# Sea level rise in Mozambique

## Trends and vulnerabilities

*This review aims to summaries some key findings from literature to provide an overview of sea level rise trends and vulnerabilities in Mozambique. However, as its scope is limited by time and available resources, the review will not cover all trends and vulnerabilities of sea level rise in Mozambique.*

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# 1. Introduction

Sea-level rise (SLR) is primarily driven by ocean warming and the melting of glaciers and ice sheets, both of which are direct consequences of climate change. Since 1880, global mean sea levels have risen approximately 20–23 centimetres, with the rate of increase over the past decade exceedingly twice that observed during the first decade of satellite records (1993–2002). Mozambique experiences sea-level rise rates above the global average, with projections indicating an increase of 0.5 to 1.0 meters by 2100, and under scenario SSP3-7.0, 0.75 metres (Climate Change Knowledge Portal, 2021; Trisos et al., 2022). Despite this growing global concern, research focusing on the specific impacts of SLR and adaptive responses in Mozambique remains limited.

## Geography and economy

Mozambique has a coastline of approximately 2,470 kilometres of coastline (CIA, 2025). It has a population of approximately 34.4 million, with around 40.2% (14.2 million) residing in urban areas (France Diplomatie, 2025; Mazuze, 2024). Coastal communities heavily depend on marine resources and agriculture, both of which are threatened by saline intrusion (Mazuze, 2024). Mozambique is one of the most vulnerable countries to natural disasters and climate change risks. It is ranked the 7$^{th}$ most disaster-risky country in the world and first in Africa (Bündnis Entwicklung Hilft, 2023). This is partly due to its geographic location and topography, particularly the low-lying hinterland and extensive coastline. The significant risks include land loss, coastal erosion, inland flooding, infrastructure damage, and disruption to economic activity, creating a strain on adaptation capacity (World Bank, 2025a).

The economy has faced persistent challenges since 2015, including the hidden debt crisis, cyclones, COVID-19, an ongoing conflict in the north, and the post-electoral unrest (World Bank, 2025b). Mozambique's economy remains heavily reliant on low-productivity subsistence agriculture, which employs approximately 70% of the population, most of whom live in rural areas (World Bank, 2025a). Although the country has experienced economic growth driven by the mining and natural gas sectors, this growth has not translated into sufficient job creation to significantly reduce poverty. Rural poverty remains widespread, and the labour market is dominated by the informal sector, which accounts for over 80% of employment (World Bank, 2025b).

# 2. Sea-level rise and associated risks

Mozambique is experiencing sea-level rise at rates exceeding the global average due to regional oceanographic processes and local land subsidence. The resulting coastal erosion, flooding, and saltwater intrusion are already impacting critical sectors such as agriculture, fisheries, and water supply.

## 2.1 Environmental risks

Over 60% of its population, more than 13 million people, live in low-lying coastal areas with rapid urbanisation to coastal cities (Hove et al., 2025). Rapid urbanisation in vulnerable coastal cities such as Beira, Maputo, and Quelimane is occurring with limited resilience planning, further heightening exposure to SLR (Agostinho Chavana, 2023). By 2030, approximately 176,000 residents of these low-lying areas are projected to face displacement due to SLR-related hazards, including flooding and land loss (Brown et al., 2010).

SLR, compounded by global warming, intensifies coastal hazards such as storm surges, tsunamis, and flooding (Trisos et al., 2022). Currently, large numbers of people live in coastal hazard zones exposed to storm surges, and Mozambique faces particularly high risks from tropical storms (Neumann et al., 2013). From 2000 to 2015, the percentage of Mozambicans exposed to flooding increased by more than 50% (Trisos et al., 2022). Projections estimate that by 2100, coastal flooding could affect up to 4.35 million people annually, the highest figure in Africa (Brown et al., 2010).

The anticipated rise in average sea levels will result in marked changes in coastal dynamics, including intensified erosion and coastline retreat. Northern Mozambique is expected to experience significant impacts on its economy, biodiversity, human habitation, and ecosystem services (Mucova et al., 2021). Land losses could reach 3,268 square kilometres, which would be over 40% of the coastal land area, with approximately 291 square kilometres of agricultural land at risk (Neumann et al., 2013).

Saline intrusion is another critical consequence of SLR, threatening freshwater resources and soil quality essential to coastal farming communities (Hove et al., 2025; Pandey et al., 2024). Approximately 291 square km is agricultural land (about 24% of costal agricultural land) is at risk for saltwater intrusion and flooding (Neumann et al., 2013). Saline intrusion can cause erosion on

the coast, affecting water resources, aquaculture, the viability of the coastal mangrove systems, and agricultural and residential land.

SLR will also alter biogeographical patterns, particularly threatening mangrove ecosystems, which provide vital coastal protection and biodiversity support. Mozambique hosts Africa's largest mangrove forest, covering over 300,000 hectares (UNEP, 2020). However, the mangroves are unlikely to naturally keep pace with the rapid sea-level rise (Saintilan et al., 2020). These ecosystems have declined by nearly 5% since 1996 (Santos et al., 2024) and suffered severe damage from events such as Tropical Cyclone Eline in 2000, which caused a 48% loss in mangrove cover (Trisos et al., 2022).

## 2.2 Infrastructure

Infrastructural damage is a significant concern regarding SLR. The long coastal plain and extensive low-lying areas expose more land and critical infrastructure to the risks of SLR. Lan loss, erosion, more frequent storm surges, and saline intrusion will all affect the critical infrastructure in various ways. Coastal cities like Beira, Maputo, and Matola are already highly vulnerable to storm surges and flooding and face heightened risks of land loss and of SLR. The critical infrastructure, such as hospitals, roads, bridges, ports, and power supply systems, is at risk of damage or disruption, threatening essential services.

The rural-urban urbanisation will lead to greater exposure of SLR risks (UN Habitat, 2023). As a result, around 3 million people are increasingly exposed to rising sea levels, and people living in informal settlements are especially at-risk (PreventionWeb, 2022). For example, in Maputo, around 80% of the population lives in informal housing with major infrastructure deficits in water supply, sanitation, solid waste management, energy, roads, and communication networks (Cabrita et al., 2024).

Educational infrastructure is also at risk. Around 70% of schools in Mozambique are in high-risk zones for one or more hazards, including flooding and storm surges. Annually, natural disasters cause more than US$2 million in damage to school infrastructure, which is impacting around 540 classrooms and 57,000 students (World Bank, 2023). The compounding effects of SLR on storm surges and flooding could push these losses even higher.

Furthermore, Mozambique's storage and drainage infrastructures are insufficient to buffer against cyclones, floods, and droughts (World Bank, 2023). This also hampers the minimisation of the impact of the country's high-water dependency. SLR also, indirectly, threatens the stability of Mozambique's energy sector, particularly hydropower (World Bank, 2025a). More frequent floods and erosion affect the reliability of hydropower generation. This could have implications for the Cahora Bassa hydropower plant (currently operational) and the Mphanda Nkuwa project (planned), which are key sources of the country's electricity (World Bank, 2023).

## 2.3 Economy

The economic implications of SLR can be far-reaching. The economic implications include land loss, damage from extreme flood or storm events, and degradation of infrastructure and social systems, all of which threaten economic development (Brown et al., 2010; Hove et al., 2025). Such impacts disrupt economic activities and exacerbate Mozambique's already limited capacity to adapt to climate risks (Hove et al., 2025).

Economic sectors like agriculture, fishing, and tourism will be affected by climate change and the SLR. About 80% of the country's population depends on agriculture as their primary source of income (among the highest proportions in the world) (FAO, 2025); together with forestry and fisheries, it accounted for 27.5 percent of total GDP in 2021 (World Bank, 2023). The high reliance on natural resources makes Mozambique extremely sensitive to climate change risks, including SLR (ACF & IFPRI, 2023). It is projected that climate change will increase agricultural and fisheries climate risks due to ecological degradation and more frequent and intense droughts, floods, and cyclones, particularly affecting cashews and coconuts (FAO, 2025).

Infrastructure damage, alongside the projected coastal erosion, may severely affect the tourism sector (ACF & IFPRI, 2023). Mozambique's coastline, known for its coral reefs, mangroves, dunes, and sandy beaches, supports biodiversity and attracts millions of tourists annually (Mazuze, 2024).

Climate change-related damages to critical infrastructure, such as ports, and to major cities would have knock-on implications for various sectors and the economy as a whole (ACF & IFPRI, 2023). The nation's three major deep-water seaports, Maputo, Beira, and Nacala, are important for trade and economic activity (World Bank, 2023). SLR poses a threat to port infrastructure,

potentially disrupting shipping and trade. Additionally, rising sea levels and temperatures are projected to intensify coastal winds and storms, further complicating port operations and maritime navigation (Detelinova et al., 2023).

## 2.4 Social and health risks

Sea level rise also poses a threat to social and health risks. Lead to loss of livelihoods, displacement, lack of essential services, food insecurity, and so on. Around 3 million people are increasingly and directly exposed to rising sea levels. However, the indirect consequences heighten the number (PreventionWeb, 2022).

Mozambique's coastal regions are increasingly vulnerable to saline intrusion, a process where rising sea levels push saltwater into freshwater systems. This intrusion contaminates aquifers used for drinking water and irrigation, even with minor increases in sea level (Winthrop et al., 2018). As a result, agricultural lands along the coast are becoming less productive, threatening food security for communities that rely on subsistence farming (PreventionWeb, 2022). The contamination of water sources also poses serious health risks for coastal residents, which can lead to waterborne diseases or gastrointestinal illnesses and skin infections (João Bambaíge et al., 2008).

Today, 5 million people in Mozambique are estimated to be food insecure, requiring urgent humanitarian support (WFP, 2025). This crisis is likely to worsen due to a combination of climatic shocks, saline intrusion, conflict, and the depletion of food reserves (ReliefWeb, 2025). In addition, disruptions to the road network, caused by erosion, land loss, and storm surge, are limiting access to domestic markets, increasing post-harvest losses, and further undermining food availability (ReliefWeb, 2025). Coastal fisheries, which depend heavily on coral reefs, are also at risk. These fisheries provide livelihoods for 6.6 million people and supply half of the nation's animal protein, making their vulnerability a critical concern for both nutrition and economic stability (ACF & IFPRI, 2023).

In April 2025, more than 461,745 people were internally displaced due to conflict in the northern provinces (ReliefWeb, 2025). Simultaneously, 138,000 people have been displaced due to floods and cyclones, underscoring the country's vulnerability to climate-related disasters (IDMC, 2025). While local integration remains the most common solution for internally displaced

persons (IDPs), many have relocated to districts such as Metuge and Mocímboa da Praia in Cabo Delgado (IOM, 2025). These resettlement zones are located in coastal or low-lying regions, making them increasingly susceptible to SLR. Adding the environmental aspect to the already complex challenges of displacement further deepens the vulnerability of IDPs (IOM, 2025).

Continuing, there are many physical consequences to SLR, including: eroded roads, damaged building foundations, backflowing sewers, and leeching septic systems. This can increase the risk of waterborne diseases. These infrastructure failures, compounded by flooding and storm surges, pose serious public health risks (PreventionWeb, 2022).

# 3. Adaptation measures

There is little research on specific adaptation strategies for SLR in Mozambique. Nonetheless, enhancing adaptive capacity, including climate-resilient infrastructure, is recognised as essential (Hove et al., 2025; Macamo, 2021; Mucova et al., 2021). The experience of Cyclone Idai highlighted the importance of effective early warning systems to help communities prepare for imminent hazards. Although there have been improvements in weather forecasting and preparedness, challenges remain due to limited financial resources, human capacity, and investment in climate adaptation (Hove et al., 2025; Macamo, 2021).

The Government of Mozambique has initiated several policy frameworks addressing climate change. They adopted a national-level climate change policy, the National Climate Change Adaptation and Mitigation Strategy (2013–2025), which provides a framework for mainstreaming climate resilience across key sectors. Similarly, an updated Nationally Determined Contributions (NDCs) has been updated, committing to increase adaptation efforts, especially in coastal zones (ACF & IFPRI, 2023). The national institute for disasters management has a legal foundation for disaster response. The main legal and guiding instruments are the National Policy on Disaster Management (1999), Act no. 15/2014 - Disaster Management Act (2014), and the Master Plan for Disasters Prevention and Mitigation 2017-2030 (SADC, 2020). Despite the frameworks, studies find that the implementations remain weak and underfunded.

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