



Climate Change Adaptation in EAST AFRICA

The East Africa region is comprised of the countries of Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, South Sudan, Tanzania, and Uganda. The countries of the region are already subject to climate variability and extremes including droughts and floods, which in some cases have had severe economic and social implications. Climate models predict that the region is likely to experience both near-term alterations in climate such as warmer temperatures, changes in the frequency and intensity of extreme events, and decreased precipitation, as well as long-term shifts such as sea level rise. Projected climate change impacts are likely to add to the toll of current climate variability and extremes, increasing the vulnerability of communities that depend upon natural resources for their well-being and livelihoods, and resulting in significant consequences for key development areas. In recognition of this, at the national level, activities have been initiated to identify adaptation priorities. However, a deeper understanding of climate change impacts, vulnerabilities, and adaptation options is required to action these priorities and to inform the integration of climate considerations into development and sectoral strategies and plans. At the regional level, research initiatives to strengthen capacity to generate, disseminate, and use climate data and information has been a significant emphasis. As initiatives proliferate throughout the region, coordination will become increasingly important.



Map of East Africa. Source: Encyclopedia Britannica

CLIMATE IMPACTS AND VULNERABILITY

Historic Weather and Climate

Observations indicate:

- The region has seen a general warming trend in mean annual temperatures since 1960, ranging from approximately 0.7°C (Rwanda) to 1.7°C (Eritrea).
- Annual rainfall throughout East Africa has largely decreased since 1960, while variability has increased.
- The region has been subject to more frequent and intense rainfall events, floods and droughts in recent decades.
- Indian Ocean surface temperatures have increased by 1°C since 1950.
- Sea level rise in the region is variable, depending on factors such as atmospheric pressure, wind regime, river runoff, and ocean temperatures.

Projected Weather and Climate

Projections for East Africa vary across models depending on assumptions. However, models suggest:

- Temperatures are predicted to be between 1.8-4.3° C higher than the 1980-99 mean by 2100.
- By 2100, average annual precipitation may increase throughout East Africa by 2-25 percent relative to a 1980-99 baseline.
- There may be greater variability and extremes as well as a larger percentage of precipitation falling in heavy events in a number of countries in the region (Ethiopia, Kenya, Rwanda, Tanzania, and Uganda).
- Sea level rise by 2100 may range from 0.75-1.9 m.

KEY SECTOR VULNERABILITIES

Food Security

Climate change impacts in East Africa are anticipated to result in a range of direct and indirect impacts affecting food security. By 2050, high temperature stress of 30°C or above is likely to become more widespread in East Africa. For crops such as maize that are sensitive to even a few days of high temperatures, a rise of one or two degrees may reduce productivity and crop yields. This may affect food security, as maize accounts for a significant proportion of daily calories per capita in Burundi (13.1 percent), Ethiopia (19.5 percent), Kenya (33.3 percent), Tanzania (25.7 percent), and Uganda (9.3 percent). A projected decrease in reliable crop growing days a more important indicator for rainfed agricultural crops, throughout East Africa, may also reduce the productivity of rainfed agriculture

in these countries. Anticipated changes in the frequency and intensity of droughts may further exacerbate these conditions. Given the significant percentage of the region's population that depends on agriculture for their livelihoods, these impacts will not only affect food supply, but also access to food, directly in the case of subsistence/rain-fed agriculture as well as indirectly through changes in income. These impacts are likely also to exacerbate and be exacerbated by other existing environmental, social, political, and economic stresses.

Water Resources

East Africa's transboundary rivers and lakes support the health and livelihoods of millions of people, and underpin activities in hydropower production and primary economic sectors such as agriculture. The current unevenness of distribution of water resources in the region, as well as climate and non-climate stresses contribute to competition for water. Non-climate stresses likely to be intensified by climate change include susceptibility to erosion due to reduced vegetation caused by population pressures, loss of forest cover in upper catchments and along rivers, unsustainable agricultural practices, pollution from wastewater and sewage, and mining activities.

Climate change impacts such as greater incidence of heavy rainfall events in Kenya, Uganda, and Tanzania may further aggravate the effects of erosion, siltation, and sedimentation, potentially making these areas highly vulnerable to flooding. Greater intensity and duration of droughts are also likely to play an important role in determining water quantity and quality in the region. Reduced surface- and groundwater levels associated with prolonged and severe droughts can have ramifications for sectors critical for national development such as power generation and industrial production. The warmer temperatures and increased rainfall variability that are projected to occur with climate change are also likely to affect water resources in East Africa. Higher temperatures together with prolonged droughts and elevated rates of evapotranspiration, or the rate at which moisture evaporates from the ground surface, have led to disturbances in the hydraulic cycle, low river flows, and drying up of water sources of terrestrial water sources such as Lakes Tanganyika, Victoria, and Turkana. These impacts suggest the possibility of future water stress in East Africa.

They are also likely to have consequences beyond the water sector. For instance, the combination of warmer temperatures and decreased wind speeds in recent decades has led to greater stability in Lake Tanganyika, reducing the cycling of deep water nutrients to surface waters. This in turn has resulted in an estimated 30% decline in the productivity of fisheries, which in 2003 provided 25-40% of the animal protein supply for surrounding countries.

Health

Current climate variability affects health in East Africa, and climate change is likely to impose new stresses, resulting in a number of direct and indirect impacts. Malaria is among the greatest threats to human health in East Africa, and extracts a high cost at both household and national levels. In Kenya, malaria accounts for 50 percent of household expenditures on health, while in Tanzania, the disease is the cause of the greatest number of lives lost, accounting for 16 percent of reported deaths. In Ethiopia, six epidemics occurred between 1958-98, and the 2003-04 malaria epidemic is estimated to have affected 15 million people in three federal regions. A recent study that developed a model based on two monthly and three yearly climate variables and climatic data from 15 sites has found that climate change may significantly increase the number of people exposed to malaria by 2070-99 in relation to 1995 levels throughout East Africa. This will occur in part due to warmer temperatures that cause the expansion of malaria transmission zones into highland areas, where prevalence of and exposure to the disease has previously been low. In addition, these populations' ability to cope with malaria may also be weak, as a result of poverty and health systems inadequately equipped to deal with the disease.

KEY ECOSYSTEM VULNERABILITIES

Terrestrial—Grasslands and Forests

Grasslands are a significant ecosystem type in East Africa. They support the well-being and livelihoods of millions of pastoralists and agro-pastoralists throughout the region, with an estimated 8 million pastoralists in the Ethiopian portion of the Horn of Africa alone. Grasslands are already subject to a number of non-climate stresses which include overgrazing, overexploitation, shifts away from traditional modes of rangelands management, bush encroachment, introduction of invasive species, and population growth. Higher temperatures and greater frequency and duration of droughts may exacerbate these non-climate stresses. Climate and non-climate stresses may worsen degradation and desertification, lower carrying capacity, decrease plant crude protein content, and lead to possible increase in human and wildlife competition and conflicts for resources.

Forests are the dominant vegetation type in parts of East Africa. These ecosystems are important for their biodiversity, natural resources, and ecosystem services, and their contributions to the health and well-being of the communities that depend upon them as well as the greater economy. Forests are already under pressure from a number of non-climate stresses, which have contributed to a reduction of forests in East Africa from an area of 88 million hectares in 1990 to 73 million hectares in 2010. Non-climate stresses include encroachment, illegal settlements, conversion of forest land to agricultural and livestock areas, harvesting of fuelwood at a rate faster than regeneration, and weak institutional capacity and policy frameworks to regulate environmental and forest management.

Coastal and Marine—Wetlands, Coral Reefs, and Fisheries

Wetlands in East Africa, including mangroves, provide employment as well as water, food, and other ecological services. They also serve as important habitats for wildlife, fish, and flora, and as buffers to climate change impacts such as storms. Wetlands throughout the region

have experienced significant degradation due to a number of non-climate stresses such as drainage for agricultural purposes, sand and clay mining, settlements, tourist infrastructure, aquaculture, over-harvesting of biomass, and pollution. These impacts are likely to be exacerbated by climate change impacts such as warmer temperatures, greater incidence of heavy rainfall events, and more frequent and prolonged droughts.

Coral reefs and their resources are critical 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 threat from non-climate stresses, such as sedimentation from urban development and deforestation, overfishing, destructive fishing practices, pollution from herbicides and pesticides, and diseases. Climate change impacts such as warmer sea temperatures, greater intensity of storms, and higher carbon dioxide levels are likely to exacerbate them. Climate and non-climate stresses have contributed to extensive coral bleaching in various areas. Bleaching can compromise coral health if they are not allowed sufficient time to recover.

In addition to supporting diverse ecosystems, fisheries are an important source of protein for the communities neighboring the Great Lakes. Lake Victoria is estimated to harbor 430 fish species in surrounding wetlands, and to have accounted for 95 percent of Kenya's total fish yields in 2002. Lake Tanganyika has historically supported fisheries; in 2003, they provided 25-40 percent of the animal protein supply for surrounding countries, and yielded harvests worth tens of millions of dollars. These lakes and their fisheries are threatened by a number of non-climate stresses such as pollution from households, industry, and agriculture; the introduction of invasive alien plant and fish species; and overexploitation of resources. Climate change is likely to exacerbate these stresses, and may result in irreversible environmental damage, poorer nutrition, and greater poverty for the communities that depend on these resources.

REGIONAL STRATEGIES, PLANS, AND INSTITUTIONS RELEVANT TO CLIMATE CHANGE

Regional Strategies and Plans

A regional climate change strategy or plan does not exist. At the national level, as parties to the United Nations Framework Convention on Climate Change, which establishes the overall framework for intergovernmental efforts to tackle global climate change, most East African countries have submitted:

- Initial National Communications: Cover mitigation and adaptation, and include 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.
- National Adaptation Programmes of Action (NAPA): Identify the most vulnerable sectors to climate change and the needs of the country to adapt to climate change. NAPAs also recommend relevant stakeholders, policies, programs, and projects that can help address the impacts of climate variability and change in the country

Regional Institutional Framework

- Nairobi Declaration on the African Process for Combating Climate Change (2009), whose development was led by the African Ministerial Conference on the Environment (AMCEN), promotes a common African position on climate change and highlights continent-wide concerns about the impacts of climate change on marine and coastal ecosystems and resources and on coastal communities.
- Bamako Declaration on the Environment for Sustainable Development (2010), whose development was also led by AMCEN, urges African states to prepare national adaptation plans, adopt and implement ecosystem-based approaches, and accelerate implementation of the Hyogo Framework for Action and the program of action for the implementation of the African regional strategy for disaster risk reduction (2005-15). The convention also provides a regional legal framework, and coordinates the actions of Eastern and Southern African member states to develop programs that strengthen their ability to protect, manage, and develop sustainably their coastal and marine environments and resources.
- Common Market for Eastern and Southern Africa's objectives include: developing a shared African vision on climate change and a common African platform for international climate negotiations; fostering regional and national cooperation among a wide range of stakeholders; supporting integration of climate change considerations into regional and national policies, sectoral planning, and development and budgeting; capacity building; and expanding scientific and technical knowledge base to inform decision-making processes.
- African Ministerial Conference on Water seeks to promote greater cooperation among African countries on water resource issues through policy and activity coordination, financing review and mobilization, and monitoring of implementation progress of major regional and global water initiatives.

REGIONAL ADAPTATION PRIORITIES

Regional adaptation priorities have not been articulated. However, examination of NAPAs and other equivalent country documents indicates that national adaptation priorities tend to focus on the areas of agriculture and food security, water resources, forests, disaster response, livelihoods, health, energy, and coastal zones. Given the transboundary nature of a number of the region's river basins as well as forest, coastal, and marine ecosystems, regional coordination will be required to ensure long-term sustainable management of these resources. Developing a regional strategy and action plan may help to achieve this by defining and clearly laying out agreed regional priorities as well as identifying concrete steps for implementing activities that support them. A strategy may also help to inform the creation of a portfolio of projects that can be marketed to donors and other potential investors, and serve as the foundation for a regional platform for dialogue and coordinated response to climate change impacts.

KEY PLAYERS AND INITIATIVES

At the national level, donor-funded adaptation pertinent activities have largely tended to focus on assessments as well as initiatives supporting mainstreaming of adaptation into development strategies, plans, and policies, and strengthening understanding of vulnerabilities and adaptation options in sectors such as health or food security. As a result, a number of important sectors such as water resources and energy remain under-examined, both in terms of understanding vulnerability and piloting adaptation measures. At the regional level, the focus has been on initiatives to enhance understanding of climate change impacts, vulnerabilities, and adaptation options through the generation and dissemination of relevant data as well as network and capacity building. There are also a number of activities throughout the region seeking to address non-climate stresses in various sectors that are important for adaptation, although their adaptation benefits are not explicitly monitored or evaluated. Current regional initiatives include the following:

- Assessments of Impacts and Adaptations to Climate Change (United Nations Environment Programme, System for Analysis Research and Training, and the Third World Academy of Sciences).
- Capacity Strengthening of Least Developed Countries for Adaptation to Climate Change (International Institute for Environment and Development).
- Food Insecurity and Vulnerability Information and Mapping Systems (United Nations inter-agency working group).
- Climate Change Adaptation in Africa (Funded by United Kingdom Department for International Development and Canadian International Development Research Centre).
- Famine Early Warning Systems Network (Funded by U.S. Agency for International Development).

PRIORITY CHALLENGES AND CONSTRAINTS FOR ADDRESSING VULNERABILITY AND INCREASING RESILIENCE

Despite the myriad climate change related activities taking place at both the regional and national levels, a number of challenges and needs remain in regard to understanding the climate change impacts, vulnerabilities, and adaptation options in sectors such as water resources, forests, and energy. Additional needs include improving seasonal forecasts, developing approaches and tools for vulnerability and adaptation assessment, and devising methodologies and tools for climate change monitoring, detection, and attribution. It also will be necessary to strengthen planners' and policy-makers' awareness and understanding of climate change impacts and vulnerabilities to facilitate mainstreaming of vulnerability and adaptation considerations into general development and sectoral plans, policies, and processes. At the regional level, it is also necessary to better understand the interactions between migration, resource distribution and use, and climate change so that initiatives can reflect changing distributions of vulnerabilities. Moreover, there is a need to better leverage existing frameworks to enable collaboration and coordination in addressing both non-climate and climate stresses that affect transboundary ecosystems and promoting their effective management. As regional mechanisms are dependent upon the quality of engagement by individual nations, this may necessitate the creation of incentives that not only encourage active participation, but also enforcement of agreed measures. Addressing these needs at both regional and national levels will be essential for enabling successful regional response to climate change impacts in support of both regional and national climate-resilient development.

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