



Climate Change Adaptation in TANZANIA

Severe weather events, such as droughts, floods, and storms, have historically imposed heavy costs in Tanzania. The projected impacts of climate change are likely to add to the toll, resulting in significant consequences for key development areas that could potentially hamper further development. In recognition of this fact, the Government of Tanzania and the donor community have already initiated activities to determine vulnerability and adaptation priorities. However, a number of adaptation needs remain, including integrating climate change into the country's strategic vision, determining priorities for key sectors such as agriculture and food security, and developing a National Climate Change Strategy that is linked to sectoral objectives. Accomplishing these priorities will require overcoming existing key barriers pertaining to data availability and accessibility, as well as the limited capacity to predict future climate change and assess sector impacts.



Map of Tanzania. Source: Encyclopedia Britannica

CLIMATE IMPACTS AND VULNERABILITY

Historic Weather and Climate

- Temperatures have risen by about 1.0°C since 1960, an average of 0.23°C per decade.
- Annual rainfall has decreased at an average rate of 3.3 percent per decade.
- Precipitation patterns have become more unpredictable, with an increase in the amount of precipitation falling in isolated events.
- Sea surface temperatures of the Indian Ocean have risen 1°C since 1950.

Projected Weather and Climate

Most climate models project for Tanzania:

- An average increase of 1.0-2.7°C in annual temperatures by the 2060s, and of 1.5-4.5°C by the 2090s.
- Projected changes in annual precipitation by the 2060s range from a decrease of 1 percent to an increase of 18 percent from the 1970-99 average.
- A larger percentage of precipitation is anticipated to fall in heavy rainfall events.
- A rise in sea level of 0.75-1.90 m by 2100.

KEY SECTOR VULNERABILITIES

Food Security

Climate change can influence food security both directly and indirectly, with implications for the availability and accessibility of food. Mixed rainfed and highland perennial systems in the Great Lakes region and other parts of Eastern Africa are expected to be severely affected by climate change, with increased variability and warmer temperatures of greatest concern, resulting in crop yield declines for these areas. A recent study estimates that an increase in temperature of 5°C in Eastern Africa may lead to a production decline of nearly 20 percent by the 2090s. Other climate (e.g., inundation and salinization due to sea level rise, damage to or destruction of crops due to storms) and non-climate (e.g., erosion, resource governance issues) stressors may exacerbate food security impacts related to climate change. Adaptation measures can help to mitigate the negative impacts of climate change on agriculture and food security. Tanzania's National Adaptation Programme of Action (NAPA) includes the following priorities:

- Make better use of climate and weather data, weather forecasts, and other management tools, and expand the climate and weather data collection network
- Create awareness on the negative effects of climate change
- Increase the use of manure and fertilizer
- Improve range management for livestock production
- Implement drip irrigation for specific regions
- Control pests, weeds, and diseases
- Enhance biological control of tsetse fly
- Promote indigenous knowledge

Water Resources

In Tanzania, a significant degree of variability already exists in the availability and accessibility of water throughout the country, depending on topography, rainfall patterns, and climate. In terrestrial water sources, such as lakes Tanganyika, Victoria, and Turkana, the observed links between inter-annual lake level fluctuations and rainfall suggest the possibility of future water stress due to climate variability. The Tanzania NAPA, which is based on stakeholder consultations, ranks water resources among the top three sectors of concern. The water sector is further affected by a number of non-climate stresses such as poor management, inadequate infrastructure, and pollution, all of which further contribute to the unreliability of water supply and quality. Climate-related impacts are likely to exacerbate these. The NAPA cites changes in runoff in river basins, encroachment into stream ecosystems, and water logging due to increased water flows as possible impacts. Through these impacts, climate change can affect both water quantity and quality, with implications for the availability and accessibility of water resources for human consumption as well as for agricultural, industrial, and energy production use.

Health

Current climate variability also affects health in Tanzania, and climate change is likely to impose new stresses, resulting in a number of direct and indirect impacts (summarized below).

Impact Mode	Impacts	Consequences
Direct	<ul style="list-style-type: none"> Exposure to thermal extremes, especially heat waves. Altered frequency and/or intensity of other extreme weather conditions (droughts, floods, storms, etc.). 	<ul style="list-style-type: none"> Altered rates of heat- and cold-related illness, especially cardiovascular and respiratory diseases. Deaths, injuries, and damage to public health infrastructure.
Indirect (due to disturbances of ecological systems)	<ul style="list-style-type: none"> Effects on ranges and activity of vectors and parasites. Altered local ecology of water- and food-borne infective agents. Altered food (especially crop) productivity due to changes in climate, weather, and associated pests and diseases. Shifts in the quality, quantity, and distribution of fresh water. Sea level rise with population displacement and damage to infrastructure. Increased levels and biological impacts of air pollution, including pollens and spores. Social, economic, and demographic dislocations due to adverse climate change impacts on the economy, infrastructure, and resource supply. 	<ul style="list-style-type: none"> Change in geographic ranges and incidence of vector-borne diseases. Changed incidences of diarrhea and infectious diseases such as cholera. Regional malnutrition and hunger with consequent impairment of child growth and development, especially in vulnerable communities. Injuries, increased risk of various infectious diseases (due to migration, overcrowding, contamination of drinking water). Asthma and allergic disorders, other acute and chronic respiratory disorders and deaths. Wide range of consequences affecting public health (e.g. mental health, nutritional impairment, infectious diseases, civil strife).

Malaria is currently the leading cause of death in Tanzania, accounting for 16 percent of reported deaths. Climate change may magnify the rate of malaria incidence by producing an environment conducive to vector breeding. In addition, the incidence of malaria may increase at a higher rate in highland areas, where prevalence of the disease has previously been low. The communities in these regions are likely to have greater sensitivity to malaria, due to their relative lack of previous exposure and limited immunity. Their adaptive capacity to cope with malaria may also be weak, as a result of poverty and health systems inadequately equipped to deal with the disease. An important part of responding to these challenges will be monitoring the non-climate impacts affecting adaptive capacity such as poverty and the quality and accessibility of the Tanzanian health system.

KEY ECOSYSTEM VULNERABILITIES

Coral Reefs

Coral reef ecosystems and the resources they harbor are critically important as habitats for biodiversity, sources of food, providers of ecological services, and major tourist attractions. They also help protect the shoreline from damage by storms. Coral reefs are already under significant stress from non-climate and climate change stressors, and extensive coral bleaching has occurred in various areas. For example, in 1998, up to 50-90 percent of reefs were bleached in Tanzania and Kenya. Factors contributing to impacts on coral reefs include:

- Higher ocean temperatures, together with pollution and other impacts, can cause coral bleaching.
- Rising sea levels can change periods and degrees of exposure to light, thus affecting the photosynthetic species.
- Ocean acidification due to rising carbon dioxide concentrations may adversely affect corals and other marine calcifiers such as shrimp and crabs, and could ultimately exert significant pressure on the composition, distribution, and productivity of ecosystems.
- Continued human impacts such as destructive fishing practices, over-fishing, coral mining, damage from boats, and dredging are likely to exacerbate climate change stresses.
- Increased storminess can cause more physical damage to reefs which may take longer to recover. Loss of reefs can exacerbate the damage caused by storms on beaches, mangroves, and coastal settlements and infrastructure.

Mangroves

The natural resources and ecosystem services provided by mangroves support the well-being and livelihoods of the communities that rely on them. These ecosystems also serve as important buffers to climate change impacts such as storms. Mangroves in Tanzania, such as those in the Rufiji Delta, are among the most vulnerable in the world, and the 73,500 ha of mangroves in the Rufiji-Mafia-Kilwa Seascape and associated coral reefs support livelihoods in areas such as fisheries (prawn and fin) and forest products (timber and poles) for a significant portion of the delta's population. Remote sensing change detection from 1991 and 2000 conducted by World Wildlife Federation in the delta shows that mangrove cover has been reduced and replaced largely by agricultural or open land. Both climate and non-climate stressors have contributed to these shifts. Non-climate stresses include land use changes, building of dams, cutting and clearing of mangroves to establish areas for aquaculture, tectonic activity, and subsidence.

Grasslands

Grasslands comprise approximately 40 percent of Tanzania's total land area, and are important for livestock cultivation. Intensive grazing has already caused a shift in foliage species composition. Climate change may further decrease foliage coverage, reduce carrying capacity, and diminish crude protein content in plants. These changes can have implications on milk and meat production in livestock, and may create the need for provision of protein feeds as supplements. This can result in an increase in costs of livestock production and a decrease in the availability and accessibility of dairy and meat products. Furthermore, shifts in temperature and precipitation may exacerbate these impacts by producing conditions that are increasingly favorable for diseases and pests that plague livestock.

Woodlands

Woodlands, including both forests and miombo woodlands, are the dominant vegetation type in Tanzania, and comprise 50 percent of the total land area. Woodlands are important for their biodiversity, natural resources, and ecosystem services, which support the health and well-being of the communities that depend on them as well as of the greater economy. Woodlands are already under threat from a number of non-climate pressures, including the clearing of land for agricultural use, shifting and slash and burn cultivation, and harvesting of fuelwood at a rate faster than that of regeneration. Anticipated climate change impacts, including reduction of woodland cover and shifts in forest types, species, and distribution, may exacerbate these non-climate stressors, further threatening woodland ecosystems.

NATIONAL STRATEGIES, PLANS, AND INSTITUTIONS RELEVANT TO CLIMATE CHANGE

National Strategies and Plans

- Initial National Communication (2005): Covers both mitigation and adaptation, and includes information on greenhouse gas emissions, mitigation options, vulnerability assessments of key sectors, potential adaptation measures, and the policy and institutional context for responding to climate change.
- NAPA (2007): Assesses climate change related vulnerabilities in various sectors that are important to the economy of Tanzania.

Institutional Framework

- National Climate Change Committee (NCCC): Advises the Department of the Environment on climate change related issues.
- Centre for Energy, Environment, Science, and Technology: Houses the secretariat of the NCCC and offers technical and administrative support to the NCCC and climate change study teams.
- Tanzania Meteorological Agency: Provides meteorological data as well as climate information and predictions to inform the country's planners.

Government Adaptation Priorities

The NAPA provides both a prioritization of sectors vulnerable to climate change and a set of six priority projects, listed in the box below.

NAPA Prioritization of Sectors		NAPA Priority Projects
Agriculture and food security (including livestock) (1) Water (2/3) Energy (2/3) Forestry (4) Health (5)	Wildlife (6/7) Tourism (6/7) Industry (8) Coastal and marine resources (9) Human settlements (10) Wetlands (11)	1.) Improving food security in drought-prone areas by promoting drought-tolerant crops 2.) Improving water availability to drought-stricken communities in the central part of the country 3.) Shifting of shallow water wells from areas affected by inundation in the coastal regions of Tanzania mainland and Zanzibar 4.) Adapting to climate change through participatory reforestation on Mount Kilimanjaro 5.) Implementing community-based mini-hydro for economic diversification as a result of climate change 6.) Combatting malaria epidemics in newly mosquito-infested areas.

Little progress has been made on the implementation of these projects or on integrating climate change into development and sector strategies and plans. Thus, ongoing priorities for Tanzania include:

- Integrating climate change into the country's strategic vision.
- Identifying priorities for key sectors such as agriculture and food security.
- Developing a National Climate Change Strategy that is linked to sectoral objectives and draws the necessary linkages between adaptation and low emission growth opportunities, particularly related to reducing emissions from deforestation and forest degradation.

Key Players and Initiatives

A number of adaptation-specific activities have been funded and implemented by bilateral donors, multilateral agencies and development banks in Tanzania (see below). Donor funded activities have tended to focus on documenting vulnerability in specific sectors, identifying and assessing possible adaptation measures, and developing action plans. Very little progress has been made on implementing adaptation. There are also a number of activities seeking to address non-climate stressors in various sectors that are important for adaptation, although their adaptation benefits are not explicitly monitored or evaluated.

Title	Lead Organization	Funding Source
Mainstreaming Climate Change in Integrated Water Resources Management in Pangani River Basin	United Nations Development Programme (UNDP)/Ministry of Water/Pangani River Basin Board	Global Environment Facility – Small Grants Program, Special Climate Change Fund
Community Based Adaptation to Climate Change in Africa	International Development Research Centre, Canada (IDRC)	Climate Change Adaptation in Africa (CCAA)
Managing Risk, Reducing Vulnerability and Enhancing Productivity under a Changing Climate	IDRC	CCAA
Improving Smallholder Livelihoods through Woodlots Management: An Adaptation to Climate Variability and Change in Makete District, Tanzania	UNDP/United Nations Environment Programme	Climate Change Adaptation and Development Initiative

Priority Challenges and Constraints for Addressing Vulnerability and Increasing Resilience

Tanzania faces a number of adaptation-specific needs, including:

- Increasing the capacity to develop, design, and implement financing proposals and projects that meet donor requirements.
- Increasing the availability of sufficient and reliable meteorological data and information as well as up-to-date data collection and processing systems and data dissemination facilities.
- Filling gaps in analyses of climate impacts, their consequences for communities, ecosystems, and economic sectors, and potential adaptation measures.
- Increasing availability and accessibility of scientific data to policymakers and planners.

Addressing these constraints and needs will be essential in enabling Tanzania to move beyond assessments, strategies, and pilots to adaptation implementation that supports long-term climate-resilient development.

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