ‘+’ indicates percentage points above). Many of the implementation priorities include improving the effectiveness of management.

Country	Current status of MPAs	Aichi gap	Implementation priorities
Comoros	<ul style="list-style-type: none"> • 2 MPAs and 2 LMMAs cover 0.09% of EEZ • Moheli MPA transformed into an island biosphere reserve, in 2016 • Promise of Sydney commitment to reach 7% of all marine and coastal ecosystems protected by 2024 	-9.9% Will be -3% after national target met	<ul style="list-style-type: none"> • National MPA project starting, focus on full implementation • Support development of LMMAs, engagement with MIHARI (Madagascar LMMAs) • Capacity building in management, and design/implementation of new MPAs and LMMAs
France	<ul style="list-style-type: none"> • 3 large MPAs cover 11.28% of EEZ • New small-scale MPAs in Mayotte (18) similar in scale to LMMAs 	+1.28%	<ul style="list-style-type: none"> • Improve effectiveness of management and environmental controls in heavily populated islands (Reunion, Mayotte) • Engage with adjacent countries to network MPAs to increase their resilience
Kenya	<ul style="list-style-type: none"> • 6 national protected areas and 24 LMMAs cover 1.03% of EEZ 	-9%	<ul style="list-style-type: none"> • National planning for network of MPAs and LMMAs
Madagascar	<ul style="list-style-type: none"> • 28 MPAs and >70 LMMAs cover 1.31% of EEZ • Promise of Sydney specifies increase in number of protected areas (3 times), but not their area 	-8.7%	<ul style="list-style-type: none"> • Complete current national MSP process identifying priority sites for MPA and LMMA designation • Turn the Promise of Sydney LMMA commitment and distinction between terrestrial and marine PAs into specific area target for marine areas

¹ The total for the WIO excludes the national figure for South Africa, but includes the area of EEZ and MPAs in KwaZulu-Natal province.

Country	Current status of MPAs	Aichi gap	Implementation priorities
Mauritius	<ul style="list-style-type: none"> 14 MPAs and 6 LMMAs cover 0.01% of EEZ 	-10%	<ul style="list-style-type: none"> Specify marine conservation and protection targets under the national Ocean Economy roadmap Undertake MSP at national levels to identify priority areas for MPAs/ LMMAs
Mozambique	<ul style="list-style-type: none"> 5 MPAs cover 2.54% of EEZ 	-7.5%	<ul style="list-style-type: none"> Implementation of the new large MPAs (Primeiras & Segundas) Identification of LMMAs through fishery legislation in support of fishery cooperatives National planning for network of MPAs and LMMAs Capacity building
Seychelles	<ul style="list-style-type: none"> 9 MPAs, 5 LMMAs cover 0.06% of EEZ Committed to 30% of EEZ in MPA management under debt for adaptation swap 	-9.9% Will be +20% after national target met	<ul style="list-style-type: none"> Capitalization of trust fund to secure MPA commitment Capacity building to ensure effective implementation of MPAs
South Africa	<ul style="list-style-type: none"> Nationally, 24 MPAs cover 0.67% of mainland EEZ. The Prince Edward Island MPA declared in 2013 increased the national MPA coverage by an additional 180,000km² In KwaZulu-Natal province (in the WIO), 4 MPAs cover 0.67% of EEZ, or 2,153km² MPA planning and zoning process very advanced under Operation Phakisa. Committed to 5% of EEZ in MPAs under this plan 	WIO only: -9.3 % Will be -5% after national target met	<ul style="list-style-type: none"> Confirmation and implementation of current MPA zoning plan Assessment of next steps to meet Aichi Target 11 and SDG 14 goals
Tanzania	<ul style="list-style-type: none"> Currently 7 MPAs, 13 LMMAs covering 2.92% of EEZ 	-7.1 %	<ul style="list-style-type: none"> National planning for network of MPAs and LMMAs
WIO total	<ul style="list-style-type: none"> MPAs and LMMAs cover 138,900km² (2.13%) and 16,700km² (0.26%) of WIO EEZs respectively, for a total of 155,500km² (2.39%) 	-7.6 %	<ul style="list-style-type: none"> Undertake regional planning for regional networks of MPAs/ LMMAs, combining both national and regional targets and priorities

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Boxes

- Box 1**
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ACRONYMS

CBD	Convention on Biological Diversity
CCP	Community Fishery Council (in Portuguese)
EEZ	Exclusive Economic Zone
FAO	UN Food and Agriculture Organization
GDP	Gross Domestic Product
GMP	Gross Marine Product
IOM	Integrated Ocean Management
IOTC	Indian Ocean Tuna Commission
INDC	Intended Nationally Determined Contribution
IUU	Illegal, Unreported and Unregulated
LMMA	Locally Managed Marine Area
MPA	Marine Protected Area
MSP	Marine Spatial Planning
NGO	Non-Government Organization
NMCI	Northern Mozambique Channel initiative
PHE	Population-Health-Environment
RFMO	Regional Fisheries Management Organization
SADC	Southern African Development Community
SDG	Sustainable Development Goal
SeyCCAT	Seychelles Conservation & Climate Adaptation Trust
UN	United Nations
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WDPA	World Database on Protected Areas
WIO	Western Indian Ocean
WIOSAP	Western Indian Ocean Strategic Action Programme

The Western Indian Ocean in numbers



60 MILLION

About 60 million people live within 100km of the coast across the Western Indian Ocean

US\$333.8BN

The overall value of ocean assets in the Western Indian Ocean is more than US\$333.8 billion



4TH

The economic output of the Western Indian Ocean makes it the fourth largest economy in the region

2.4%

Only 2.4 per cent of marine areas are under some form of protection in the Western Indian Ocean



Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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