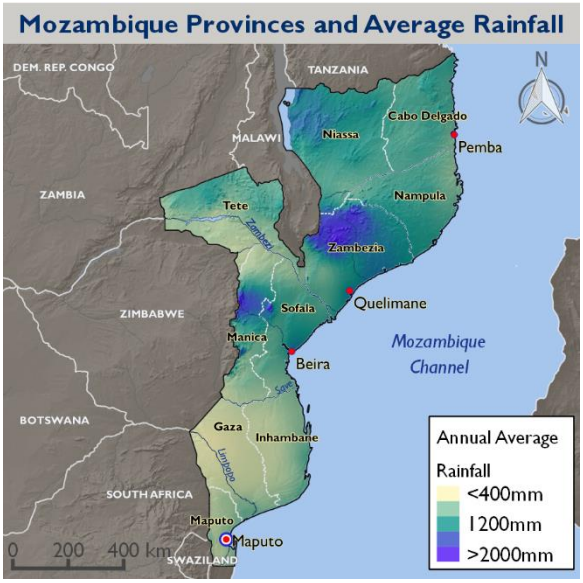
USAID
FROM THE AMERICAN PEOPLE

FACT SHEET

CLIMATE RISK PROFILE
MOZAMBIQUE

COUNTRY OVERVIEW



Mozambique's vulnerability to climate change is a function of its location and geography: large areas of the country are exposed to tropical cyclones, droughts (every three to four years) and river/coastal storm surge flooding. This vulnerability is heightened by the country's 2,470 km of coastline and socioeconomic fragility. More than 60 percent of the population lives in low-lying coastal areas, where intense storms from the Indian Ocean and sea level rise put infrastructure, coastal agriculture, key ecosystems and fisheries at risk. Although migration to urban areas is rising, two-thirds of the population still resides in rural areas with limited access to electricity, improved drinking water and sanitation. Forty-five percent of the population lives below the poverty line and 70 percent depends on climate-sensitive agricultural production for their food and livelihoods. Increased frequency and severity of intense storms, droughts and floods are likely to exacerbate these development challenges. For example, El Niño conditions in 2015–2016 caused the worst drought in 35 years, reducing food availability by 15 percent. Food insecurity caused by the drought worsened in 2017 with Cyclone Dineo, which damaged crops and destroyed infrastructure. (1, 2, 5, 14, 21)

CLIMATE PROJECTIONS

- 1° C increase in temperatures by 2037
- Increase in droughts and duration of dry spells
- Increase in heavy rainfall events and intensity of cyclones
- 13–56 cm rise in sea levels by 2090

KEY CLIMATE IMPACTS

Agriculture
Reduced yield/damage to crops
Shifts in growing seasons
Disruption of local markets and livelihoods

Water
Increased risk of water stress in some areas and flooding in others
Reduced hydropower production

Coastal Resources
Loss/damage of mangroves, coral reefs and seagrass, and associated impact on small-scale fisheries and tourism revenue

Human Health
Shift in range and seasonality of vector-borne diseases (e.g., malaria)
Increased risk of waterborne diseases

July 2018
This document was prepared under the Climate Change Adaptation, Thought Leadership and Assessments (ATLAS) Task Order No. AID-OAA-I-14-00013 and is meant to provide a brief overview of climate risk issues. The key resources at the end of the document provide more in-depth country and sectoral analysis. The contents of this report do not necessarily reflect the views of USAID.

CLIMATE SUMMARY

Mozambique's climate ranges from tropical and subtropical in the north and center, to semi-arid steppe with a pocket of tropical dry desert in the south (e.g., parts of Gaza). October to March is generally hot and rainy, with temperatures along the north coast and inland in the Zambezi Valley averaging more than 35°C. April to September is cooler and drier, with nighttime average temperatures in the south dipping below 15°C. The rainy season begins in November and peaks in January/February. Rainfall varies from 1,800 mm per year near the Zambezi Delta to 300 mm per year in the lowlands of the southern interior. The highlands of the northern and central regions are affected by the northeast monsoon in summer. Tropical cyclones from the Indian Ocean typically strike Mozambique in summer and are associated with the heaviest rainfalls. (2, 9, 15)

HISTORICAL CLIMATE

Historic climate trends include:

- Average temperatures have increased 1.5–2°C (1961–2010).
- Southern Mozambique has experienced more persistent droughts, while coastal regions have experienced more episodic floods (since 1960).
- Zambezia and coastal parts of Nampula have received lower average precipitation and Zambezia and Sofala have experienced more consecutive dry days (2000–2014 compared to 1981–1999); despite this, most of the country received marginally higher average precipitation.
- Sea levels have risen 3 cm (1961–2001).

FUTURE CLIMATE

Projected changes include:

- Average temperature increase of 1°C in the next 20 years; more marked temperature increases in the interior, southern and coastal areas.
- Increase in the number of days exceeding 35°C.
- Decrease in the number of nights below 25°C.
- Increase in intensity of rainfall events and cyclones.
- No statistically significant rainfall changes, but likely continuation of delayed start and earlier end to the rainy season in the north.
- Increase in droughts for central and southern regions; more floods during rainy seasons.
- Additional sea level rise of 13–56 cm by 2090.

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE

Rural livelihoods in Mozambique are primarily agriculture-based and climate-dependent. Agriculture accounts for more than 25 percent of Mozambique's GDP and employs more than 75 percent of the country's workforce. Most producers are subsistence, smallholder farmers, and the majority of production is rainfed, vulnerable to rising temperatures and variable rainfall. Yields of major crops such as cassava, sorghum, soybeans and groundnuts could decrease by 2–4 percent over the next 40 years (particularly in the central region). Some drought-sensitive, major food crops like maize could decline by as much as 11 percent on average (2046–2065), and by as much as 45 percent in areas such as Tete. More erratic rainfall and changes in temperature could contribute to the spread of existing and new agricultural pests, such as the fall armyworm, posing unprecedented threat to maize and sorghum. Increased risk of floods and droughts are likely to impact key value chain crops such as soy, pigeon pea and sesame, disrupting local markets and farmers' income. Increases in the frequency and severity of cyclones also put crops at risk, such as the 2017 Cyclone Dineo, which destroyed almost 30,000 hectares of crops and 135,000 cashew and coconut trees. These impacts on production, combined with the effects of flooding and heavy rainfall events on rural roads, could result in an agricultural GDP loss of 4.5–9.8 percent by 2050. (2, 4, 5, 8, 9, 14, 19, 20)

Climate Stressors and Climate Risks AGRICULTURE

Stressors	Risks
Rising temperatures	Shifts in growing seasons and decrease in duration of rainy season (particularly in central regions and Zambezi Valley)
Variable rainfall	Decrease in crop yields, particularly for drought-sensitive crops like maize and soy
Extreme events (droughts, intense rainfall events, cyclones)	Storm damage to crop and tree production
	Inundation and waterlogging of low-lying crops
	Flooding of roads connecting crops to markets

WATER RESOURCES

With 104 river basins and considerable groundwater potential, Mozambique has abundant water resources. However, increased risk of floods and droughts, more variable rainfall and high population growth are putting these water resources under pressure. Mozambique shares 13 main rivers with neighboring countries and projected rainfall reductions in Zimbabwe and Zambia could translate into significant reductions in river flows in Mozambique. Flows of the Zambezi River could be reduced by up to 15 percent (not taking into account drought risk and population growth). In the central zone, this could translate into per capita water availability falling from about 1,900m^3/capita/year in 2000 to about 500m^3 by 2050 (the international water scarcity threshold is 1,000m^3/capita/year).

Even in areas where river flows are expected to increase (such as in the south), projected population growth is expected to decrease water availability. For example, in the Limpopo Basin, an estimated 15 percent increase in river flows will likely still result in a 64 percent drop in water availability by 2050 due to population growth. Increased river flows are likely to increase flood risk, particularly from January to March, and high intensity rainfall events will increase flash flooding along the coast. A 25 percent increase in the magnitude of large flood peaks is expected along the main stems of both the Limpopo and Save Rivers in the south. Saltwater intrusion from sea level rise and storm surges has already compromised the drinking water of major cities like Beira and is expected to impact as much as 240 km^2 in the Zambezi River system alone. In addition, increased evaporation and variable rainfall, combined with upstream irrigation demands, may negatively impact Mozambique's hydropower production. Mozambique is currently a net exporter of electricity, largely due to production along the Zambezi River Basin. (2, 3, 7, 9, 11, 22)

Climate Stressors and Climate Risks WATER RESOURCES

Stressors	Risks
Rising temperatures; increased evaporation	Reduced surface water flow in the central region, increasing water stress
Increase in rainfall variability	Increased surface water flows in some areas (like the south), increasing the risk of flooding, especially in urban areas with poor drainage networks
	Decrease of groundwater and available water in reservoirs
Increase in heavy rainfall events	Increase in saltwater intrusion in coastal aquifers and rivers
Rising sea levels	Reduced hydropower generation capacity; decreased revenues from hydropower; more marked seasonality of power generation

COASTAL RESOURCES

Mozambique has one of the longest coastlines in Africa, approximately 2,470 km, home to 60 percent of the population and various important ecosystems such as coral reefs, mangroves and seagrass. These ecosystems protect coastlines from storm surges and erosion and provide habitats for a variety of species, including endangered green and hawksbill sea turtles and vulnerable dugong. Coral reefs in particular are critical to maintaining coastal fisheries (many of which are small-scale), which support about 6.6 million people and provide about half of Mozambicans' animal protein. Coral reefs are also the basis for rapidly growing coastal tourism. Increasing ocean temperature and acidification, sea level rise and saltwater intrusion threaten these ecosystems and increase the risk of biodiversity loss. Approximately 90 percent of coastal erosion can be attributed to climate change impacts. An estimated 4,850 km^2 of land could be lost to sea level rise by 2040. Low-lying and densely populated cities like Beira and Maputo are particularly vulnerable. In Beira, for example, erosion of 30–40 m of beach in the last 15–20 years has threatened mangroves and coastal infrastructure. Even small rises in sea levels can dramatically increase the probability of severe storm surges. By the 2040s, damage to transportation and infrastructure in coastal areas could rise to $103 million per year. (6, 8, 10, 12, 13, 18, 19)

Climate Stressors and Climate Risks COASTAL RESOURCES

Stressors	Risks
Rising sea levels	Loss of and damage to ecosystems such as coral reefs, mangroves and seagrass; loss of biodiversity
Warming and acidification of ocean	Loss of revenue from tourism and fisheries
	Accelerated coastal erosion, threatening habitats, houses and infrastructure; forced migration away from coast
Increased risk of cyclones	Increased probability of severe storm surge events and damage

HUMAN HEALTH

Several leading causes of death in Mozambique are likely to be exacerbated by climate change. Malaria, the top cause of death of children under five, is more likely to appear in areas previously unsuitable for the disease to thrive, such as the higher elevations of Tete and Niassa Provinces, and malaria transmission will be more unpredictable. Diarrheal disease, the fourth leading cause of death overall, will likely increase due to rising temperatures and heavy rainfall events. An increased risk of flooding is also likely to increase the risk of cholera outbreaks, as evidenced by the cholera outbreaks in 2017 in Nampula and Cabo Delgado that were linked to severe flooding in those provinces. These climate risk factors come on top of other risk factors contributing to poor health in Mozambique, such as low access to improved sanitation, improved water sources and health facilities. The projected climate impacts on agriculture will also negatively impact food security and nutrition – almost one-third of Mozambicans suffer from chronic food insecurity, most of whom live in agricultural areas likely to be hardest hit by climate impacts. (15, 16, 17, 20)

Climate Stressors and Climate Risks HUMAN HEALTH

Stressors	Risks
Rising temperatures	Increased incidence of malaria in highland regions of Tete and Niassa; more difficult to predict timing and location of malaria transmission
Increase in rainfall variability	Increased risk of diarrheal disease and cholera
	Additional strain on health services
Increased risk of heavy rainfall events	Crop failure/lower yields, aggravating already high rates of food insecurity

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

Building on the momentum created by the adoption of the 2013–2025 National Climate Change and Mitigation Strategy, a Climate Change Coordination Unit (Unidade das Mudancas Climaticas) was established in 2014. The unit developed a climate knowledge management hub run by the Mozambique Academy of Sciences, which also hosts an online course on adaptation and disaster risk reduction. Mozambique also established a climate and health observatory in 2016 to support evidence-based decision making. (6, 9, 15)

NATIONAL STRATEGIES AND PLANS

- Intended National Determined Contribution (2015)
- Climate Change And Gender Action Plan (2014)
- National Climate Change Adaptation and Mitigation Strategy for period 2013–2025 (2012)
- National Adaptation Program of Action (2007)
- First National Communication to the UNFCCC (2006)
- Master Plan for Risk and Disaster Reduction 2017–2030

KEY RESOURCES

1. CIA. World Factbook: Mozambique.
2. FAO. 2016. Aquastat: Mozambique.
3. Global Facility for Disaster Reduction and Recovery. 2017. Mozambique.
4. IFPRI. 2012. Southern Africa Agriculture and Climate. A Comprehensive Analysis – Mozambique.
5. IFRC. 2017. Final Report: Mozambique: Food Insecurity.
6. IISD. 2011. Review of Current and Planned Adaptation Actions: Mozambique.
7. INGC. 2009. Synthesis report. INGC Climate Change Report: Study on the impact of climate change on disaster risk in Mozambique.
8. INGC. 2012. Responding to Climate Change in Mozambique.
9. Netherlands Commission for Environmental Assessment. 2016. Climate Change Profile: Mozambique.
10. SARUA. 2014. Mozambique Country Report.
11. Spalding-Fecher et.al. 2016. The vulnerability of hydropower production in the Zambezi River Basin to the impacts of climate change and irrigation development.
12. USAID. 2013. Mozambique Climate Vulnerability Profile.
13. USAID. 2013. Mozambique Environmental Threats and Opportunities Assessment.
14. USAID. 2017. Impact of Climate Change on Select Value Chains in Mozambique.

15. USAID. 2018. Climate Change and Health in Mozambique: Impacts on Diarrheal Disease and Malaria.
16. WHO. 2015. Mozambique: WHO Statistical Profile.
17. WHO. 2018. Disease Outbreak Report – Cholera in Mozambique.
18. Wilkinson, C. (ed.). 2008. Status of Coral Reefs of the World.
19. World Bank. 2010. Economics of Adaptation to Climate Change: Mozambique.
20. World Bank. 2016. World Development Indicators.
21. World Bank. n.d. Climate Change Knowledge Portal: Mozambique.
22. World Energy Council. Hydropower in Mozambique.

Map source: WorldClim Global Climate Data and Hijmans, R.J. et al. 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25: 1965–1978.

SELECTED ONGOING EXPERIENCES

Below are selected projects focused on climate change adaptation, or some aspect of it, in Mozambique.

Program	Amount	Donor	Year	Implementer
Adapting to Climate Change	Not available	German Federal Ministry for Economic Cooperation and Development (BMZ)	2015–2018	National Directorate of Water Resources Management, National Institution of Disaster Management
Pilot Program for Climate Resilience	$86 million	World Bank, IFC, AfDB	2011–present	Various government ministries
Mozambique Coastal City Adaptation Project	$19.9 million	USAID	2014–2019	Chemonics International
Climate Change and Environment Sector Program Support; Phase III	$5 million	Danida	2014–2017	Government of Mozambique
Artisanal Fisheries and Climate Change	$3.4 million	World Bank	2015–2019	Institute for Small-Scale Fisheries Development
Cities and Climate Change	$120 million	World Bank	2012–2019	Ministry of Planning and Development
Climate Resilience: Transforming Hydro-Meteorological Services	$21 million	World Bank	2013–2018	National Directorate of Water; National Institute of Meteorology
Environment Mainstreaming and Adaptation to Climate Change	$7 million	UN – MDG Fund	2008–2012	MICOA and others
Integrating Disaster Risk Reduction and Climate Change Adaptation into District Development Plans in Mozambique	$580,000	ACP-EU	2015–2018	Global Facility for Disaster Reduction and Recovery
Climate Friendly Cold Storage for Artisanal Fisheries in Mozambique	$778,000	Nordic Development Fund	2017–2019	Ocean Excellence Ehf., National Development Institute of Fisheries and Aquaculture, Rare, Inc.