Severe weather events such as droughts and floods have historically imposed heavy costs in Ethiopia. The projected impacts of climate change may affect the consequences of these events, and could potentially hinder advancements in key development areas such as food security, water resources management, health, and economic growth. In recognition of this fact, the Government of Ethiopia has initiated activities to determine vulnerability and adaptation priorities, while the donor community has provided support to facilitate mainstreaming of adaptation considerations into development processes and increase resilience in the agriculture and food security sector. However, a number of adaptation needs remain, including the need for more technical expertise in vulnerability and adaptation assessment and implementation in sectors such as agriculture and food security, water resources, and health; improved technical facility and technological capacity to provide accurate and timely weather and climate forecasts; a strengthened institutional framework for dealing with climate change; and enhanced coordination.

**CLIMATE IMPACTS AND VULNERABILITY**

**Historic Weather and Climate**

- Observations indicate a rise in average temperature of about 1.3°C between 1960 and 2006.
- Strong variability makes long-term precipitation trends difficult to determine, but studies suggest an overall decline since 1984, with significant year-to-year volatility.
- Major floods have been a common occurrence, leading to loss of life and property in numerous parts of the country.
- Rising sea surface temperatures in the Indian Ocean influence the migration of the Intertropical Convergence Zone and can further increase variability in the timing and duration of rainfall seasons, and consequently cause frequent drought.

**Projected Weather and Climate**

While projections for Ethiopia vary across climate models, the majority of climate models suggest the following:

- Median annual temperature will continue to increase through the 2090s.
- Although there are significant discrepancies between model predictions for rainfall for many areas in Africa, current rainfall projections for Ethiopia for the 2060s range from a decrease of 6 percent below the observed 1970-99 average to an increase of 24 percent.
- Most models predict a larger percentage of precipitation falling during heavy events, which can increase the risk of disasters such as floods and landslides.

**KEY SECTOR VULNERABILITIES**

**Food Security**

The climate impacts of greatest significance for agriculture and food security are likely to be warmer temperatures and more frequent occurrence of drought. Climate change may affect crop yields, and consequently, nutrition and health. A recent study indicates that an increase in temperature of 5°C in East Africa may lead to a production decline of nearly 20 percent by the 2090s. Increased intensity and frequency of drought can affect food security through direct impacts on food availability (e.g., reduced crop yields, and changes in the quantity and quality of livestock feed and forage), and through indirect impacts on livelihoods and income that in turn have consequences for food accessibility.

Currently, the Horn of Africa is seeing one of the driest years since 1995 due to two consecutive seasons of significantly below-average precipitation. This has led to crop failures, livestock losses, and high local cereal prices, which have affected food availability and accessibility. As a result, the United States Agency for International Development's Famine Early Warning Systems Network has referred to the situation as “the most severe food security emergency in the world today.”
**Water Resources**

Ethiopia has relatively abundant water resources, with estimated mean annual flows from the country’s 12 river/drainage basins of 111 billion cubic meters and groundwater potential of approximately 2.6 billion cubic meters. To date, only a small portion of these resources has been developed for sectors such as hydropower, agriculture, and water supply and sanitation. As these sectors develop, demand for water is likely to rise. Impacts of climate change may act as an additional stressor, affecting the quantity and quality of available water resources, particularly in low-rainfall areas such as the lowlands. Climate change may also exacerbate existing non-climate stresses such as weak water resources governance. Adaptation measures such as improved water storage may serve as important coping mechanisms and help to reduce the potential impacts of climate change.

**Health**

Current climate variability adversely affects health in Ethiopia, and climate change is likely to impose new stresses, resulting in a number of direct and indirect impacts, summarized in the table below. Increased malnutrition, diarrhea, and malaria have been identified as the impacts of greatest significance. Higher than normal temperatures associated with climate change can increase the incidence of malaria, which may spread to formally unaffected highland areas. Prevalence of the disease has previously been low in these areas, and communities are likely to be more sensitive, due to their relative lack of previous exposure and limited immunity.

**Potential Impacts and Consequences of Climate Change for Health**

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| **Direct**  | • Exposure to thermal extremes, especially heat waves.  
• Altered frequency and/or intensity of other extreme weather conditions (droughts, floods, storms, etc.). | • 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)** | • 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.  
• Fresh water vulnerability.  
• 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. | • Change in geographic ranges and incidence of vector borne diseases. For instance, an increase in temperature of 1-2°C can shift potential malaria risk areas from the traditional tropical to temperate zones.  
• Changed incidences of diarrhea and infectious diseases.  
• Regional malnutrition and hunger with consequent impairment of child growth and development especially in vulnerable communities.  
• 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). |

**KEY ECOSYSTEM VULNERABILITIES**

**Highlands**

The highland areas are comprised of the middle highlands with altitudes between 1,500-2,300 meters above sea level (m.a.s.), and the highlands, with altitudes upwards of 2,300 m.a.s. These ecosystems host a rich diversity of flora and fauna, including a number of endemic species, such as several globally recognized endemic bird areas. The highlands also support the majority of the country’s human population. The high population density and the economic activities undertaken in the highlands are placing stress on fragile highland ecosystems.

Climate variability has already begun to affect highland areas, with rainfall irregularities and associated flooding and droughts of greatest concern. For instance, localized flooding below hillsides is a widespread hazard in the foothills of the mountainous areas in northwest Amhara, which can damage agriculture and ecosystems. Predicted changes in climate may increase climate risks and worsen non-climate stressors, such as soil problems and the pest damage that already plagues the Arsi-Bale Highlands.

**Lowlands**

Lowlands consist primarily of the arid lowland plains. These ecosystems and the resources they provide, such as grazing grasslands and firewood for household use and sale, support the well-being and livelihoods of the estimated 8 million pastoralists located in the Ethiopian portion of the Horn of Africa. These lowland areas are currently under pressure from a number of non-climate stresses such as overgrazing, overexploitation, shifts away from traditional modes of rangeland management, bush encroachment, introduction of invasive species, and population growth.

**CLIMATE CHANGE ADAPTATION IN ETHIOPIA**
Projected changes in climate may exacerbate both non-climate and climate stressors. For instance, overgrazing and collection of fuelwood can expose the soil to erosion, which can negatively affect water availability and accessibility. This can affect ecosystem services such as soil protection and water regulation, in turn lowering the productivity of other services and products. Together, climate and non-climate stresses may contribute to lowland degradation and desertification, resulting in a decline in the resource base that harms lowland ecosystems and hastens the need to develop alternative livelihood options.

**NATIONAL STRATEGIES, PLANS AND INSTITUTIONS RELEVANT TO CLIMATE**

- Initial National Communication (INC) (2001): Considers mitigation and adaptation and includes information on greenhouse gas emissions, potential mitigation options, vulnerability assessments of key sectors, possible adaptation measures, and the policy and institutional context for responding to climate change.

- National Adaptation Programme of Action (NAPA) (2007): Draws on the multilateral environment agreements synergy assessment reports, the INC, and two national and eight regional consultative workshops conducted by the National Meteorological Agency (NMA). (Other relevant plans strategies and policies are listed in the box at right.)

**Institutional Framework**

The NAPA process was initiated and coordinated by the NMA, the national focal point for the United Nations Framework Convention on Climate Change, with overall guidance and oversight provided by a Steering Committee. The Steering Committee is comprised of members from the ministries of Water Resources, Agriculture and Rural Development, and Finance and Economic Development; agencies for Disaster Prevention and Preparedness and Science and Technology; Addis Ababa University; the Institute of Biodiversity Conservation and Research; the Ethiopian Rural Energy Promotion and Development Center; and the Christian Relief and Development Association representing NGOs. The implementation of projects described in the NAPA is to be coordinated and led by the relevant ministry.

**GOVERNMENT ADAPTATION PRIORITIES**

The NAPA develops a list of 11 projects (listed at right) prioritized by the Government of Ethiopia, which are largely focused on decreasing vulnerability in the sectors of agriculture and food security, water resources, forestry, and health. The World Bank has identified the overlaps between adaptation priorities identified in the NAPA and at national and local workshops carried out during the course of its study. Their analysis highlights common priority areas such as natural resources rehabilitation, water harvesting, irrigation, pastoral development, reforestation, and agricultural productivity.

**KEY PLAYERS AND INITIATIVES**

Donor-funded adaptation-specific activities have tended to support national priorities through mainstreaming adaptation into development policies, strategies, plans, and institutional frameworks. The activities use assessments, reports, and initiatives to strengthen understanding of vulnerability and adaptation in the agriculture and food security sector. As the number of initiatives continues to proliferate, coordination will become increasingly important to minimize duplication of efforts and enable leveraging of existing resources and achievements. Key initiatives include:

**Adaptation-Relevant Strategies, Plans, and Policies**

- Plan for Accelerated and Sustainable Development to End Poverty
- Environmental Policy of Ethiopia
- Agriculture and Rural Development Policy and Strategy
- National Agricultural Research Policy and Strategy
- Water Resources Management Policy
- Health Sector Development Policy and Program
- National Policy on Disaster Prevention and Preparedness
- National Policy on Biodiversity Conservation and Research
- Population Policy
- Science and Technology Policy

**Priority Adaptation Projects from NAPA**

- Promoting drought/crop insurance program
- Strengthening/enhancing drought and flood early warning systems
- Developing small-scale irrigation and water harvesting schemes in arid, semi-arid, and dry sub-humid areas
- Improving/enhancing rangeland resources management practices in pastoral areas
- Community-based sustainable utilization and management of wetlands
- Building capacity for climate change adaptation
- Realizing food security through a multi-purpose large-scale water development project in Genale-Dawla Basin
- Community-based carbon sequestration in Rift Valley System
- Establishing a national climate research center
- Strengthening malaria containment programs in selected areas
- Promoting on-farm and homestead forestry and agroforestry in arid, semi-arid, and dry sub-humid areas
### Priority Challenges and Constraints for Addressing Vulnerability and Increasing Resilience

Ethiopia faces a number of cross-cutting challenges and constraints in regard to vulnerability assessment and adaptation planning and implementation. As noted in the NAPA, these challenges include:

- Lack of research and development capacity to assess the impacts and consequences of climate change.
- A dearth of individuals with specialization in vulnerability and adaptation assessment, including in sectors such as agriculture, water resources, and health.
- Limited skilled capacity, facilities, and technologies to provide accurate and timely weather and climate forecasts.
- A weak institutional framework for dealing with climate change.
- A need for improved coordination and synergy of adaptation actions generally and in specific sectors at both national and subnational levels.

Addressing these capacity, institutional, and coordination constraints and needs will contribute to Ethiopia’s ability to continue to move forward effectively on implementation of adaptations that support long-term climate-resilient development.

### KEY SOURCES