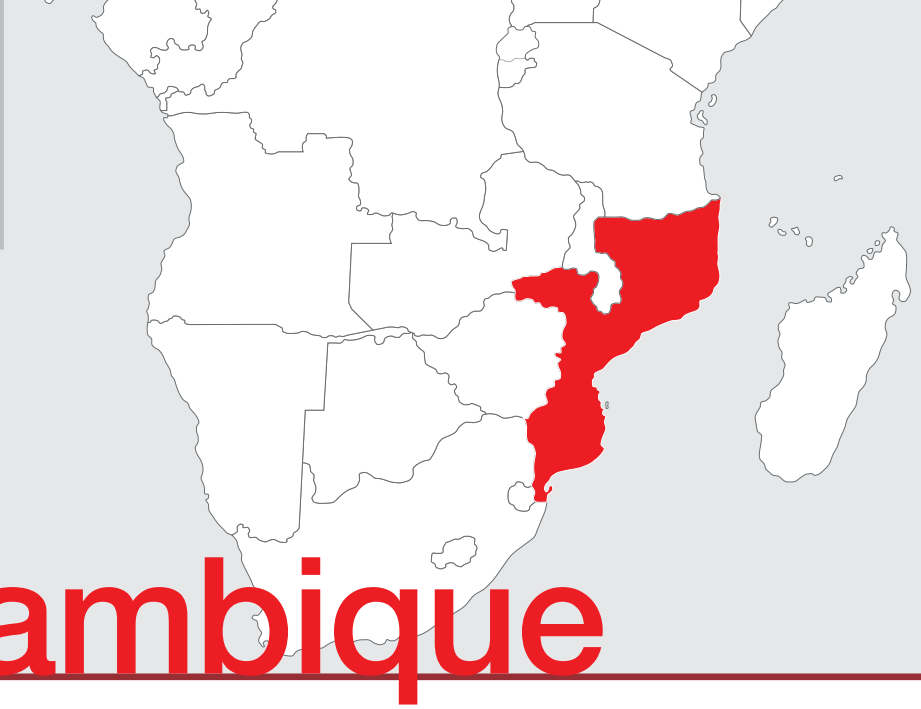
Climate Centre

CRUZ VERMELHA DE MOÇAMBIQUE CVM

Country-level | Climate fact sheet



Mozambique

The following climate factsheet summarizes available information on the climate of Mozambique, climate change and impacts of these changes on humanitarian activities in country. Each of the factsheets were written as a compilation of information from peer-reviewed academic papers, government publications, and INGO documentation.

1. Climate overview

Average temperature: The south of the country experiences a mean temperature range of 22°C to 26°C. The coastal central/northern and central interior regions (Zambezi Valley) generally experience higher average temperatures, around 24°C to 28°C (figure 1a).

Average rainfall: Total rainfall for the country averages 1600 mm per year near the Zambezi Delta to less than 300 mm per year in the lowlands of the southern interior. Rainfall is highest in the north and central regions, reaching between 1000 and 1600 mm, decreasing inland where it can be as low as 400 mm (figure 1b).

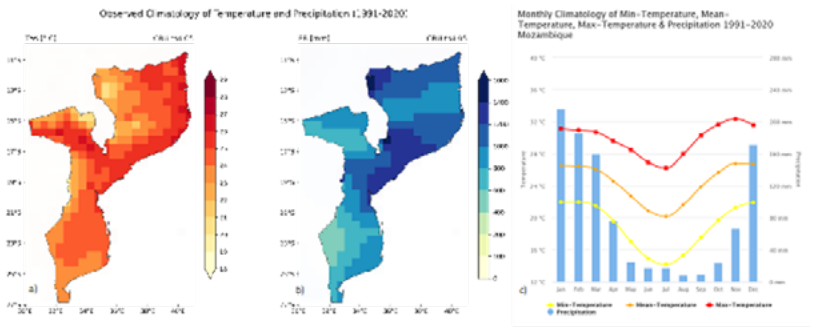


Figure 1. Observed Climatology of mean Temperature (a), annual mean total precipitation (b) and monthly climatology (c) over 1991-2020. (Adapted from World Bank, 2022)

1.1 Short overview

Mozambique's climate ranges from tropical and subtropical in the north, centre and coastal areas, semi-arid steppe in the south and a modified climate due to elevation. The country has two main seasons, a wet season during austral summer and a dry season during winter. The rainy season in begins in November and can last until April or May. Most of the precipitation falls in these summer months, with peaks in

January and February. Come the end of the rainy season, relative humidity falls, and the dry summer begins. Precipitation is low from June to August (Figure 1c).

The period between October and March is generally the warmest. Temperatures dip at the end of the rainy season, and June and July are the coolest months of the year (Figure 1c). In addition to the Intertropical Convergence Zone (ITCZ), rainfall in Mozambique is influenced by El Niño Southern Oscillation (ENSO). ENSO creates irregular periodic variation in the temperature as well as sea surface temperature, thus influencing year-to-year variability and extreme weather events such as heatwaves, droughts, and floods. Drier than normal rainfall is generally associated with the El Niño (warm) phase of ENSO while the La Niña (cold) phase of ENSO is associated with wetter than normal conditions.

The diverse and varied geography of Mozambique means that it is exposed to a broad array of environmental hazards (hydrometeorological as well as geophysical) which are directly impacted and exacerbated by the impacts of climate change across the country. Ranked 9 out of 191 countries by the 2022 Inform Risk Index, Mozambique is one of the higher hazard risk countries in the world, facing increasing risks (DRMKC, 2022).

1.2 Climate Change in Mozambique

Historical climate change	Projected climate change
Temperature	
▪ The mean annual temperature over Mozambique have increased at a rate of approximately 0.2°C/decade since 1961 to 2015 (Gutiérrez *et al.,* 2021) ▪ The frequency and intensity of hot extremes have increased and cold extremes have decreased (Seneviratne *et al.,* 2021)	▪ Mean temperature over the region are projected to rise until 2050 by at least 2°-2.5°C for a high greenhouse gas concentration scenario (SSP5-85) and 1,5°-2°C for low greenhouse gas concentration scenario (SSP2-4.5) (Gutiérrez *et al.,* 2021). ▪ Maximum and minimum temperature will increase, and heat waves will intensify in duration and peak temperatures for every increase in global warming levels above the pre-industrial values. In line with rising mean annual temperatures, the annual number of very hot days (days with daily maximum temperature above 35 °C is projected to rise and with high certainty (Gutiérrez *et al.,* 2021; Ranasinghe *et al.,* 2021; Seneviratne *et al.,* 2021)
Precipitation	
On average, precipitation has declined slightly since the 1960s, an average of 2.5 mm per month every decade. However, the number of days with heavy rainfall events have also increased by approximately 25 days a year (World Bank, 2022)	▪ Mid-century estimates (2040-2060) of annual precipitation changes over Mozambique indicate a reduction dominate by natural variability (Gutiérrez *et al.,* 2021) ▪ The frequency and intensity of heavy precipitation events are projected to increase with potential effects in flooding and soil erosion (Seneviratne *et al.,* 2021) ▪ Projected increases of average tropical cyclone wind speeds and associated heavy precipitation and of the proportion of category 4-5 tropical cyclones (Seneviratne *et al.,* 2021) ▪ Projected increase in meteorological droughts (Seneviratne *et al.,* 2021)

2. Priorities of the Movement and climate change

2.1 Scale up climate-smart DRR, early action and preparedness: DRR portrait

Existing Hydrometeorological Hazard	Projected Risks
Floods	
Along with flooding caused by cyclones and other high precipitation events, Mozambique is also vulnerable to weather that occurs in neighbouring countries which causes flooding downstream in the nine major river systems which drain in Mozambique. In particular, the central and southern regions of the country are more prone to severe floods (Government of Mozambique, 2003). Floods generally occur in the region's rainy season, with peak risk in January and February. For instance, in February and March 2000, the country saw its worst flood period in 50 years, caused by high precipitation through these cross-boundary river catchments, an event which killed over 800 people and displaced 540'000 (World Bank, 2010). Between 2000 to 2015, floods affected over 4.6 million people, caused 1204 deaths and damaged over one million houses (Government of Mozambique, 2015).	Heavy rainfall during the wet season is projected to be more intense because of the warmer atmosphere. Increases in the intensity and frequency of heavy precipitation is predicted to cause flooding and soil erosion (Gutiérrez *et al.,* 2021a, 2021b; Seneviratne *et al.,* 2021)
Droughts	
Droughts are the country's most frequent disaster, contributing to an estimated 4,000 deaths between 1980 and 2000 (World bank, 2010). These are especially common in the centre and South of the country where the return periods of officially declared droughts occur 4-10 years in the central region and 7-10 years in the south (World Bank, 2010 in Mozambique can be long lasting, regularly spanning three-to-four-year periods (Government of Mozambique, 2003). Floods can compound the impacts of drought years, notably on agricultural production. For instance, in the NDC, it is reported that droughts and floods in 2012-2013 caused a yield loss of over 216 745 ha (Government of Mozambique, 2015).	Droughts in the central and southern regions will likely increase in frequency and intensity. It is difficult to project any statistically significant changes in rainfall total, however delayed onset and offset dates of the rainy season may be more frequent, particularly in the North (Seneviratne *et al.,* 2021)

Existing Hydrometeorological Hazard	Projected Risks
Cyclones	
The cyclone season in the West Indian Ocean is from November to April. An average of 3-4 tropical cyclones impact Mozambique annually, causing significant impacts to lives, livelihoods, and infrastructure. In 2019, cyclone Dineo destroyed approximately 30,000 hectares of crops in Mozambique and displaced over 100,000 people in southern areas (Zambezian 2017). Most recently, in March and April 2019, cyclones Idai and Kenneth left over 2.2 million people in need of urgent assistance and killed hundred (OCHA 2019). The impacts of Idai and Kenneth are long lasting; in their 6th operations update of September 2020, the IFRC calculated that their response efforts had assisted over 407,372 people, and recovery efforts were on-going (IFRC 2020). The coastline of Mozambique is most frequently exposed to cyclones between October to April, areas especially in the areas between Pemba (Cabo Delgado) and Angoche (Zambezia) and also the southern areas of Sofala Province and the northern Inhambane Province. The number of tropical cyclones impacting Mozambique have increased since the 1960s (Government of Mozambique, 2015).	Projected increases of average tropical cyclone wind speeds and associated heavy precipitation and of the proportion of category 4-5 tropical cyclones (Seneviratne *et al.,* 2021)

It is essential to note that many of these hazards are interrelated and produced compound risks to the same areas and communities. In addition, risk must be understood as the interplay between hazard risk, exposure, and vulnerability which make certain communities, individuals, and sectors more impacted by the hazards. All project design should consider the risk mentioned above and the compounding risks they represent.

Disaster Risk Management Strategies

Mozambique's National Institute of Disaster Management (INGD) coordinated DRM activities in the country. The INGD works closely with the National Institute of Meteorology (INAM) and the Directorate for Water Resource Management to provide early warning systems and effective disaster risk responses. DRR has been embedded in national priorities since 2000 and the country has taken a proactive approach to reduce vulnerabilities of local communities, the economy and infrastructure to extreme events.

Disaster Risk Management Law and Policies

- Law 15/2014 Establishing the Framework for Disaster Management, Including Prevention and Mitigation. Serves as the framework for DRR and prepares the country to mitigate and respond to the impacts of climate change.
- The National Strategy for Adaptation and Mitigation of Climate Change (ENAMMC) (2013-2025) Aims to establish action guidelines for building resilience to the impacts of climate change, including the reduction of climate risks and promoting the development of low carbon and green economy.
- The Master Plan for Disaster Risk Reduction (2017-2030) Aims to align the country's DRR work with the Sendai Framework for DRR and responds to the provisions of Law No. 15/2014 which establishes the legal regime for management of disasters and climate change in Mozambique.

2.2 Reduce health impacts of climate change

Increased frequency and intensity of cyclones, floods and droughts, temperature rise, and changing precipitation patterns increase disease prevalence, injuries, loss of lives, and mental health challenges in Mozambique (Irish Aid, 2018). In addition, floods, cyclones and droughts lead to loss of crop yields, destruction of health infrastructure and contamination of water sources, causing significant health risks (Clim-Health Africa, n.d.). High population densities (in some areas), poverty, and poor access to health, sanitation and hygiene services compound the health-related impacts of a changing climate (Irish Aid, 2018).

With the rising temperature, vector-borne diseases, especially malaria, are expected to increase, even in previously unsuitable regions, such as the northern Tete and western Niassa provinces (Chemonics, 2018).

Other climatic risks that will affect health and wellbeing include malnutrition and hunger due to declines in crop yields and reduced water quality in the coastal areas due to sea-level rise and saltwater intrusion (Clim-Health Africa, n.d.). Lastly, climate change impacts also add to existing health burdens. For example, it may be challenging for the nearly 12% of the population who are affected with HIV/AIDS to cope with additional health risks posed by climate change impacts (Irish Aid, 2018)

2.3 Sustainable water: resources management, infrastructure and access

Water, Sanitation and Hygiene

Cyclones and floods pose a threat to water infrastructure and water quality as well as secondary impacts to water, hygiene and sanitation in Mozambique.

Higher temperatures and droughts due to climate change are also expected to increase evaporation rates and cause low groundwater recharge rates (Ministry of the Foreign Affairs of the Netherlands, 2018). These outcomes will lead to water shortages, especially in the drier southern parts of the country (USAID, 2021a). In addition, droughts also lead to a reduction in water quality (Murdas *et al.,* 2021). Along the coastal areas, saline intrusion will further jeopardise water quality, with the greatest impacts felt by the poor (Irish Aid, 2018).

Infrastructure, Power and Electricity

Projected sea-level rise and increase in coastal erosion will likely lead to water, sanitation and hygiene infrastructure damage, and reduce the availability of freshwater supply (Muradás *et al.,* 2021). Lastly, climate change-induced weather events and floods will cause damage to power infrastructure as droughts reduce the available surface water and hence, the hydropower generation potential in Mozambique (Uamusse *et al.,* 2020).

2.4 Enable climate resilient livelihoods and economic security

Most communities in Mozambique, especially those in rural areas, depend on natural resources and the environment for their livelihood activities and assets (Mucova *et al.,* 2021). Over 80% of the population are employed in a primarily rainfed agricultural sector, with the majority (90%) being women (USAID, 2021b; Manuel *et al.,* 2020).

In contexts such as Mozambique, women bear a disproportionate burden of climate change-related livelihood losses as men tend to migrate to other countries and metropolitain areas in search of better jobs (Ribeiro & Chaúque, 2010). In addition, an increased prevalence of tropical cyclones and intense rainfall events, with associated flooding, are expected to cause damages to agricultural infrastructure and crops (Bofana *et al.,* 2022). For example, in the first quarter of 2022, 91177 hectares of crops were lost due to cyclone Gombe, with negative consequences for food security and livelihoods (OCHA, 2022a). Droughts and declining reliability of rainfall will also cause productivity declines, especially in the semi-arid regions of the country (Hunter *et al.,* 2020).

Consequently, major crops such as maize, soya beans, sorghum and groundnuts will experience yield losses of between 17 and 25 percent (Manuel *et al.,* 2020; Ministry of the Foreign Affairs of the Netherlands, 2018). Though more resilient than crops, livestock farming will also be impacted during drought events (Hunter *et al.,* 2020). Moreover, animal parasites and diseases may increase due to climate change (USAID, 2021b).

The forest and fisheries sub-sectors are not spared from climate change impacts. Warming temperatures and droughts affect forest ecosystems through species loss and increasing vulnerability to forest fires (Irish Aid, 2018). Even the highly productive mangrove ecosystems in the coastal areas are threatened by climate hazards and coastal erosion (Charrua *et al.,* 2020). Yet, forestry sustains the livelihoods of about 12 million Mozambicans, providing them with essential goods and services such as timber and medicinal and edible plants (ibid, 2020). In the fisheries sub-sector, drought-induced water declines in rivers and lakes and temperature increases are expected to cause the greatest impact (von Hardenberg *et al.,* 2022). Here, marine heatwaves are becoming intense and longer in the biodiversity-rich Mozambican channel, negatively affecting people's livelihoods and the economy (Mawren *et al.,* 2022).

Finally, cyclones and floods destroy and inundate vital infrastructure, affecting livelihoods (UN-Habitat). For example, cyclone Gombe damaged 141,854 houses at the start of 2022 (OCHA, 2022a).

2.5 Address climate displacement and protection

Current and future displacement challenges

Mozambique is currently experiencing climate-induced migration in the south of the country while concurrently experiencing conflict-induced migration in the northern Cabo Delgado province. In 2021, 187,000 people were internally displaced due to the conflict although 50,000 also returned home due to improving security conditions (IDMC 2022). Storms and floods account for most climate-induced displacements, with around 44,000 people displaced due to them in 2021 (*ibid*.) In March 2022 Tropical Cyclone Gombe affected over 736,000 people, including IDPs and refugees (UNHCR 2022).

Out-migration from urban coastal areas is projected due to sea levels rise and as storms and flooding increases in frequency and severity (Irish Aid 2018, Oppenheimer *et al.* 2019). If the country continues to lack effective adaptation mechanisms, an estimated 916,000 people could be forced to move away from coastal areas with total annual damage costs have been estimated at up to $103 million per year in the 2040s (Irish Aid 2018).

One study found 70% of men and women attributed their migration to lack of food, drought conditions, or lack of water in their area of origin (CARE 2016). Similarly, other research found that rural-urban migrants in Beira, Mozambique, attribute weather to worsening economic conditions in their places of origin (Anderson and Silva 2020).

To minimise the need for migration, highly vulnerable cities and ports should be prioritised in adaptation efforts (Irish Aid 2018). Research has called for rights-based approach to participatory adaptation planning in Maputo to support a more inclusive city (Broto *et al.,* 2015).

Government relocation efforts to address people displaced by climate events have had mixed results, with attention paid to a lack of consultation and participation of those relocated (Jacobs and Almeida 2021).

Both flooding and drought will likely continue to cause displacement and labour migration within and outside of Mozambique. Research found an increase in male out-migration to South Africa and other countries since 2000 due to successive droughts (Ribeiro and Chaúque, 2010). Floods in Central Mozambique have increased rural-urban migration and placed additional pressure on informal urban settlements (Stal 2011).

Potential needs for migrants and displaced people

Qualitative research on rural-urban migrants in Beira, Mozambique, found that the majority prefer in situ adaptation over migration if enough sustainable livelihoods are available (Anderson and Silva 2020). This suggests a need to focus on sustainable in situ adaptation options, such as strengthening local economies and diversifying livelihoods to support people who choose not to migrate.

2.6 Policy

Relevant information from the Nationally Determined Contribution (2021)

Emission target: reduction of GHG emissions by about 40 million tCO2eq between 2020 and 2025. This would translate in emissions increase of 11% above 2015 levels; it is not compatible with a 1.5°C pathways (Climate Analytics, 2021). With a focus on Agro-livestock and Sustainable Land Use, Waste Management, Energy Security and Sustainability of Industries (Ministry of Land and Environment of Mozambique, 2021).

Area of focus on Adaptation: climate risk reduction; water resources; agriculture, fisheries, food security and nutrition; social protection; health; biodiversity; forests; and, infrastructure, urban areas, other settlements and tourist and coastal zones.

Inclusion of DRR: Yes, data and measures (Strengthening Climate Risk Preparedness, Response Capacity and EWAE system) on climate risk reduction are part of the NDC.

Ministry in charge: Ministry of Land and Environment

National Designated Entity: Presidency Center for Progress and Development of Iran

Key stakeholders: Ministry of Land and Environment has established the holding of a National Climate Change Conference (next one in 2023) every two years as a forum open to public participation on climate change.

The Initiative for Transparency in Climate Action implemented by UNEP-DTU supported on the transparency of the climate information integrated in the NDC.

The NDC Partnership 'Climate Action Enhancement Package (CAEP I and II)'.

Other National Policies on Climate

- National Strategy for Mitigation and Adaptation to Climate Change (2012) Aims to 'improve the wellbeing of Mozambicans through the implementation of concrete measures for adaptation and climate risk reduction, mitigation and low-carbon development, aiming at sustainable development'.
- Mozambique has not yet submitted a National Adaptation Plan.
- Mozambique's Long Term Low Carbon Development Strategy 2020 - 2050 and its National Adaptation Plan for the Health Sector are currently being developped (Ministry of Land and Environment of Mozambique, 2021).

Climate finance

A number of climate projects are taking place in Mozambique, including; a GCF project 'Climate-resilient food security for women and men smallholders in Mozambique through integrated risk management' (GCF, 2022), the UNDP project 'Scaling up Local Adaptation and Climate-Risk Informed Planning for Resilient Livelihoods' (UNDP, 2022) and the WHO project 'Strengthening the resilience of the Mozambique health system to climate change impacts' (WHO, 2018).

National societies cannot directly apply for climate finance from the GCF, but they can be an implementing partner for an accredited entity. (Climate Centre, 2022a).

National Societies can explore options for accessing climate funds through smaller funds, such as the GEF's Small Grants Programme or the FFEM's Small Scale Initiatives Program. These grants range from about $20,000 to $50,000 USD and are intended to support community-level initiatives. The GEF Small Grants Programme sits under UNDP and has a National Coordinator in each country. Some countries have National Climate Funds, which may be accessible to the National Society. Other funding from bilateral donors, national climate funds, or multilateral climate funds like Adaptation Fund, CREWS, or GCCA+ could be explored (Climate Centre, 2022a).

Engaging in national climate adaptation planning is vital for accessing climate finance.

Additional Resources

Climate Centre. (2022a). Factsheet on Climate Finance. https://www.climatecentre.org/wp-content/uploads/Fact-Sheet-on-Climate-Finance.pdf

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