



# MOZAMBIQUE

## CLIMATE VULNERABILITY PROFILE



US Foreign Assistance: <sup>1</sup> (thousands USD)	Requested FY 2012	Requested FY 2013
Estimated total:	380,489	316,211
Adaptation:	4,000	3,000
Feed the Future:	10,000	18,000
Malaria:	32,300	29,000
Water:	3,380	4,243

Priority Adaptation Country in 2011: YES

Key Climate Stressors: Heat, Drought, Flooding, Sea level rise

### INTRODUCTION

Mozambique is located on the eastern coast of southern Africa and has a population of approximately 23.4 million people. Mozambique's coastline is the third longest in Africa and is home to approximately 60 percent of the country's population as well as critical ecosystems such as dunes, reefs, bays, and mangroves. The rest of Mozambique is covered by savannah and secondary forest. Topographically, Mozambique is mountainous in the northwest and lies at the end of several river basins. The country faces multiple development challenges, including widespread poverty, low life expectancy, and gaps in its education system. Much of the country depends on rain-fed agriculture for both subsistence and export needs. Twenty-five percent of the country's Gross Domestic Product (GDP) comes from agriculture and 80 percent of its population relies on agriculture for their livelihoods. Similarly, fisheries and aquaculture also represent critical livelihoods, representing about 40 percent of total export earnings. Mozambique also has rich biodiversity and ecosystems that support a growing tourism industry.

### PROJECTED WEATHER AND CLIMATE CHANGES

Mozambique has a tropical to sub-tropical climate and experiences two seasons: a cool and dry season from April to September and a hot and humid season between October and March. Temperatures are warmer near the coast and southern lowland regions compared to the higher, inland regions. Mozambique is often affected by natural disasters, including droughts and floods associated with the El Niño Southern Oscillation.

**TEMPERATURE:** Average annual temperatures in warmer regions of Mozambique range from 20 to 27°C, and in cooler regions average annual temperatures range from 15 to 25°C. Average annual temperature has increased by 0.6°C between 1960 and 2006. Mean annual temperatures are projected to increase by 1.0-2.8°C by the 2060s and by 1.4-4.6°C by the 2090s compared to 1970-1999 average observed temperatures. These increases are projected to be more rapid in the inland regions than on the coast. The frequency of hot days and nights are projected to increase while the frequency of cold days and nights will decrease.

**PRECIPITATION:** The wet season in Mozambique lasts from November to April, bringing around 150 to 300 mm of rainfall per month in the north and 50 to 150 mm per month in the south. Average annual rainfall has decreased by 2.5 mm per month per decade between 1960 and 2006. However, the intensity of heavy rainfall events has increased over the same period, with the largest increases during the wet season. Rainfall projections are varied and divergent across models, particularly depending on season and region. The models indicate an overall increase in precipitation, especially during the wet season and in coastal regions.

**EXTREME EVENTS:** The coastal areas of Mozambique experience cyclones and associated storm surge. Since the 1950s, the occurrence of extreme weather events, including drought, heavy rainfall events, hurricanes, and cyclones, has increased. While cyclones are projected to become less frequent, their intensity and associated levels of precipitation are likely to increase.

**SEA LEVEL RISE:** Mozambique's coasts are susceptible to future sea level rise as the majority of the country's coastal zone is located below sea level. Sea levels are projected to rise between 0.18 m and 0.59 m by the 2090s compared to 1980-1999 sea levels.

### KEY CLIMATE IMPACTS AND VULNERABILITIES

Mozambique is extremely vulnerable to the impacts of climate change. Much of the population lives in low-lying coastal areas with weak, non-resilient infrastructure and relies on local natural resources (e.g., agriculture and fisheries) for their livelihoods. Alternating flood and drought events will affect the ability of farmers and fishermen to consistently grow crops and fish, which will likely impact food security, malnutrition, and sustainable incomes. Furthermore, sea level rise and associated saltwater intrusion could affect the availability of aquaculture, the viability of the coastal mangrove systems, and contaminate already stressed water supplies. Droughts, flooding, and greater temperatures will negatively impact human health and forest ecosystems. Finally, extreme events—namely, tropical cyclones—will affect already weak infrastructure and damage or destroy coastal ecosystems and livelihoods.

### KEY USAID PROGRAM VULNERABILITIES

**AGRICULTURE:** USAID/Mozambique is implementing projects that focus on identifying higher yield or disease-resistant crop varieties, providing education on modern cultivation techniques, and helping farmers move from subsistence farming to agricultural business markets. Current agriculture practices being promoted under these projects are likely to be vulnerable to changes in climate as they were designed to be effective under current climate conditions but not under future climate scenarios where higher temperatures, changes in precipitation, and more severe droughts and floods, are expected.

**ECONOMIC GROWTH AND TRADE:** USAID/Mozambique is supporting the Government of Mozambique in diversification of its economic base through projects that help attract private investment, improve economic governance and business climate, and invest in green growth. While much of the economy still relies on agriculture, the country

<sup>1</sup> US foreign assistance includes both USAID and Department of State program funding, but in most cases the bulk of this funding is implemented through USAID. In order to have comparable figures in these categories, all country profiles use figures from the Congressional Budget Justification (CBJ) (see <http://transition.usaid.gov/performance/cbj/185016.pdf> and <http://transition.usaid.gov/performance/cbj/158269.pdf>). Between the time of the budget request and the 653(a) report to Congress, these figures can change significantly.

is also moving towards investing in its tourism sector and renewable energy efforts. These sectors are also vulnerable to projected future climate change. Changes in temperature, rainfall, sea level, and extreme events could affect the length of tourism seasons and impact coastal and land resources that attract tourists and enable renewable energy production. Furthermore, the infrastructure investments needed to support these sectors may be threatened by a number of climate variables. For example, an increase in the severity of cyclone winds and precipitation may cause damage or destruction to energy, transport, and/or tourism infrastructure.

**HEALTH:** USAID/Mozambique's health program has three focus areas. Two of these focus areas, the Malaria Initiative and improving child and maternal health, are likely to be vulnerable to future climate impacts. For example, changes in temperature and rainfall patterns could cause alterations in current malaria disease vectors. This may ultimately change the areas and populations within Mozambique that are exposed and susceptible to malaria. Furthermore, future impacts on agricultural and aquaculture production could have secondary impacts on the availability of nutritious food for mothers and their children. Additionally, Mozambique is vulnerable to cholera outbreaks, which are closely linked with flooding. Intense precipitation events can overrun poorly placed latrines, increasing prevalence of cholera and other enteric diseases. USAID/Mozambique's health program may need to address these additional areas.

**COASTAL AND MARINE AREAS:** Coastal zones in Mozambique have already begun, and are anticipated to continue, to experience rises in sea level. The country's 2,700 km of coastline are made up of many low-lying areas characterized by a variety of ecosystems such as estuaries, mangroves, dunes, inland lagoons, coastal lakes, coral reefs, and marine swamps. The ecosystems provide habitats for a wide range of ecologically important and economically valuable species. Projected sea level rise is anticipated to increase the vulnerability of ecosystems and land to erosion and flooding. An estimated 90 percent of coastal erosion is caused by climate impacts, with average erosion rates of 0.11-1.10 m per year from 1999 to 2004. Provinces most vulnerable to rising sea levels are Zambezia, Nampula, Sofala, Beira, and Maputo, due to their low-lying topography and large populations. Beira and Maputo are particularly vulnerable because they are below sea level. Over 13 million people (60 percent of Mozambique's population) live within 50 km of the coastal zone. By the 2040s, coastal related damages in Mozambique could rise to \$103 million per year, with transportation and coastal infrastructure at risk.

## ACTIONS UNDERWAY<sup>2</sup>

Mozambique has many discrete adaptation-related efforts currently underway. Some of these efforts are focused solely on Mozambique while others include participation from other developing countries. The projects mostly center on building the capacity of Mozambique to respond to climate impacts and formulate adaptation policies, but focus on a range of sectors including disaster risk management, coastal zone management, forestry, freshwater, and rural development. One of the most important adaptation programs in Mozambique is the Pilot Program on Climate Resilience, a multilateral climate investment fund that focuses on roads, water, agriculture, coastal cities, and private sector investment. USAID/Mozambique has been allocated adaptation funding and recently supported a risk assessment study for the National Institute of Disaster Management (INGC), which looked at climate vulnerabilities in three major cities (Maputo, Beira, and Quelimane) and considered costs, benefits, and averted losses for possible adaptation measures. The Mission recently released a draft statement of work for a coastal urban adaptation program. The program will focus on several coastal cities and will seek to improve the provision of climate-resilient urban services by municipalities, increase adoption of climate resilient measures by communities, and increase access to risk-sharing tools for at-risk infrastructure and livelihoods.

## CHALLENGES TO ADAPTATION

Significant challenges to adaptation exist in Mozambique. Further research is required on the changes in extreme events and the subsequent need for disaster management and response. Coastal vulnerability and risk

assessments need to be conducted. Additionally, a network of observing and data management stations and systems needs to be established in order to support decision-making in disaster situations, particularly for rivers in the central region and major cities at risk from cyclones and storms surges. Institutionally, the Mozambican government would benefit from strengthening of its relevant ministries (e.g., Environment, Agriculture) and local institutions and improved coordination between these agencies to develop and implement adaptation strategies. risk reduction. These challenges need to be overcome to provide better collection and systematization of data relevant for vulnerability mapping and assessments and, ultimately, implementation of adaptation strategies.

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## RESOURCES

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<sup>2</sup> Actions underway include those from direct adaptation funds and indirectly attributed funds. More information on U.S. climate finance can be found at <http://www.state.gov/e/oes/climate/faststart/index.htm>.