

TANZANIA COMMISSION FOR SCIENCE AND TECHNOLOGY

POLICY BRIEF

How Does the Climate Change Impact the Economics of Zanzibar?



**Policy Brief: How Does the Climate Change
Impact the Economics of Zanzibar?**

INTRODUCTION

1. Climate Change and Islands' Ecosystems-Overview

Global climate change poses unprecedented challenges to all aspects of development. Although small islands communities contribute the least (< 1 %) to the problem of global climate change mainly emission of green house gases, it is evidently that they are among the most vulnerable to its adverse effects sea-level rise and beach erosion in particular.

Even if the effects of the threat will vary regionally, sea-level rise of the magnitude currently projected (~ 5 mm yr-1) is expected to have disproportionately great effects on the economic and social development of many small island ecosystems . Coastal land loss already is projected to have widespread adverse consequences. Indeed, it has been argued that land loss from sea-level rise, especially on atolls and low limestone islands, is likely to be of a magnitude that would disrupt virtually all economic and social sectors in these countries.

Small islands communities contribute the least (< 1 %) to the emission of green house gases. However it is evidently that they are among the most vulnerable to its adverse effects on socio-economical aspects

Coastal ecosystems are severely suffering in response of climatic changes. Coastal resources such as corals and mangroves are projected to experience serious impacts as a result of elevated

Granger, O.E., (1997): Caribbean island states: perils and prospects in a changing global environment. Journal of Coastal Research, 24, 71 94.

sea surface temperatures (SSTs). Beach erosion and coastal landslides, flooding, and salinisation of coastal aquifers will be widespread. Moreover, protection costs for settlement, critical infrastructure, and economic activities that are at risk from impacts of climate change will be burdensome for many small islands like Zanzibar.

2. Climate Change and Zanzibar Economy

The current climate and current costs of climate variability

- The economy of Zanzibar depends on the weather and the climate. The islands are also affected by the regional patterns of extreme weather, which lead to major events such as floods, droughts and storms.
 - Temperature has been rising over the last thirty years on both islands (i.e Unguja and Pemba), with a strong increase in average and maximum temperatures. There are evidences of changes in rainfall variability, and there have been higher rainfall intensity events recorded in recent years. Extreme events are intensifying. The most extreme cases of temperature, heavy rainfall and wind speeds on record on the islands have all occurred over the last ten years.
 - Zanzibar Island ecosystems strongly depend on the marine and coastal environment. The data in Zanzibar shows increasing wind speeds, wave (sea surface) heights and high sea water levels. This could be linked with severe coastal erosion coupled with socio-economic drivers (i.e. loss of mangroves, over abstraction of water, coral reefs degradation etc).

➤ **The impacts and economics costs of future climate change;**

Future climate projections for the medium-long (2040-2060) and long-term (2080-2100) have been analyzed, using statistically downscaled global modeling for Zanzibar.

The key findings are:

- **Temperature:** The climate models project significant increases in average temperature for Zanzibar, with increases in maximum monthly temperature of 1.5 to 2°C by the 2050s (2045-2065) and 2 to 4°C by the 2090s (2081-2100), with a fairly similar increase across the months of the year.
- **Rainfall:** There are consistent trends projected of increasing rainfall during the Mar-May wet season, as well as an increase in January and February. There is also a trend of decreasing rainfall during the dry season (June – October).
- **Extreme events:** The models indicate an intensification of heavy rainfall, especially during the rainy season, and thus greater flood risks. The models also indicate an increasing intensity of dry spells during the dry season. It is important note that
- **Sea level rise:** This is a critical issue for Zanzibar. The global average sea level rise increases ranges between 0.2metre and 0.6 m. For the next century, the level could be 1m or even more. For the Zanzibar context, there is a need to study more factors such natural land up lift or subsistence to give relative sea level rise. Currently,

there is insufficient data on these and other trends for the islands.

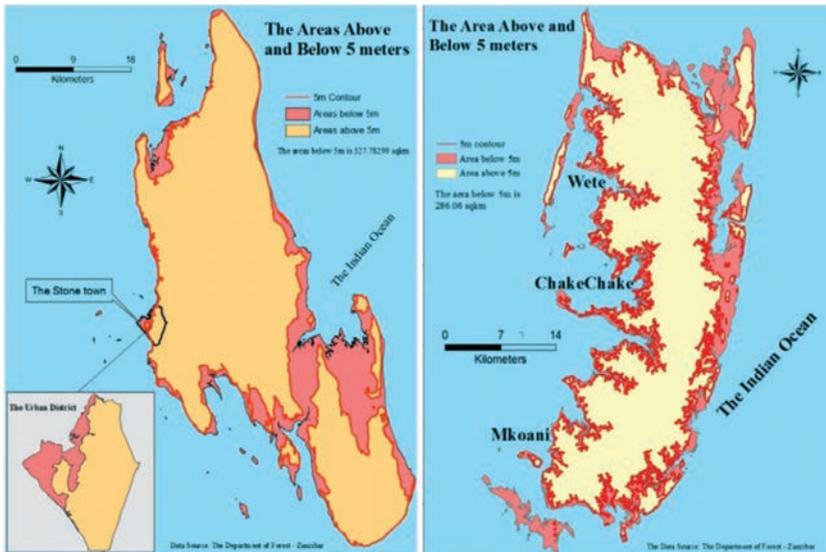


Fig. 1: Low lying areas having risk of flooding

- The maps (Fig. 1) represent land area most at risk from major storm surges and high tides (which are likely to increase with sea level rise) – but it is stressed that the area that will be inundated will be much lower (as sea level rise is only likely to rise by 0.3 to 1 metre over the next century). The mapping of the country shows large low-lying areas. For Unguja, around 328 km² is below the 5 metre contour line and for Pemba around 286 km² is below the 5 metre contour line. This equates to 19.7 % of Unguja and 28.9 % of Pemba. Similarly, the population in these zones has been estimated. For Unguja, around 224 000 people live below the 5 metre contour line (29%) and for Pemba, the number is higher at around 281 000 (54%). This highlights that a high proportion of people and assets (homes) are likely to be concentrated in many of these at-risk areas. These maps can identify areas at risks,

and help prioritise potential adaptation, however further work to improve the resolution of mapping is recommended. They can also provide important information on vulnerable areas, which are important for spatial planning and development, allowing the most at risk areas to be avoided, and thus reducing future risks.

- **Sea temperature and ocean acidification:** These include rising sea temperatures and ocean acidification, the latter arising from the absorption of atmospheric CO₂ levels and decreasing seawater pH. These will lead to impacts on marine ecosystems, particularly carbonate organisms including building reef corals.

- **Socio-economic projections and climate screening of development**

Socio-economic dynamic is very crucial for considering the vulnerability change in Zanzibar over future decades. This includes population trends and economic development, development policies and plans of Zanzibar.

- **Population**

The current population of Zanzibar is around 1.3 million people with growth rates of around 3%, which implies a population of over 2 million by 2030. There is also likely to be high urbanization trends. The population growth is likely to increase future vulnerability and climate risk such as shifting marginalized areas which have higher risks, e.g. low lying areas are risk of flooding (Fig. I). It is also likely to increase pressures on all the sectors such as natural resources use, water abstraction, land-use pressures, energy consumption, etc.

➤ **Economic development**

The current Zanzibar economy is highly reliant on natural resources and ecosystems. The Vision 2020 sets out the future planned direction, with high growth rates, a strong growth in tourism, and a move into modern sectors. These changes will introduce new pressures which climate change will act upon.

➤ **Climate change economic cost at glance**

The increased intensity of extreme events is leading to impacts with high economic costs.

- The highest ever recorded precipitation event on the island was recorded in 2005, with flood that seriously damaged at least 1,000 homes and displaced 10,000 people. The event caused economic loss of about \$1 million equivalent to 0.2% of Zanzibar's GDP.
- Heavy rainfall events in 2011 also led to the damage of road infrastructure in Pemba. Low and erratic rainfall in 2006/7 on the islands led to a major crop failure. The contribution of agricultural crops to GDP on the islands was significantly lower in 2007, and was a strong factor in reducing GDP (by several %).
- The crop failures in 2007 also led to a large-scale hunger crisis in 2008, which affected over 20% of the population (300,000 people). The health costs of this failure (using prevention costs as a proxy) have been estimated at \$ 5 – 7 million, equal to 1% of Zanzibar GDP.

3. What should be done? Policy implications

The study has recognized the existing a number of climate change related policies such as Environment Policy and Disaster Management Policy. These policies are very useful in minimizing the impacts of climate change in the Isles. Based on the above analysis, Zanzibar Government efforts towards combating the impacts of climate change could be benefit by enriching the following policy recommendations:

- Strengthen the existing climate change related policies and disaster risk reduction plans to work more effectively. The dynamics i.e. changing patterns of trends and extremes should be considered.
- Zanzibar has an existing adaptation deficit associated with current climate extremes. It is therefore important to reduce current economic losses (from current variability) as well as providing greater resilience to future climate change.
- Enhance the institutional capability and resources of the State University of Zanzibar (SUZA), Zanzibar Meteorological Agency, Institute of Marine Sciences, and other related academic institutions looking at meteorological data (both terrestrial and marine), and to improve data collection and interpretation.
- Install additional meteorological stations, tide gauges and sea temperature loggers, as well as support and train more human resources. These systems need to be put in place now, to allow sufficient baseline data collection, and to provide a time series of observational changes of climate change over coming years.

- Establish early warning system in Zanzibar and involving all stakeholders in disaster management activities. Warning systems could also be further developed and tested to make them more effective. It is important to ensure the communication and dissemination of information is effective and reliable, so that early warning information reaches (and is understood by) the range of potential users (fishermen, communities at risk, farmers, etc.).
- Strengthen the existing institutional and legal frameworks with capacity building within Ministries and Departments across government in the areas of agriculture, health, and emergency services.
- Improve the collection, analyse and dissemination of DRR information (using risk maps for example), and for capacity building and training for responses, for local and district level.
- Improve sectoral plans and policy, a particular important area is for land-use, spatial planning and major/critical infrastructure siting, where risk mapping would allow the reduction of current and future exposure to extreme events (e.g. from flooding).
- Start planning for the potential increases in extreme events that may arise, i.e. the changes in likelihood and magnitude of events, and to mainstream climate change.

This brief is based on the report entitled “The Economics of Climate Change in Zanzibar” (<http://www.economics-of-cc-in-zanzibar.org/>) compiled by The Global Climate Adaptation Partnership (GCAP) UK, in collaboration with the State University of Zanzibar (SUZA) and Institute of Marine Sciences-UDSM, for the First Vice President’s Office of Revolutionary Government of Zanzibar by Prof. Mohammed Sheikh, Paul Watkiss and Dr. Hassan Mshinda. Mohammed Sheikh is from SUZA, Paul Watkiss is from GCAP and Hassan Mshinda is the Director General of COSTECH.

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