



OPERATIONAL BRIEF

# Climate Change and the Blue Economy in Africa

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



A robust Blue Economy could protect Africa from the worst effects of climate change. At the same time, the effects of climate change are already preventing the continent from achieving the full benefits of a vibrant Blue Economy.



Changing temperatures, rainfall patterns, and climate extremes are already impacting biodiversity with far-ranging consequences on species range, plant, and animal reproductive and/or migration cycles.



Temperature increases are already driving fish from tropical areas toward the poles. The fisheries most at risk are those along the Gulf of Guinea, from Gabon to Guinea-Bissau, and along Africa's east coast, from Eritrea to Mozambique.



In 2019, the African continent experienced above-average sea-level rise of five millimeters. Sea levels will almost certainly climb by half a meter by the end of the century, with regional variations on the continent.



The population inhabiting low-level, coastal areas in Africa is rising at an annual rate of 3.3 percent per year, more than double the global average. This is partly driven by repetitive drought in Mediterranean areas. By 2050, between 72 million and 94 million people are expected to inhabit several of West Africa's low-lying urban centers.



With World Bank Group support, various African countries are taking ambitious climate action, with a strong focus on increasing adaptation and resilience, leveraging private sector finance, and supporting increased systemic climate action at the country level.



# Introduction

Climate change is impacting the planet overall, and the Blue Economy is not exempt from these effects. On the contrary: the ocean is a major regulator of global and regional weather, and ocean acidification is a fundamental influencer of coastal and marine ecosystems.

Climate change is already affecting the Blue Economy in various ways. Sea-level rise is causing havoc on shorelines due to geomorphological processes. Changes in precipitation is causing floods and droughts in unpredictable patterns. Rising sea temperatures is starting to change patterns of ecosystem productivity, which will, in turn, reduce the availability of fish for human consumption. If climate change continues unchecked, extreme weather such as storm surges could conceivably combine with normal lunar tides to overwhelm the ability of coastal countries to safeguard their residents and infrastructure.

Preparing for these outcomes by developing Africa's Blue Economy could help reduce the potential impacts of climate change while improving the resilience and adaptation of the continent's coastal communities.

# What Climate Modelling Tells Us

## Temperature

According to the Intergovernmental Panel on Climate Change's (IPCC's) [Sixth Assessment Report](#), which includes a major new modelling exercise, mean annual temperatures have shown an increase of 0.2°C to 0.5°C per decade. Under each of the major emissions scenarios assessed, a global temperature increase of 1.5°C over pre-industrial levels is likely to be exceeded in the next decade or so, and by mid-century all but the lowest emissions scenarios suggest temperature increases of 2°C or more. High-emissions scenarios suggest it is very likely that warming will exceed 3°C

by 2100, except in Central Africa, where the estimate is 2.5°C. Under high-emissions scenarios, temperatures are projected to be up to 8°C warmer in parts of Algeria and Saudi Arabia. Modelling suggests that the number of days hotter than 35°C will increase by 20, to 160 days a year on average, with variations depending on the scenario and region. For life-threatening temperatures above 40°C, projections indicate an increase of 10 days, to 140 days a year depending on scenario and region.

## Precipitation

Rainfall projections for Africa are highly uncertain, but many parts of the region are expected to experience extreme precipitation changes, with droughts occurring alongside extreme rainfall days. This has already been observed over much of Sub-Saharan Africa. The trend is projected to continue with regional variations.

to more flooding events. Model results vary by scenario and region, but they suggest that present 1-in-100-years floods [could become as frequent as 1-in-40-years floods under low-warming scenarios, and 1-in-20-years floods under higher warming scenarios.](#)

Projections suggest an increase in extreme rainfall days over West Africa and the Sahel, and more intense and frequent occurrences of extreme rainfall over the Guinea highlands and Cameroon mountains. In eastern Africa, precipitation shows a high degree of temporal and spatial variability. Over the past three decades, rainfall has decreased over eastern Africa. Monsoonal precipitation has also declined throughout much of the Great Horn of Africa over the past 60 years. The Mediterranean coasts of Morocco, Algeria, and Egypt will receive about 10 percent to 20 percent less rain in the 2°C increase scenario, reaching up to 50 percent less rain in the 4°C scenario.

At the same time, droughts are expected to increase in all regions of Africa except the northern parts of East Africa and the Horn of Africa. In line with this, observation and modelling suggest increasing aridity in North Africa, West, and East Southern Africa, and in Madagascar.

Climate change is also increasing the frequency and intensity of El Niño Southern Oscillation and modifying the behavior of the West African monsoon, which is [arriving later in the year.](#)

Failure to curb global greenhouse gas emissions would put the world on a trajectory towards planetary warming of 3°C, which would cause catastrophic disruptions of the whole African food system.

The frequency and intensity of heavy precipitation events are projected to increase almost everywhere in Africa, leading



# The Biophysical Effects of Climate Change

## Rainfall, drought, and their effects on landscapes and vegetation

In Africa, ecosystem services provide subsistence to millions of people in Africa—particularly in rural areas—and support rural and national economies. According to [World Bank estimates](#), Africa's natural capital is valued at US\$9,225 per capita—more than US\$8 trillion in total. However, Africa's ecosystems are increasingly at risk from climate change and other serious challenges.

Changing temperatures, rainfall patterns, and climate extremes are already impacting biodiversity with far-ranging consequences on species range, plant, and animal reproductive and/or migration cycles. By 2100, climate change could result in significant losses of African plant species—

more than 50 percent of the population for some bird and mammal species—and up to a 30 percent decline in the productivity of Africa's lakes.

Climate change effects are expected to drive large ecological shifts, with impacts on the distribution of disease, vectors, and water availability, in addition to livelihoods. Expansion in the range of various pathogens, diseases, and pests will increase the vulnerability of crops, reduce agricultural production, and jeopardize human health. Prevention of future epidemics and pandemics is closely linked to preventing degradation of habitats and conserving wildlife.

## Impact of rainfall on watersheds

The combined effects of temperature and precipitation changes are expected to impact surface water levels, with Africa's river flows expected to decline between 20 and 40 percent by 2050. For instance, stream flows for the Okavango catchment in Botswana are expected to decrease by 20 percent.

Changes in rainfall and evaporation impact the degree to which surface water infiltrates the ground and therefore the recharge rates for groundwater, threatening water availability in water-scarce regions (northern, eastern, and central Africa).

Extreme rainfall events wash soils away—worsening the erosion of already degraded land—and push rivers and streams beyond their banks. They drag sediments and contaminants that can affect water sources for human supply. Moderate to severe degradation has already been identified in several life-supporting river basins, including the Niger (50 percent degraded), Senegal (51 percent), Volta (67 percent), Limpopo (66 percent), and Lake Chad (26 percent) river basins.



## Impact of sea level rise and extreme weather on the coast

In 2019, the African continent experienced an above-average sea-level rise, reaching five millimeters in several oceanic areas surrounding it. This level was exceeded around the south-western Indian Ocean from Madagascar towards Mauritius.

Sea levels will almost certainly climb by half a meter by the end of the century, potentially increasing by 1 meter (m) unless greenhouse emissions are quickly curbed. Tunisia, for example, could experience a 0.38m to 0.96m sea-level rise by 2100. Meanwhile, cyclones are expected to become more powerful.

## Coastal erosion

Climate change exacerbates existing coastal erosion caused by a combination of factors including the poor management of coastal sediment flow around infrastructure such as ports; the retention of sediment in upstream dams; the mining of riverine and beach sand; and the loss of coastal habitat that would otherwise physically slow down the retreat of the coast.

As sea level rises and natural defenses crumble, the coast is at risk of permanent inundation. [Major coastal cities like Abidjan, Cotonou, Lomé, and Nouakchott are likely to be highly impacted by erosion](#), with urban areas in Mauritania

being particularly exposed. But the challenge is not only urban: major national parks in Mauritania, like Diawling and Banc d'Arguin, will be also significantly affected. Another [study](#) by the World Bank estimated that the economic costs of coastal erosion in northwest Africa range from 0.2 percent of gross domestic product (GDP) in Algeria, to almost 3 percent of GDP in Tunisia.

## Impact of sea temperature change on fisheries

Marine heat waves are expected to continue to increase in frequency and intensity, especially around the Horn of Africa and the Mediterranean Sea. In the past three decades, the Mediterranean summer sea surface temperature has increased 1.15°C, rising on average 0.4°C per decade.

Climate change is already causing variations in fish migration patterns. In most instances, fish are moving from tropical areas toward the poles. Fish stocks in some areas are also declining in response to increased temperatures, acidification, and deoxygenation.

Projections show that fisheries along a substantial length of Africa's coastline are at high ecological risk from climate change. The fisheries most at risk are those along the Gulf of Guinea, from Gabon to Guinea-Bissau, and along Africa's east coast, from Eritrea to Mozambique.

Modelling shows that the maximum catch potential could decrease by 30 percent or more as early as 2050 in many tropical West African countries, including the Congo Republic, Côte d'Ivoire, Equatorial Guinea, Gabon, Liberia, and the islands of São Tomé and Príncipe. By contrast, the catch potential at higher latitudes is projected to decrease only moderately. In some instances—most notably in the waters of Senegal, The Gambia, and Cabo Verde—the catch potential is even [expected to increase](#).

Acidification is also a matter of concern. Although its impacts are not as well understood and are more difficult to measure, it is likely that they will be more [severe and widespread](#), particularly on shell-forming species, invertebrates, and coral-associated species and throughout any carbon-dependent ecological processes.



# How Climate Change will Affect People

## Food and water security

By 2050, Africa will be facing the dual challenge of a high population and diminished food security due to climate change. By then, the continent's population is expected to reach nearly [1.3 billion](#). The rapidly growing population is already placing significant pressure on the region's food systems.

Climate impacts will affect agricultural yields and the geographic range and viability of crops, disrupting already vulnerable food systems and affecting rural livelihoods. Already, adverse climatic conditions following the 2015–16 El Niño led to food insecurity and nutrition crises in several countries across Eastern and Southern Africa. Unusual weather and climate conditions in East Africa have also resulted in the most destructive desert locust outbreak in the Horn of Africa in 25 years, and the most serious in 70 years for Kenya, posing a serious threat to the region's livelihoods and food security. In Somalia and Kenya, the number of people affected by food insecurity increased between 2018 and 2019, from [1.6 million to 2.1 million in Somalia](#) and from [0.7 million to 3.1 million in Kenya](#).

Water supply is increasingly at risk in Sub-Saharan Africa. Droughts and prolonged dry periods increase soil erosion and exacerbate land degradation, further undermining food security. Ongoing droughts in southern and eastern Africa, as well as water scarcity in North Africa, are threatening the lives of millions. Water availability has declined from 5,790 cubic meters per person in 2002 to 4,019 cubic meters per person in 2014. Future water availability under a changing climate is projected to decrease in most parts of Africa. Less than [4 percent of Africa's arable land is irrigated](#), making the continent extremely vulnerable to rainfall-related shocks. These impacts will disproportionately affect the rural poor, who are a large share of the region's overall population.

## Migration of people

The year 2020 marked the highest number of internal displacements recorded, the majority of which were in north and Sub-Saharan Africa. New and repeated displacements were also recorded when conflict overlapped with extreme weather events, triggering an estimated 4.3 million new displacements in Sub-Saharan Africa alone.

There is robust evidence that [climate change effects will impact the size and direction of migration flows](#), but these are also highly influenced by other factors, such as social and economic conditions. Armed conflicts and violence increase vulnerabilities, including food insecurity and forced displacement.

## Where people can live

If global average temperatures increase by 1.5°C, the number of people exposed to river flooding in Africa is predicted to rise to 23.4 million by 2050, with a [57 percent increase in fatalities](#). These increases are driven by climate change coupled with population growth and high levels of migration to urban areas, resulting in the expansion of the informal settlements that typically spring up without planning or basic services that could help manage flooding events. In sub-Saharan Africa, an estimated 60 percent of the population lives in such informal settlements, which are highly vulnerable to natural disasters.

The risk of flooding is more pronounced in southwest Africa and in West African countries with large rivers (for example, Benin, Cameroon, and Nigeria). The topography of some cities, combined with deforestation and encroachment of informal settlements into floodplains, leads to situations of multiple risk that are aggravated by climate change.

Floods disproportionately affect the poor. Many informal settlements are located on floodplains or hillsides, where they are especially vulnerable to floodwaters or landslides. The consequences of this positioning can be fatal, as Sierra Leone discovered in 2017 when three days of intense rainfall triggered a massive landslide in the Babadorie river valley, resulting in the death and disappearance of more than 1,000 people.

The population of Africa inhabiting low-level, coastal areas is rising at an annual rate of 3.3 percent per year, more than double the global average. This is partly driven by repetitive drought in Mediterranean areas, which force rural communities to settle on the coast. By 2050, between 72 million and 94 million people are expected to inhabit several of West Africa's low-lying urban centers. Given that sea-level rise is already being observed—in 2019, the African continent experienced above-average sea-level rise, reaching five millimeters compared with the previous year in several oceanic areas surrounding it, and even exceeding this level around Madagascar towards Mauritius—the African population is at high risk from rising oceans.

## Other impacts

The effects of climate change may trigger or worsen conflicts by increasing competition over land and water resources, or by causing disruptions in production and markets. Some countries are more vulnerable to climate-related conflict than others, especially if they experience ethnic fragmentation, high dependence on rainfed agriculture, low human development levels, and political and economic marginalization. In the Lake Chad Basin, for example, the seasonal migration of pastoralists is already leading to a rise in tensions with settled farmers as resources (water for irrigation) become scarcer.

Heatwaves also pose a threat to people. In the past five decades, countries such as Botswana, Chad, Sudan, and Uganda have experienced increases in average temperature ranging from 1°C to more than 3°C. The increase is starkest in eastern Africa. Low access to air conditioning and vulnerable power grids add to this vulnerability in many African countries.



# The World Bank's Approach to Climate Change in Africa



## Roadmap for Middle East and North Africa

World Bank Group commitments are driving support for countries to take ambitious climate action, with a strong focus on increasing adaptation and resilience, leveraging private sector finance, and supporting increased systemic climate action at the country level.

The World Bank Group's [Middle East and North Africa Climate Roadmap \(2021–2025\)](#) aims to drive climate action and green recovery in the region. The roadmap outlines four key transformation areas to build low-carbon, resilient societies:

- Food systems, water security, and resilient natural capital
- Energy transition and low-carbon mobility
- Climate-smart cities and resilient coastal economies
- Sustainable finance for climate action.

**THE ROADMAP BUILDS ON THE WORLD BANK GROUP'S CLIMATE CHANGE ACTION PLAN (2021–2025) AND COMMITMENT TO BOOST CLIMATE ACTION BY:**



**Increasing World Bank Group investments:** US\$10 billion of World Bank and International Finance Corporation funding will be used for climate-smart projects and policy reforms, leveraging an additional US\$2 billion in private sector financing.



**Aligning financial flows with the Paris Agreement by the 2023 financial year:** Investments—particularly into infrastructure and physical assets—will be aligned with country agreements and the Paris Agreement to ensure there are no stranded assets.

**The roadmap for the Middle East and North Africa provides a framework for ambitious climate action in the region. It unites climate action and development, strengthens institutions, overcomes barriers to private sector engagement, fosters regional integration, and builds resilient and more inclusive societies.**



**Balancing adaptation and mitigation:** Fifty percent of climate finance will be invested in initiatives that help build resilience, guided by regional and country-specific demand.



**Integrating climate risk management:** Strategies and interventions will be informed by the World Bank's country climate and development reports, a core diagnostic tool that helps identify country-level risks and opportunities linked to low-carbon growth.



## Next Generation Africa Climate Business Plan

The [Next Generation Africa Climate Business Plan](#) (Figure 1) is grounded in the World Bank Group's commitment to mainstream climate action into the development agenda. The previous climate plan portfolio allowed for the development of a wide range of tools, instruments, and approaches to drive climate resilience and mitigation, rendering them ready for scaling and replication.

The new portfolio will draw on past successes, mobilizing proven tools and instruments to replicate and scale up low-carbon and resilience initiatives. For example, the Solar Lighting project, which started with Lighting Africa, has now evolved to form [Lighting Global](#).

The Climate Plan identifies five strategic directions for Sub-Saharan Africa to achieve climate-smart growth and shared prosperity. These strategic directions are highly interconnected, with gender, community engagement, fragility, and social inclusion as components of transformational climate action.

### THE STRATEGIC DIRECTIONS ARE AS FOLLOWS:

- Food security and a resilient rural economy
- Ecosystem stability and water security
- Low carbon and resilient energy
- Resilient cities and green mobility
- Climate shocks and risk governance.



Figure 1: Key elements of the Next Generation Africa Climate Business Plan (2021–2026). Source: [World Bank, 2020](#).





## Climate financing with IDA20

The International Development Association's 20th replenishment cycle (IDA20) of US\$93 billion aims to support a green, resilient, and inclusive recovery from COVID-19 for the poorest countries between 2022 and 2025, with the ultimate goal of restoring their trajectory towards achieving the 2030 development goals.

IDA20 will increase climate-related financing, with both intensified emphasis on climate adaptation and a higher target for climate co-benefits, which will increase to 35 percent on average over the 2023 to 2025 fiscal period.

(Co-benefits refers to World Bank financing that supports climate action while also furthering development objectives.) Alignment with the Paris Agreement and the rollout of country climate and development reports, which are a flagship new diagnostic tool to help integrate climate and development in country development strategies, are two significant innovations in IDA20.



## Data, knowledge, and solutions

Open sources of information about the impacts of climate change and accessible tools that support technical analysis are valuable for helping countries decide how to respond to climate change. To ensure that all countries have access to relevant data, the World Bank developed the [Climate Change Knowledge Portal](#), which carries global data on historical and projected climate vulnerabilities and impacts.

Another World Bank initiative is the [Wealth Accounting and the Valuation of Ecosystem Services](#) partnership, which promotes sustainable development by ensuring that natural resources are included in development planning and national economic accounting.

Various adaptation initiatives within Africa drawn on data and knowledge that was developed with World Bank assistance. For instance, in Malawi, the World Bank supported the scaling up of modernized climate information and early warning systems, while also building capacity within the country's Department of Climate Change and Meteorological Services.



## Blue Economy and climate

The Blue Economy considers economic development and climate action through ocean health as compatible propositions. It focuses on capturing potential synergies and managing the trade-offs across industries to better address the growing threats confronting oceans, particularly those posed by climate change, while simultaneously maximizing the socioeconomic benefits generated by marine activities and ensuring the continuous delivery of goods and services for present and future generations.

The World Bank's Blue Economy Program, [PROBLUE](#), supports the development of integrated, sustainable, and healthy marine and coastal resources. With the Blue Economy Action Plan as its foundation, PROBLUE contributes to the implementation of Sustainable Development Goal 14 and is fully aligned with the World Bank's twin goals of ending

extreme poverty and increasing the income and welfare of the poor in a sustainable way. The World Bank's overall oceans portfolio was worth more than US\$9 billion in active projects as of June 2022.

The World Bank and the European Commission recently launched the [Blue Economy Development Framework](#). The framework provides a set of analytical tools to help countries define a roadmap to a diversified and sustainable maritime economy, while building resilience to climate change.

On the regional scale, in February 2019, Morocco hosted the launch of the regional [Blue Belt Initiative](#), a collaborative platform for state and non-state actors to design, finance, and implement new sustainable economic activities based on the circular economy and Blue Economy models.





