



OPERATIONAL BRIEF

Coastal and Marine Biodiversity and Ecosystems

BLUE ECONOMY FOR RESILIENT AFRICA PROGRAM

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About the Blue Economy for Resilient Africa Program

The Blue Economy generated nearly US\$300 billion for the African continent in 2018, creating 49 million jobs in the process. These and other crucial benefits—most notably food security, livelihoods, biodiversity, and resilience to the effects of climate change—are entirely dependent on the health and productivity of coastal and marine areas.

By safeguarding productive coastal landscapes, countries will be in a better position to take full advantage of future Blue Economy opportunities, which range from sustainable blue energy to aquaculture to blue carbon.

The World Bank's Blue Economy for Resilient Africa Program, announced at COP27, will provide multisectoral analytical, financial, and policy support to Africa's coastal countries and island states to help them leverage the opportunities—and manage the risks—inherent in scaling up their Blue Economies.

About this series of briefs

The Blue Solutions for Africa series of operational briefs captures how a thriving Blue Economy can help African countries better manage the development challenges they face while supporting economic growth, sustainable livelihoods, and the health of these precious ecosystems.

THE BRIEFS COVER THE FOLLOWING THEMATIC AREAS

- Climate change
- Coastal and marine biodiversity and habitats
- Sustainable fisheries
- Marine pollution
- Jobs and livelihoods
- Participatory marine spatial planning
- Data management and knowledge creation
- Innovative financing instruments
- Developing and incentivizing institutions
- New frontiers of innovation



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Key Messages



To develop a resilient Blue Economy, the African continent needs to better protect and manage its biodiversity and habitat to enhance ecosystem services.



Better monitoring of the ocean's physical and biological changes will be key. Improved coastal and marine data and knowledge will inform co-created management decisions.



Governance also plays an important role. Coastal areas and territorial waters are under the jurisdiction of several agencies that lack sufficient coordination and incentives to improve the management of natural resources. Marine spatial planning is an important tool to improve such governance.



On-the-ground enforcement and monitoring also need to be improved. Countries along the African coastline desperately need to regain control over their exclusive economic zones through at-sea patrolling of their open waters.



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Introduction

Africa's diverse and rich biodiversity—which provides critical ecosystem services, drives the continent's economy, and serves as a buffer to climate change—are increasingly threatened by ocean and coastal degradation, overfishing, erosion, and the effects of climate change.

To mitigate these threats and improve the resilience of marine habitats, Africa's governments need to partner with the private sector and development finance institutions, including the World Bank, to improve collaborative marine resource governance, enhance the knowledge base of marine ecosystems and species to inform decision-making, and strengthen the restoration, monitoring, and control of marine and coastal areas.

This brief sets out the key challenges to marine and coastal ecosystems in African countries, as well as what is needed to address these challenges. It also provides insight into how World Bank-financed projects in Africa are enhancing biodiversity restoration and conservation, while diversifying livelihoods, especially for the benefit of women.

The Challenge

Africa is home to eight out of 36 global biodiversity spots, 439 marine key biodiversity areas, and 148 marine and coastal Ramsar sites. The continent's 30,000 kilometer (km) shoreline is a cradle of immensely diverse ecosystems, including mangroves, coral reefs, and seagrasses.

Africa's diverse and rich biodiversity provides critical ecosystem services, drives the continent's economy, and serves as a buffer to climate change. The African Union's *Agenda 2063* has declared the Blue Economy to be "Africa's Future" in recognition of the key role oceans play as catalysts for socioeconomic transformation. Fisheries and aquaculture already contribute US\$24 billion to the African economy. However, Africa needs to urgently address important challenges in the blue sector—including coastal erosion, biodiversity loss, pollution, and overfishing—to unlock the full potential of the Blue Economy.

About 21 percent of the world's mangroves are found in Africa. Coastal mangroves are unique ecosystems that provide critical socio-economic benefits such as coastal protection, food security (through fishing and mariculture), ecotourism opportunities, and carbon sequestration. Despite its importance, mangroves have been depleted, overharvested for firewood and charcoal, or transformed with the increase urbanization of coastal areas.

Effective policies, patrolling, and surveillance efforts can improve the management, use, and protection of blue resources. The eradication of destructive fishing practices such as blasting, beach seining, juvenile fishing, the use of cyanide, and bottom-trawling would also restore marine life for sustainable use under a Blue Economy.

Climate change is exacerbating these challenges by causing warming waters, sea level rise, acidification, and coastal erosion. Climbing sea-water temperatures and the reduction of oxygen concentrations will have a significant effect in coastal and marine ecosystems, affecting primary production by phytoplankton and algae, as well as the abundance and distribution of marine species. Increasing temperatures are already leading to coral reef bleaching, and increased acidification is affecting coral rates of calcification. Both drivers are threatening the survival of coral reefs, which provide vital habitat for many fish, sharks, crabs, and mollusk species that have important economic value for many countries.

Under a high carbon dioxide scenario, it is predicted that climate change will, by 2050, reduce the global maximum catch potential by 7.7 percent, decreasing revenues by 10.4 percent. (Maximum catch potential is a proxy measure for the maximum sustainable yield.) Climate change could have a similarly significant impact on Africa's marine fisheries, with West African countries expected to be among the worst affected, while North African countries will likely be less affected. Some African countries could even see an increased catch potential. Similarly, climate change will have different effects on the biomass and abundance of different marine ecosystems and species.

Although weather shocks caused by typhoons, cyclones, and coastal storms are familiar natural phenomena along the African coast, climate change and related dynamics such as sea-level rise and coastal erosion will exacerbate the damage brought about by these events. The deterioration of coastal habitats and coral reefs reduces the protection services and benefits they offer while increasing the risk of floods. Areas along the coast of Benin, Côte d'Ivoire, Senegal, and Togo are subject to an average erosion of **1.8 meters each year**. In 2017, erosion, flooding, and pollution **cost these countries about US\$3.8 billion**, equal to about 5.3 percent of their combined GDP for that year.

Invasive species, introduced through the release of ballast waters from foreign oceans by the maritime sector, are also negatively affecting Africa's marine ecosystems. Ships carry ballast water for stability on shipping routes, then release this water (and whatever organisms it contains) into foreign ecosystems. About **10,000 species are carried in ships' ballast water tanks each day**. Africa is not exempt from this issue and attention is needed to reduce the negative ecological and economic effects of invasive species. South Africa, for example, is faced with **the challenge of managing 45 invasive**

species that have affected the local environment and native species, including Chilean mussels (*Semimytilus algosus*), Pacific barnacles (*Balanus glandula*), and South American sunstar (*Heliaster helianthus*).

Better understanding and knowledge of marine biodiversity and coastal habitats is needed to enable African governments to better manage these risks to local economies. Support is needed for initiatives that collect data and conduct research into how climate change is affecting the coastal regions, causing sea level erosion as well as changes to the ocean's biological resources and chemical and physical characteristics. Not knowing the current status of marine species and threats will impede the proper use of blue capital for economic growth. Climate change will exacerbate the degradation of oceanic habitats, in turn threatening the continent's nascent Blue Economy. Strong commitment from governments and investments from the public and private sectors will help reverse this trend, enabling a sustainable Blue Economy in Africa that is better able to improve resilience towards climate change risks and slow the loss of coastal and marine biodiversity.



Source: R. Tiffer-Sotomayor & C. Ramirez

What is Needed

To fully seize the opportunities of the Blue Economy, Africa needs a combination of improved governance; ambitious, innovative investments into scalable solutions to improve the resilience of marine natural capital; strengthened knowledge of the marine environment; and better collaboration and enforcement.



Improved governance

Effective action is frequently hindered by lack of coordination between the various entities responsible for governing coastal areas, territorial waters, and exclusive economic zones. Incentives to support sustainable management of coastal and marine natural resources are also often inadequate. **Marine spatial planning** can be an effective tool for improving coastal governance. To support such planning, policies and regulations need to be updated to:

- Ensure that comprehensive environmental impact assessments are conducted on vulnerable coastal and ocean areas
- Reduce pollution, including risks from maritime transport
- Better manage coastal urbanization
- Improve protections of critical marine habitats.

The establishment of marine protected areas and other no-fishing zones could, as an example, support the restoration of mangroves and coral reefs, so **creating space for overfished species to recover**. Several African countries have supported the proposed **post-2020 Global Biodiversity Framework**, which aims to protect 30 percent of land and oceans by 2030. However, to date only **16.9 percent** of the African shore and oceans are protected.



Ambitious and innovative investments into solutions

Many African nations have committed to various international agreements and conventions that seek to reduce greenhouse gas emissions while supporting adaptation, mitigation, and other measures to preserve the continent's natural capital. These include the United Nations Sustainable Development Goals, the Convention on Biological Diversity, the Convention on Climate Change, Ramsar, and the Paris Agreement. To meet the conditions of these commitments, which include the upcoming adoption of the **post-2020 Global Biodiversity Framework**, countries will need to engage in meaningful actions to improve the protection and restoration of their blue natural resources. This includes managing coastal and marine ecosystems better, investing more into monitoring marine and coastal species populations, and controlling invasive species.

Achieving these commitments will also require increased and urgent investment into building the capacity of national and local agencies in charge of marine and coastal ecosystems. Many African countries lack essential resources, knowledge, and skills to meet their coastal and marine challenges, including addressing illegal, unreported, and unregulated fishing.



Strengthened knowledge of the marine environment

In Africa, as in across the world, information on coastal biodiversity and marine ecosystems is lacking. Knowledge on the status of species that are important for a Blue Economy and sustainable marine management needs to be strengthened. For example, more data is needed about whales, dolphins, turtles, and sportfishing species to support sustainable ecotourism, while data on yellowfin and skipjack tuna, snappers, mollusks, shrimps, lobsters, and sea cucumbers will support both fisheries and local food security.



Enforcement and collaboration

Countries along the African coastline desperately need to regain control of their oceans and align interests in their exclusive economic zones. Coastal and at-sea patrolling of open waters is needed to reduce **enormous losses of blue capital**. Coordination between national central agencies and coastal cities, districts, and counties is crucial. The development and nurturing of public partnerships with all involved actors, including non-government organizations, beach management units, and the private sector, is essential.

How the World Bank Group Contributes to Solutions

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Halting the loss of biodiversity along Africa's coastline will strengthen the continent's resilience to the looming effects of climate change while improving outcomes for Blue Economy development, livelihoods, and nutrition security.

In addition to addressing [pollution](#), improving the management of fisheries, and other measures discussed in this [series of briefs](#), the World Bank helps various African countries preserve their biodiversity and strengthen their marine habitats by providing technical advisory to support policy and program development, building the knowledge and skills base, and supporting financing projects and initiatives.



Financial, technical, and analytical support

The World Bank provides financial analytical and technical support to help governments and regional entities craft enabling policies and regulations, while better tracking the value of blue natural capital against the cost of challenges such as pollution. World Bank's support has resulted in:

- **The development of Mozambique's 2020 Marine Fisheries Regulations, including the introduction of innovative new tools for the [spatial co-management of fisheries](#) in partnership with local communities.** To date, co-management plans have been developed in the key biodiversity hotspots of Moma and Pebane. Among other measures, these plans include no-take and conservation zones. This analytical work was done through the World Bank's South West Indian Ocean Fisheries Governance and Shared Growth program (SWIOFish).
- **Better understanding of the cost of marine pollution to Tanzania.** Analysis by the World Bank has estimated that marine plastic pollution in Dar es Salaam city and on Zanzibar's Unguja Island is costing the country US\$28.2 million (US\$17.7 million for Unguja Island and US\$10.5 million for Dar es Salaam) in lost revenue from tourism, fishing, and mariculture, while undermining other ecosystem services such as food. This is a significant cost that needs attention from government. This analytical work was done with the support of [PROBLUE](#), a multi-donor trust fund managed by the World Bank.
- **Improved accounting of marine and coastal wealth.** The [Wealth Accounting and the Valuation of Ecosystem Services](#) partnership (WAVES) is helping countries across the world implement natural capital accounting, which draws on internationally agreed standards to develop wealth accounts that properly consider ecosystem services such as water. In Africa, WAVES has developed marine accounts for Zambia, Madagascar, and Botswana. The World Bank provides secretariat support to the partnership.



Building the knowledge and skills base

In addition to supporting activities to expand knowledge of marine biodiversity and build the capacity of government fisheries agencies, the World Bank:

- **Brokered a partnership with the European Marine Spatial Agency to provide African countries with state-of-the-art spatial data** that will help them understand how, for example, pollution is affecting corals, or how currents and warming temperatures can affect fish stocks and distribution.
- **Helped to establish regional coastal-marine platforms to share data and monitor biodiversity and climate-related changes** such as shoreline retreat, erosion, sea-level rise, and flooding in the coastlines and ocean. For example, the [West Africa Coastal Areas Management Program](#) is developing a coastal observatory for 17 countries in the region.

- **Helped countries adopt a DNA-based tool to quickly and inexpensively determine the diversity of species present in a local marine ecosystem.** The [Kenya-Marine Fisheries and Socio-Economic Development](#) project will use the tool to increase knowledge on the priority fisheries and the current status of critical ecosystems as coral reefs.



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Programs, projects, and initiatives

The World Bank supports various country and regional initiatives that aim to increase the resilience and adaptation of Africa's coastal areas. To date, the World Bank has supported initiatives that:

- **Strengthen formal protections for coastal and marine areas.** A multisectoral, integrated blue program developed by the Government of Mozambique, with the World Bank's support, has contributed to important policy and regulatory shifts and helped to secure on-the-ground investments to develop the country's blue sector. To date, the program's flagship contribution to biodiversity restoration and conservation has been partnering with local stakeholders to merge the Maputo Special Reserve and Ponta do Ouro Partial Marine Reserve to create a new national park, the Maputo National Park, which is surrounded by a new Maputo Environmental Protection Area (MEPA), also established through World Bank support. National parks have stronger conservation status in Mozambique, and this declaration has effectively secured the habitats of coastal elephants and nesting areas for several endangered marine turtle species. The MEPA expands the conservation of ocean ecosystems from three nautical miles from the coastline (about 5.5 kilometers) to 18 nautical miles (33.3 kilometers), effectively safeguarding ecotourism and fisheries resources for local communities in the area. The MEPA is also joined to South Africa's iSimangaliso Wetland Park, a hotspot of biodiversity and a World Heritage Site, creating the first transboundary marine corridor in Southern Africa.
- **Draw on nature-based solutions to increase coastal resilience.** In Mauritania, for example, biological and mechanical fixation methods were used to protect and reinforce coastal dunes in Nouakchott, the country's capital. Priority beaches were also replenished to protect the city against marine submersion. In Benin, Togo, and São Tomé e Príncipe, [grey and green interventions](#) were used to improve the state of beaches and coastal defenses, so increasing these countries' resilience to flooding and coastal erosion. Both projects were implemented under the [West Africa Coastal Areas Management Program](#).
- **Reduce harmful fishing practices.** With World Bank support, Kenya, Tanzania, Mozambique, and Madagascar have improved their fisheries stocks by strengthening the monitoring, control, and surveillance of fishing activities both on shore and in the open seas. This has reduced overfishing and the bycatch of non-target species such as whales, porpoises, turtles, and birds. In Tanzania, the World Bank supported improvements in monitoring, control, and surveillance through its South West Indian Ocean Fisheries Governance and Shared Growth program, SWIOFish.



- **Protect and restore threatened habitats.** With the World Bank's support, Kenya launched the Kenya-Marine Fisheries and Socio-Economic Development project, which aims to, among other objectives, restore mangroves in the counties of Lamu, Kilifi, and Kwale. Mangroves provide critical habitats for fish, mollusks, and crustaceans, yet their trees are harvested for poles, firewood, and charcoal or transformed with the increase urbanization of coastal areas. In Gabon, the World Bank supported the government in implementing its [Sustainable Management of Critical Wetland Ecosystems project](#), which sought to conserve and restore three important Ramsar-classified sites—Bas Ogooué, Setté Cama, and Petit Loango—while supporting income-generating activities and improving monitoring to reduce illegal fishing and poaching. These wetlands are home to migratory birds, hippopotamus, and are important spawning, feeding, and breeding grounds for many fish of economic value to the local communities.

- **Support sustainable mariculture activities that empower women.** Through SWIOFish, the World Bank has supported 15,859 seaweed farmers from 77 communities in Zanzibar—74 percent of which were women—with equipment and training to boost production and so reduce pressure on natural ecosystems.
- **Prevent the introduction of invasive species.** Invasive species can disrupt marine community structures, fisheries, and public health. Most invasive species are transported by the maritime sector. The International Finance Corporation, the private sector arm of the World Bank Group, provided US\$70 million in investments for the installation of 150 ballast water-treatment facilities on board the ships of a large global shipment company to prevent the transport of invasive species in ballast water. This project enabled the company to comply with the [International Maritime Organization's Ballast Water Management Convention](#), which has established standards for the management of ships' ballast water.



Community participation in mangrove restoration efforts in Kenya. Source: Kenya-Marine Fisheries and Socio-Economic Development project.

Case study

PROJECT SUCCESSFULLY REDUCES BLAST FISHING IN TANZANIA

Blast fishing—once a common practice in Tanzania—is a highly destructive fishing method for habitats and biodiversity. This method, which involves using explosives to stun or kill fish, also destroys coral reefs, leaving behind dead zones.

To respond to this challenge, the Government of Tanzania—with World Bank support through the South West Indian Ocean Fisheries Governance and Shared Growth program—strengthened the monitoring, control, and surveillance of fishing activities along its coastline. This has resulted in a [dramatic decrease in blasting fishing since 2016](#) (Figure 2). To further manage protected areas coral reef habitat, the project has also supported the establishment of the coral reef benthic monitoring system. The gathered data informs ongoing marine protected areas management.

TOTAL NUMBER OF BLASTS FOR TANGA, DAR ES SALAAM, PWANI, LINDI AND MTWARA REGIONS IN TANZANIA

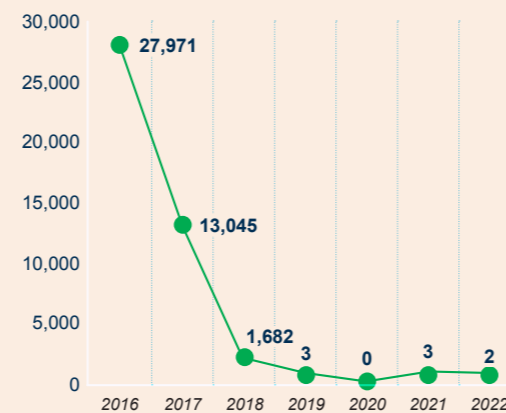


Figure 2: Blast fishing trend in Tanzania's marine habitat. Data sources: Blast Fishing Monitoring Network (2019) and Ministry of Livestock and Fisheries (2022)

Case study

LINKING CLIMATE CHANGE, BIODIVERSITY, AND HUMAN WELLBEING

The World Bank-supported Blue Economy Program for Results in Morocco demonstrates the intricate linkages between biodiversity, economic development, and food security.

Morocco's coastal areas contribute 59 percent of GDP and provide 52 percent of jobs in the country. The fisheries sector alone contributes 1.5 percent of GDP and provides 700,000 direct and indirect jobs. But coastal erosion is threatening more than half of Morocco's shoreline. Sea level rise, storms, flooding, landslides, sandstorms, and heat waves are increasing in frequency, which can cause economic loss through damage to coastal communities and lost tourism revenues.



THE WORLD BANK SUPPORTS THE GOVERNMENT OF MOROCCO WITH THE INNOVATIVE BLUE ECONOMY PROGRAM FOR RESULTS TO ADDRESS THE GROWING IMPACTS OF CLIMATE CHANGE AND DEVELOP AN INCLUSIVE AND RESILIENT BLUE ECONOMY. THIS PROGRAM INVESTS IN PROJECTS THAT AIM TO:

- Enhance coastal resilience by restoring 15,710 hectares (ha) of coastal forests by financing tree planting, fencing, and the eradication of invasive species.
- Increase soil protection in 9,418 ha of pristine coastal forests, stabilizing of 1,060 ha of sand dune areas.
- Implement biodiversity management plans in seven sites of biological and ecological interest for fisheries and tourism
- Invest in watershed management of coastal areas to reduce floods risks
- Implementing sustainable fish-stock management plans through community participation and through the establishing of three new marine protected areas, totaling 61,500 ha, for fisheries management.

The program will also improve Morocco's scientific knowledge of the coastal and marine ecosystems by strengthening monitoring programs to track water quality, sediments, biota, sea- and land-based pollution, fish stocks, and the shoreline.



What Success will Look Like

Addressing the current biodiversity loss and climate change will require global investments of between **US\$598 billion and US\$824 billion per year**. Countries will need to draw on funding from both public and private sources if they hope to tackle the drivers of biodiversity loss, which include ocean and coastal degradation, overfishing, and erosion, the effects of which are being multiplied by climate change-induced temperature changes, extreme weather events, and ocean acidification. This will be even more challenging for Africa, which faces **additional pressures**

due to population growth, with consequences for health, trade, and food security, as well as land desertification and water security.

To succeed, African countries need to intensify their focus on the Blue Economy. Specifically, they need to define strategies and investments that generate meaningful solutions for those who live in vulnerable coastal areas or depend on marine life for their livelihoods.

The current biodiversity loss and climate change will require global investments of between

US\$598 billion and US\$824 billion per year.



