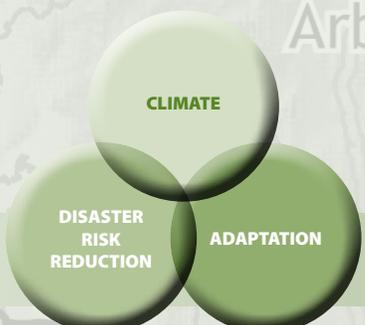


Vulnerability, Risk Reduction, and Adaptation to Climate Change

ETHIOPIA



GFDRR
Global Facility for Disaster Reduction and Recovery

CLIMATE
INVESTMENT FUNDS



COUNTRY OVERVIEW

Ethiopia occupies 1.2 million square kilometers in the Horn of Africa and is considered to be one of the poorest countries in the world, with an average GDP of US\$ 350¹ per capita and high rates of poverty. In 2010, the population numbered 81 million, with an annual growth rate of 3.2%. Such a rapid population increase produces great strain on the country's natural resources. In addition to the widespread poverty and population pressures, a number of socio-economic factors exacerbate the development challenges

Key Sectors

Agriculture
Health
Water Resources
Infrastructure

Source: Ethiopia's National Adaptation Program of Action, 2007

in Ethiopia, thus increasing the country's vulnerability to climate variability and climate change. Foremost among these burdens are the insufficiently developed water resources, sparse availability of health services, inadequate road infrastructure (particularly in drought-prone areas), and weak institutions.²

Ethiopia has a long history of coping with extreme weather events. Rainfall is highly erratic and typically falls in the form of intensive convective storms spawned by the country's varied topography. Over the past three decades, Ethiopia has experienced countless localized drought events and seven major droughts, five of which resulted in famines.³ Future climate variability and change are expected to worsen these conditions, potentially accelerating already high levels of land degradation, soil erosion, deforestation, loss of biodiversity, desertification, recurrent floods, as well as water and air pollution. Recurrent droughts and floods pose the greatest threat to local populations. According to Ethiopia's National Adaptation Program of Action (NAPA), the agricultural, water resources, and human health sectors will be most negatively impacted by climate change. NAPA additionally identifies the infrastructure sector as particularly vulnerable to climate change impacts.⁴

PRIORITY ADAPTATION MEASURES

Ethiopia published a National Adaptation Program of Action (NAPA) in June 2007 and has prioritized the following actions in response to current and projected climate variability and change:

- ➔ Promoting drought/crop insurance programs;
- ➔ 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 resource management practices in pastoral areas;
- ➔ Establishing community-based sustainable utilization and management of wetlands in selected regions of the country;
- ➔ Establishing a capacity building program for climate change adaptation;
- ➔ Realizing food security through a multi-purpose large-scale water development project in the Genale-Sawa Basin;
- ➔ Establishing a community-based Carbon Sequestration Project in the Rift Valley System;

¹ Ethiopia World Bank Country Brief

² GFDRR Disaster Risk Management Profile

³ Ibid.

⁴ Climate Change National Adaptation Plan of Action of Ethiopia, 2007.

- ➔ Establishing national research and development (R&D) center for climate change;
- ➔ Strengthening malaria containment programs (MCPs) in selected areas;
- ➔ Promoting farm and homestead forestry and agro-forestry practices in arid, semi-arid, and dry sub-humid regions.

In addition to increasing the amount of cropland that is irrigated and investing in agricultural research and development, the World Bank's Economics of Adaptation to Climate Change study of 2009 also recommends⁵ the following actions for infrastructure and transport:

- ➔ Prioritizing hydropower generation by altering the scale and timing of planned hydropower projects as well as constraining downstream and irrigation flow;
- ➔ Increasing the number of paved and hardened roads;
- ➔ Improving transportation operation and maintenance;
- ➔ Developing new road design standards that consider projected climate changes;
- ➔ Transferring relevant transportation technology to stakeholders;
- ➔ Enhancing transportation safety measures.

In recent years, the government of Ethiopia has placed significant emphasis on building human and institutional capacity to deal with climate variability and change, improving natural resource management, enhancing irrigation agriculture and water harvesting, strengthening early warning systems, and raising awareness of the challenges posed by climate variability and change. However, much remains to be done, and only a coordinated effort that packages these activities through a climate change lens can successfully begin to tackle the challenges ahead.

CLIMATE BASELINE AND CLIMATE FUTURE

BASELINE CLIMATE

As a result of its varied topography, Ethiopia has a highly variable tropical climate (Figure 1). The highland regions are cool and host most of the country's population, while temperatures in the Dallol Depression are some of the hottest on the planet. The country's climate is broadly divided into three zones: 1) the alpine vegetated cool zones (Dega) are areas over 2,600 meters above sea level, where temperatures range from near freezing to 16°C; 2) the temperate Woina Dega zones, where much of the country's population is concentrated, are areas between 1,500 and 2,500 meters above sea level where temperatures range between 16°C and 30°C; and 3) the hot Qola zone, which encompasses both tropical and arid regions and has temperatures ranging from 27°C to 50°C.

Mean rainfall can range between 0 and over 4000 mm annually, with considerable spatial and temporal variability in both distribution and quantity. Rainfall in the country is bimodal, with 60% occurring during the long rainy season (Gaana), which generally lasts from March to May, and the short rainy season (Hagaya), which occurs between September and November. Two similarly distinguished dry seasons exist: a long dry season (Boonahagaya) occurs throughout much of the country between December and

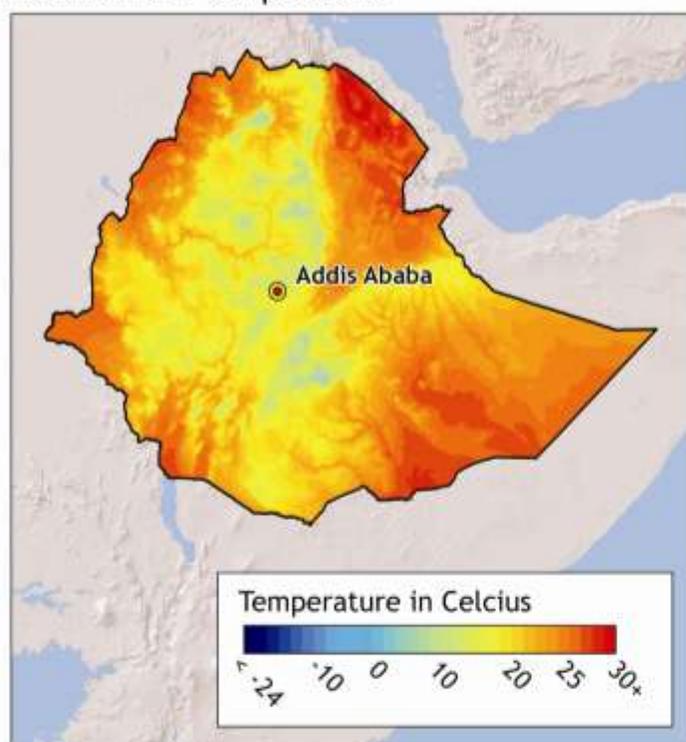
⁵ World Bank, 2010. Synthesis Report of the Economics of Adaptation to Climate Change Study.

February, and a short dry season (Adolessa) occurs between June and August. The onset and duration of the rainy seasons (as well as rainfall intensity and annual quantity) vary considerably inter-annually, due to the movements of the Inter-Tropical Convergence Zone (ITCZ), which can lead to droughts in various parts of the country.

RECENT CLIMATE TRENDS⁶

- ➔ Mean annual temperature increased by 1.3°C between 1960 and 2006, an average rate of 0.28°C per decade. The increase in temperature has been most rapid for the period of July-September, at a rate of 0.32°C per decade.
- ➔ Daily temperature observations show significantly rates of increase in the frequency of hot days, and much larger increases in the frequency of hot nights.⁷

Mean Annual Temperature



Total Annual Precipitation

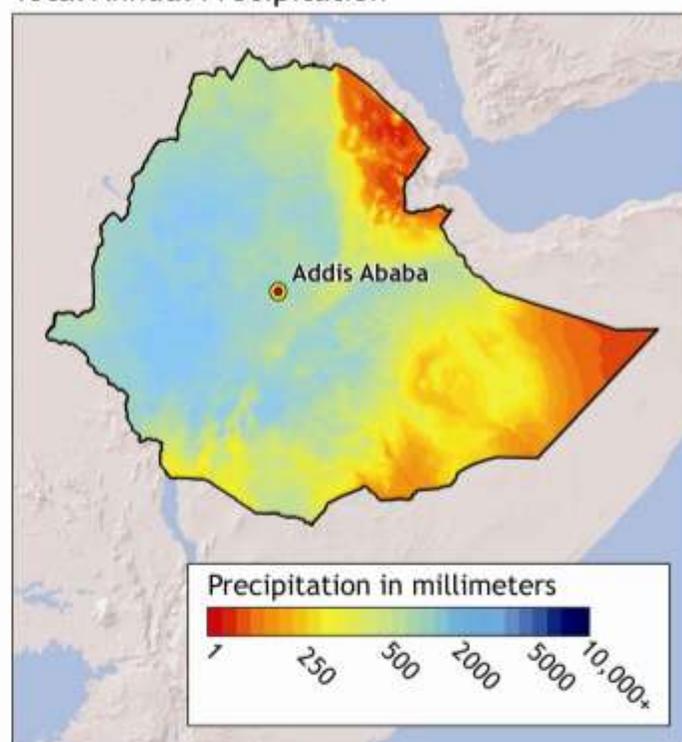


Figure 1: Climate Baseline for Ethiopia

- ➔ The average number of hot days per year increased by 73 (an additional 20% of days) between 1960 and 2003. The rate of increase is seen most strongly during the short dry season (Adolessa) between June-August when the average number of hot days has increased by 9.9 days per month over the same period.

⁶ UNDP Climate Change Country Profile: Ethiopia

⁷ Hot days/nights are defined as the temperature above which 10% of days or nights are recorded in current climate of that region or season.

- ➔ The average number of hot nights per year increased by 137 (an additional 37.5% of nights) between 1960 and 2003. The rate of increase is seen most strongly during the short dry season (Adolesa) between June and August, when the average number of hot nights increased by 18 days per month over this period.
- ➔ The frequency of cold days⁸ decreased significantly in all seasons except during the long dry season (Boonahagaya) in December-February. The frequency of cold nights decreased even more rapidly and significantly in all seasons.
- ➔ The average number of cold days per year decreased by 21 (5.8% of days) between 1960 and 2003. This rate of decrease is most rapid from September to November when the average number of cold days decreased by 2.3 days per month over this period.
- ➔ The average number of cold nights per year decreased by 41 (11.2% of days). The rate of decrease is most rapid from June to August, when the average number of cold nights decreased by 3.7 nights per month.
- ➔ Long-term trends in rainfall are difficult to determine for Ethiopia due to strong inter-annual and inter-decadal variability in rainfall data. A lack of rainfall records impedes the proper analysis of historical trends in rainfall variability, which is particularly important since much of the rainfall in Ethiopia is brought about by localized, convective storms.

CLIMATE FUTURE⁹

The climate science community sources a suite of models to inform decision makers on future climate. GCMs (Global Climate Models), RCMs (Regional Climate Models), downscaling techniques (both empirical and statistical), and several comprehensive reviews are available on the subject. GCMs are our primary source of information about future climate. They comprise simplified but systematically rigorous interacting mathematical descriptions of important physical and chemical processes governing climate, including the role of the atmosphere, land, oceans, and biological processes. Climate projections for Ethiopia and the eastern Sahel are particularly challenging due to the large climate variability observed over the 20th century, which makes it difficult to provide clear attributions to climate change. The following insights into a changing climate are derived for the Horn of Africa region as a whole, as well as for Ethiopia, from a suite of GCMs used by the Intergovernmental Panel on Climate Change. Specific projections through 2050 are based on the ISP2a emissions scenario.

- ➔ Mean annual temperature is projected to increase by 1.1 to 3.1°C by the 2060s, and 1.5 to 5.1°C by the 2090s.
- ➔ All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current climate.
- ➔ Annually, projections indicate that hot days will occur on 19-40% of days by the 2060s, and 26-69% of days by the 2090s. Days that are considered 'hot' for their season are projected to increase most rapidly from July to September, occurring on 38-93% of days by the 2090s.
- ➔ Nights that are considered 'hot' are projected to increase more rapidly than hot days, occurring on 29-66% of nights by the 2060s and 34-87% of nights by the 2090s (as compared to recorded temperatures for the period 1970-1999). Nights that are considered hot for their season are

⁸ Cold days/nights are defined as the temperature below which 10% of days or nights are recorded in current climate of that region or season

⁹ UNDP Climate Change Country Profiles

projected to increase most rapidly from July to September, occurring on 53-99% of nights by the 2090s.

- ➔ All projections indicate decreases in the frequency of days and nights that are considered cold in the current climate. Cold nights decrease in frequency more rapidly than cold days, and do not occur at all in most model projections by the 2090s under the highest emissions scenario (A2).
- ➔ Projections from different models are broadly consistent in indicating increases in annual rainfall for Ethiopia as a whole. These increases are largely a result of increasing rainfall during the 'short' rainfall season (October-December) in southern Ethiopia. October-December rainfall is projected to increase between 10 and 70% on the average over Ethiopia.
- ➔ Large, proportional increases in October-December rainfall are predicted to occur in the driest, eastern-most parts of Ethiopia.
- ➔ Model data are broadly consistent in indicating increases in the proportion of total rainfall that falls in 'heavy' events, with annual changes ranging from -1 to +18%. The largest increases are seen in July-September and October-December rainfall.

CLIMATE CHANGE IMPACTS ON NATURAL HAZARD VULNERABILITY

AT A GLANCE

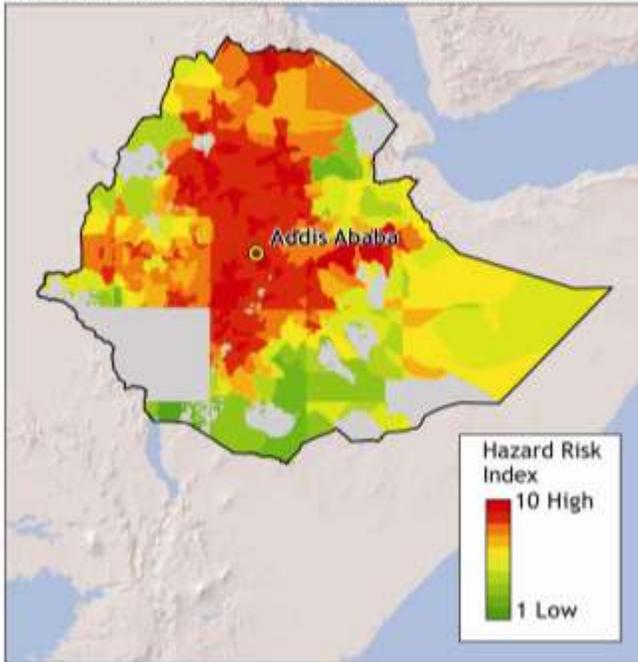
Ethiopia's low economic development, inadequate infrastructure, and lack of institutional capacity all contribute to the country's vulnerability to climate change. These conditions have already led to significant land degradation, which results in greater vulnerability to climate-related natural hazards, including wildfires, epidemics, floods, and droughts. Based on recent data, the last two hazards appear to be the most significant and are discussed in more detail below.

- ➔ **Droughts** are the greatest and most recurring climate hazard in Ethiopia, particularly for pastoral and agro-pastoral communities that inhabit drought-prone areas. The country encompasses primarily dry sub-humid, semi-arid, and arid regions, all of which are highly prone to desertification and drought. While droughts have always plagued Ethiopia, their magnitude, frequency, and intensity have significantly increased since the 1970s. Droughts threaten areas where livestock rearing is a primary activity, and threaten fodder and range productivity, all of which are likely to worsen under projected changes in climate.¹⁰ Drought impacts include pasture shortages, overgrazing, land degradation, decreased water availability, and livestock diseases. All of these impacts lead to decreased livestock productivity, crop failure in agro-pastoral areas, food insecurity, and increased conflicts over scarce resources. Droughts not only bring loss of life, famine, and hardship to today's inhabitants (during the 2006 droughts, 25-60% of livestock were killed in some areas), but they also threaten the country's future, as children aged five or less are 36 and 50% (respectively) more likely to be malnourished if they were born during a drought.¹¹

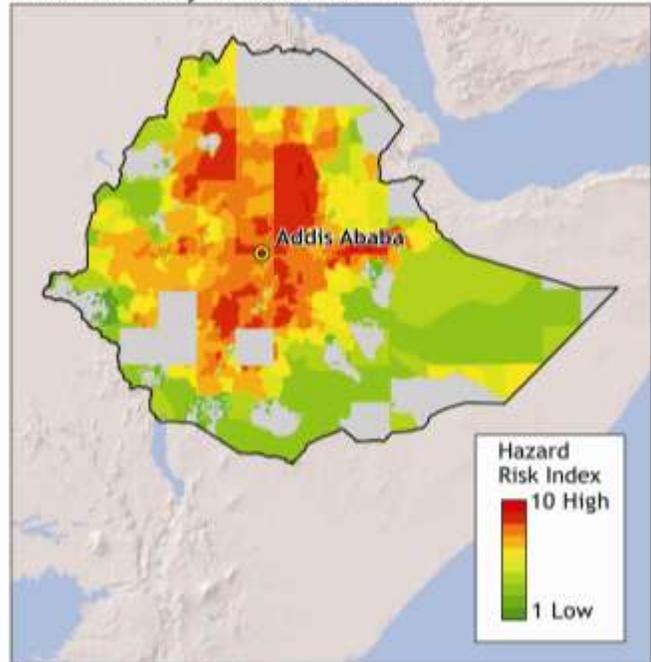
¹⁰ GFDRR Disaster Risk Management Profile.

¹¹ UNDP. Human Development Report 2007/08.

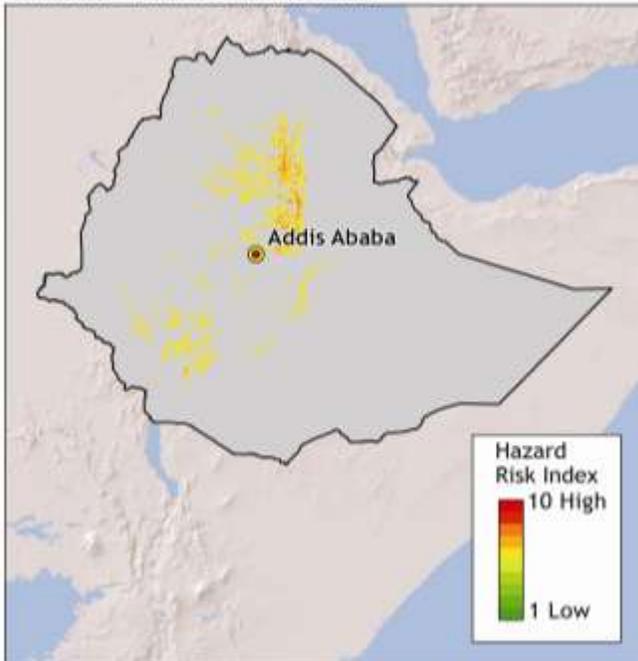
Droughts- Proportional Economic Loss



Flood Mortality Risks and Distribution



Landslide Hazard Distribution



Fire Density 1997-2008



Figure 2: Exposure to climate-related hazards across Ethiopia¹²

¹² UNEP Global Risk Identification Program (GRIP), and Columbia University Center for Hazards and Risk Research (CHRR), International Bank for Reconstruction and Development/The World Bank, and Columbia University Center for International Earth Science Information Network (CIESIN), and UNEP/GRID-Europe Global Assessment Report on Risk Reduction (GAR).

➔ **Flash floods and seasonal river floods** pose a significant challenge to the country's vulnerable institutions. Flash floods occur regularly throughout the country, particularly after a long dry spell. More recently, in the years 1988, 1993, 1994, 1995, 1996, and 2006, major floods inflicted significant losses in terms of human life as well as productive capital. Floods are occurring with greater frequency and intensity across the country due to vulnerabilities imposed by high rates of deforestation, land degradation, increasing climate variability, and settlement patterns. Large-scale floods occur mostly in the lowland areas, while flash floods resulting from intense rainfall events destroy settlements in the Highlands (including in the Awash River Basin and in the Rift Valley). The capital city of Addis Ababa also experiences annual flood events, which destroy property and pose a significant threat to urban dwellers.¹³

Implications for Disaster Risk Management

- ➔ Climate impact models display a high degree of concurrence in simulating an increase in rainfall extremes over East Africa. An increase of more than 20% in the very extreme (once-in-100-years) rainfall events is expected in southern Ethiopia by the year 2100. A rise in extreme rainfall events during the long rainy season could have long-term implications for flood impacts.¹⁴
- ➔ According to the country's National Adaptation Program of Action, climate change in Ethiopia will bring changes in precipitation patterns, rainfall variability, and temperature, which could increase the frequency and occurrence of floods and droughts.
- ➔ The increasing year-to-year climate variability and increases in both droughts and heavy precipitation events lower agricultural production with negative effects on food security.¹⁵
- ➔ Negative climate impacts on crop and livestock production could lead to food shortages, further hindering economic growth.¹⁶
- ➔ The availability of clean drinking water is likely to decrease due to increasing evaporation and the increasing variability of rainfall events.¹⁵
- ➔ Incidences of malaria will increase in areas of the highlands where malaria was previously not endemic. The warming climate is also expected to cause an increase in cardio-respiratory and infectious diseases.¹⁷

SECTORAL CLIMATE RISK REDUCTION RECOMMENDATIONS

The following impacts, as well as policy and program options, are summarized in Ethiopia's NAPA and other country documents as listed in the footnotes.

AGRICULTURE

Agriculture remains by far the most important sector in the Ethiopian economy. This sector directly contributes to approximately 85% of employment and livelihood activities of the population, and

¹³ GFDRR Ethiopia Disaster Risk Management Profile.

¹⁴ Shongwe, Mxolisi, Jan van Oldenborgh, G. Bas de Boer, Bart van den Hurk, van Aalst M. *Changes in Extreme Weather in Africa under Global Warming*. KNMI.

¹⁵ Keller, M. 2009. Climate Risks and Development Projects: Assessment Report for Community-Level Project in Guduru, Oromiya Ethiopia. Bread for All.

¹⁶ IFPRI Research Brief 15-6: Perceptions of Stakeholders on Climate Change and Adaptation Strategies in Ethiopia.

¹⁷ Ibid note 15.

accounts for about 50% of the country's gross domestic product (GDP). In addition, agriculture-related activities are responsible for about 88% of export earnings and supply around 73% of the raw material requirement of agro-based domestic industries. The agriculture sector underpins national food security and plays a key role in Ethiopia's overall socio-economic development.

The agriculture sector is dominated by small-scale, predominantly subsistence farmers dependent on rain and traditional technologies (Figure 3). The government of Ethiopia has declared increasing the productivity of the agriculture sector a top priority. Extreme weather events related to climate change pose a serious challenge to further development of this sector. Drought, which in many cases leads to famines, severely reduces productivity, as do floods. The escalated occurrence of these disasters has rendered the country increasingly dependent on food aid.¹⁸

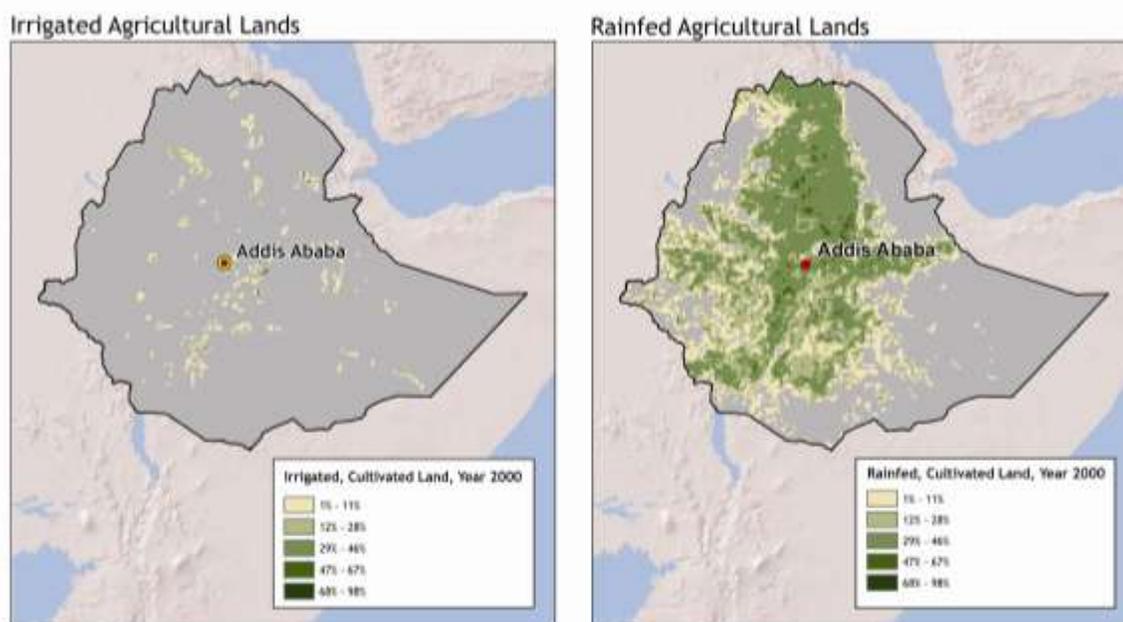


Figure 3: Amount of irrigated and rainfed agriculture across Ethiopia

According to Ethiopia's NAPA, climate change will cause a shortening of the crop maturity period as well as a decrease in crop yields. Low water-storage capacity and high dependence on rainfed agriculture leave the agriculture sector even more vulnerable to climate risks. Establishing a long-term adaptation strategy will require transitioning large numbers of rural residents away from on-farm activities or into high-productivity, more commercially oriented agriculture or agro-industries. In addition, while the IDA-supported Productive Safety Nets Program (PSNP) and Food Security Project already exist, the next step will be to assist the poorest farm households to 'graduate' from food security programs in a sustainable manner.¹⁹ Results from the Economics of Adaptation to Climate Change study in Ethiopia corroborate the need to prioritize improved agricultural productivity, including soft measures such as agricultural extension and hard measures such as

¹⁸ CEEPA. 2006. Climate Change and African Agriculture. Policy Note No. 25, August 2006, CEEPA.

¹⁹ Ethiopia Country Assistance Strategy

improved on-farm technology, improved seeds and flood control measures, better weather forecasting, and non-farm diversification.²⁰

Adaptation efforts in agriculture should include:

- ➔ Introducing programs/projects that promote improved farming practices, drought-resistant and early maturing crop varieties, and supply inputs that increase crop yield and productivity.
- ➔ Improving land management, moisture and soil conservation, and flood control methods in both the high and lowland areas.
- ➔ Developing improved water use (water harvesting, small-scale irrigation, etc.) in drought-prone areas to alleviate rain shortages that cause crop failure.
- ➔ Improving farmers' knowledge about proper use of weather information in carrying out agricultural activities to avoid risks of climate change.
- ➔ Introducing/supporting off-farm activities to increase alternative household income sources.

HEALTH

Warmer temperatures and variations in rainfall patterns associated with climate change are already altering the transmission mechanisms of water- and vector-borne diseases in Ethiopia. Incidence of malaria, dengue fever, and water-borne diseases (e.g. cholera, dysentery) is likely to become more prevalent, while food insecurity related to extreme events also threatens the lives and livelihoods of millions of Ethiopians.²¹ The NAPA cites the migration of malaria carriers to highland areas as the predominant risk to the human health sector. Malaria already accounts for up to 20% of deaths of children under five years of age. During years when epidemics prevail, mortality rates of nearly 100,000 children are not exceptional. The last serious malaria epidemic occurred in 2003; up to 16 million cases of malaria were detected — 6 million more than those in an average year.²² Minor shifts in geographical presence of malaria could expose millions to infection (e.g. in densely populated areas of east African highlands).²³ Rainfall also plays a role in determining the availability of mosquito habitats and the size of mosquito populations. While the complete eradication of malaria seems unlikely in the near-term, containment of the disease may be considered as the best alternative.

To avoid future health risks associated with climate change, it will be necessary to organize and implement community-based health education programs in order to raise awareness and educate local population about the importance of personal hygiene and environmental health management. Such a community-based mechanism would benefit from training programs to build local capacity to take up adaptive measures such as use of bed nets and to encourage the use of climate and meteorological data in the planning of malaria control measures.²⁴ Adaptation efforts in the health sector should:

- ➔ Implement community programs that help to prevent and control communicable diseases like malaria through community participation.

²⁰ Synthesis Report and Social Synthesis Report of the Economics of Adaptation to Climate Change. 2010. World Bank.

²¹ Climate Change National Adaptation Plan of Action of Ethiopia. 2007.

²² UNICEF. Malaria in Ethiopia. Accessible at <http://www.unicef.org/ethiopia/malaria.html>

²³ Intergovernmental Panel on Climate Change (IPCC) (2001). Climate change: The scientific basis. Retrieved from ipcc.ch/

²⁴ Climate Change National Adaptation Plan of Action of Ethiopia. 2007.

- ➔ Organize and implement community-based health education programs to create awareness and develop knowledge about personal hygiene and environmental health management.
- ➔ Develop and introduce surveillance systems, early warning systems, introduce methods of health prevention, and vector control for health workers and the community.
- ➔ Provide training programs to build manpower capacity to improve the provision of health extension services at the local level.
- ➔ Support health research and community health services as well as the development of health facilities and infrastructure.

WATER RESOURCES

Home to twelve major river basins, Ethiopia is rich in water resources and is considered to be the “water tower” of Northeast Africa. Yet extremely limited water storage capacity prevents the country from capitalizing on these abundant water resources. Climate change is expected to reduce run-off to Nile tributaries (Abay and Awash Rivers) by up to one-third. Decrease in river run-off has important consequences for flow into hydropower generation. In addition, climate change is expected to lead to drying of wetlands with severe implications for key breeding sites of some bird species.²⁵

Water resources are unevenly distributed, both spatially and temporally. Between 80-90% of the country’s surface water resources are found within four major river basins – Abay (Blue Nile), Tekeze, Baro Akobo, and Omo and Omo Gibe. These are located in the west and southwest of the country where only 30-40% of the population resides. In the east and central river basins, home to 60% of the population, there are only 10-20% of the country’s surface water resources.²⁶ According to NAPA, the water resources sector will be affected by climate change through a decrease in river run-off, a decrease in energy production, as well as increased floods and droughts. Adaptation activities in the water sector should include:

- ➔ Conducting water resources assessment studies (inventory of water quality and quantity for surface and underground water to develop proper use of available water resources).
- ➔ Introducing improved methods of water conservation, storage, and rational use.
- ➔ Construction of small check dams and rainwater harvesting schemes to meet water supply for domestic and irrigation use.
- ➔ Undertaking soil conservation measures that help reduce soil erosion and siltation and also protect water sources from pollution.
- ➔ Implementing watershed management and water conservation programs and projects that promote local community participation.
- ➔ Introducing methods for flood protection and maintenance of flood control structures,

²⁵ World Bank. Ethiopia Climate Risk Fact Sheet.

²⁶ GFDRR Disaster Risk Management Profile.

EXISTING ADAPTATION FRAMEWORK/STRATEGY/POLICY AND INSTITUTIONAL SET-UP

The **NAPA** of Ethiopia was initiated and coordinated by the National Meteorological Agency and underpinned by a project Steering Committee representing key stakeholder institutions, including the Ministry of Water Resources, Ministry of Agriculture and Rural Development, Ministry of Finance and Economic Development, Disaster Prevention and Preparedness Agency, Ethiopian Science and Technology Agency, National Meteorological Agency, Addis Ababa University, Institute of Biodiversity Conservation and Research, Ethiopian Rural Energy Promotion and Development Center, and the Christian Relief and Development Association (CRDA) as an umbrella organization representing NGOs. In addition to preparing a NAPA, the government of Ethiopia has made notable progress toward establishing institutional arrangements focused on managing climate change and adaptation interventions.

- ➔ The **FY 2008-2010 Ethiopia Country Assistance Strategy (CAS)** recognizes the risks posed by climatic shocks, including droughts and floods, and the need to reduce poverty and strengthen livelihoods so that food-insecure Ethiopian households can withstand adverse climatic shocks. The CAS identifies the potential entry points for reducing household vulnerability to food insecurity. These include existing programs such as the Productive Safety Nets and Food Security program as well as proposed programs such as the Land Management Project and the Tana Beles Integrated Water Resource Development Project. The CAS also emphasizes urban development and extending infrastructure for poverty reduction.
- ➔ The **Ethiopia Plan for Accelerated and Sustainable Development to End Poverty (PASDEP, 2006-2010)** provides an overarching policy strategy for reducing poverty and addressing food security. PASDEP builds on the initiatives pursued under the Sustainable Development and Poverty Reduction Program (SDPRP), particularly in promoting agricultural and rural development, developing human capital, promoting local capacity building in support of the decentralization process, increasing household access to primary health care, and responding more effectively to the HIV/AIDS pandemic.
- ➔ **National water resources policies and strategies** aim at conducting water resources assessment studies including: inventory of water quality and quantity for surface and underground water to develop proper use of available water resources; introducing improved methods of water conservation, storage and rational use; construction of small check dams and rainwater harvesting schemes to meet water supply for domestic and irrigation use; undertaking soil conservation measures that help reduce soil erosion and siltation and also protect water sources from pollution; implementing watershed management and water conservation programs/projects that promote local community participation; introducing methods for flood protection, disaster prevention, and maintenance of flood control structures; and managing and tackling droughts as well as the associated slow onset diseases.
- ➔ **The Health Policy Program** aims to implement measures that help prevent and control communicable diseases like malaria through community participation; organize and implement community-based health education programs to create awareness and develop knowledge about personal hygiene and environmental health management; develop and introduce surveillance systems; introduce methods of vector control for health workers and the community; provide training programs to build the manpower capacity needed to improve the provision of health extension services at the local level; support health research and community health services through the supply of drugs and help the development of health facilities and infrastructure.

- ➔ **The Coalition for Food Security** was launched by the Government in 2003 to differentiate chronic and transitory food insecurity. The Coalition established that eight regions and 262 *woredas* are chronically food insecure. These areas are characterized by recurrent drought occurring over the past ten or more years, inability to produce or access sufficient food, and dependence on emergency food relief even when there is sufficient precipitation. The Food Security Program (FSP) and the PSNP have supported these areas in particular.²⁷
- ➔ **The Agriculture Development-Led Industrialization (ADLI) strategy**, initiated in 1994, highlights the importance of developing the agriculture sector to drive the growth of other sectors of the economy as well as to ensure food security.
- ➔ **The Environmental Policy of Ethiopia** is an umbrella policy comprising 10 sectoral and 10 cross-sectoral environmental policies, which were formulated and approved by the government in 1997 to promote sustainable socio-economic development through sound management and rational use of natural resources and the environment.²⁸
- ➔ **The Rural and Agricultural Policy Safety-Net Program and PASDEP/FSS** are community-based participatory projects/activities striving to ensure food self-sufficiency, increase farm production, and reduce vulnerability through transfer of income, household asset building, and public works in order to develop natural resource base and productivity.

Ongoing Efforts- At a Glance

Vulnerability Reduction Project Description

Water Availability and Access (2010 – 2011)	Led by IWMI, this project focuses on ways to cope with water scarcity and adapt to drivers of change. It focuses on an improved understanding of water availability and access in river basins, on how major change drivers influence these, and on adaptive-management strategies to deal with these changes.
Automated Weather Stations (ongoing)	20 automated weather stations donated by WFP have been set up around rural Ethiopia by the National Meteorological Agency to help monitor climate change risk; these send real-time data from pastoral areas to Addis Ababa every 15 minutes. ²⁹
MERET: Land regeneration in Ethiopia (ongoing)	A joint venture between the Ethiopian government and WFP, the MERET program gets chronically food-insecure communities involved in environmental rehabilitation and sustainable income-generating activities that improve livelihoods. ³⁰
Agro-ecosystems Resilience (2010-2012)	A research project that focuses on the significant risks facing rural communities (especially from climate variability and change) through impacts on agricultural production and the natural resource base, and develops tools and methodologies for assessing and adapting to these risks, from the local to the regional scale. CIAT is lead partner.

²⁷ http://www.chronicpoverty.org/uploads/publication_files/CPR2_Background_Papers_Brown-Teshome.pdf

²⁸ NAPA

²⁹ World Food Program www.wfp.org/countries/ethiopia

³⁰ World Food Program <http://www.wfp.org/node/14481>

URAdapt (ongoing)

Managing water in the urban-rural interface for climate change-resilient cities: The project analyses different scenarios of urbanization, water use, and hydrological change related to climate, in order to project possible water futures for the cities and their relationships to rural areas. URAdapt research consists of climate change downscaling, hydrological modeling, urban water allocation modeling, as well as socio-economic studies on vulnerabilities, and policy and institutional orientations for resilience. IWMI is the lead organization.

GFDRR Interventions (by Project Title)³¹

Ethiopia: Weather Risk Management Framework using Weather-Based Indices

Facilitating provision of baseline vulnerability information on flood-exposed communities in Ethiopia

Mitigating impacts of adverse shocks on nutrition and health

INSTITUTIONAL AND POLICY GAPS

- ➔ Strengthening institutions to support agriculture and enhancing the skills and knowledge of male and female farmers will yield significant returns. The capacity of agricultural institutions is still weak, and the private sector is not yet strong enough to fill the gap. Moreover, there is a considerable gender imbalance. Women are less educated, not equally involved in decision making, and tend to benefit less from the overall development process. Strengthening service provision and addressing gender imbalance will yield high returns.³²
- ➔ Partnership and networking between different organizations working on climate change and disaster risk reduction has been very weak. More needs to be done to foster coordination and stronger partnerships.³³
- ➔ Food aid has been managed mainly through emergency mechanisms. There is growing recognition that food security and early warning activities ought to be decentralized to regional and woreda (district) levels.

RESEARCH, DATA, AND INFORMATION GAPS

Ethiopia's status as a developing country dependent mainly on agriculture makes it particularly susceptible to the effects of climate change. Added to this is the fact that, like most other developing countries, Ethiopia does not have adequate monitoring systems for the prediction of extreme events or the assessment of possible changes in weather patterns, thus making the task of developing short-term response or disaster-reduction strategies extremely difficult. Adaptation strategies are likewise difficult to formulate unless detailed vulnerability and impact assessment studies are undertaken. Existing information deficiencies are outlined below.

³¹ GFDRR Country Programming Framework: Ethiopia (available at: http://gfdr.org/ctryprogram_pdfs/et.pdf)

³² World Bank 2010. Project Appraisal Document Vol. 1 "Ethiopia - Agricultural Growth Project"

³³ Local innovation in climate-change adaptation by Ethiopian pastoralists: PROLINNOVA—Ethiopia and Pastoralist Forum Ethiopia (PFE)

RESEARCH GAPS

- ➔ Research on ways to reverse environmental degradation (including the loss of soil nutrients and sources of water) could substantially raise agricultural productivity. Average land productivity has increased in recent years, despite problems of environmental degradation in some areas. However, climate change and related extreme weather events are more likely to occur in the future and rainfall and temperatures are likely to become more variable, with adverse impacts on land productivity.³⁴
- ➔ A National Research and Development Center on Climate Change³⁵ has been proposed to coordinate all studies related to climate change for the country.
- ➔ An improved understanding of traditional mechanisms for coping with climate hazards, coupled with effectively designed strategies for dissemination of endogenous knowledge, could support vulnerability reduction for the country's population.
- ➔ There is a growing demand for detailed accounts of local adaptation to climate change, to serve as a starting point for knowledge exchange on successful practices among vulnerable populations and to support rational policymaking in vulnerable areas.
- ➔ Technology access and income diversification activities need to be explored and piloted in the highland areas (as noted in the Economics of Climate Change Study) as they were identified as having pro-poor effects.

DATA AND INFORMATION GAPS

- ➔ The lack of rainfall records impedes proper analysis of historical trends in rainfall variability, which is particularly important since much of the rainfall in Ethiopia is brought about by localized, convective storms.
- ➔ A better understanding of the local dimensions of vulnerability is essential to developing appropriate adaptation measures that will mitigate these adverse consequences. This requires detailed vulnerability assessments to be conducted in the most vulnerable arid, semi-arid, and dry sub-humid lowland communities.
- ➔ Flood forecasting and communication systems are weak and should be improved in those areas that are heavily affected by floods.
- ➔ Existing poverty-reduction and food-security programs should be scaled up and properly funded, placing emphasis on irrigation structures and mitigation of flooding and drought, in parallel with research into drought-resistant seed varieties.³⁶

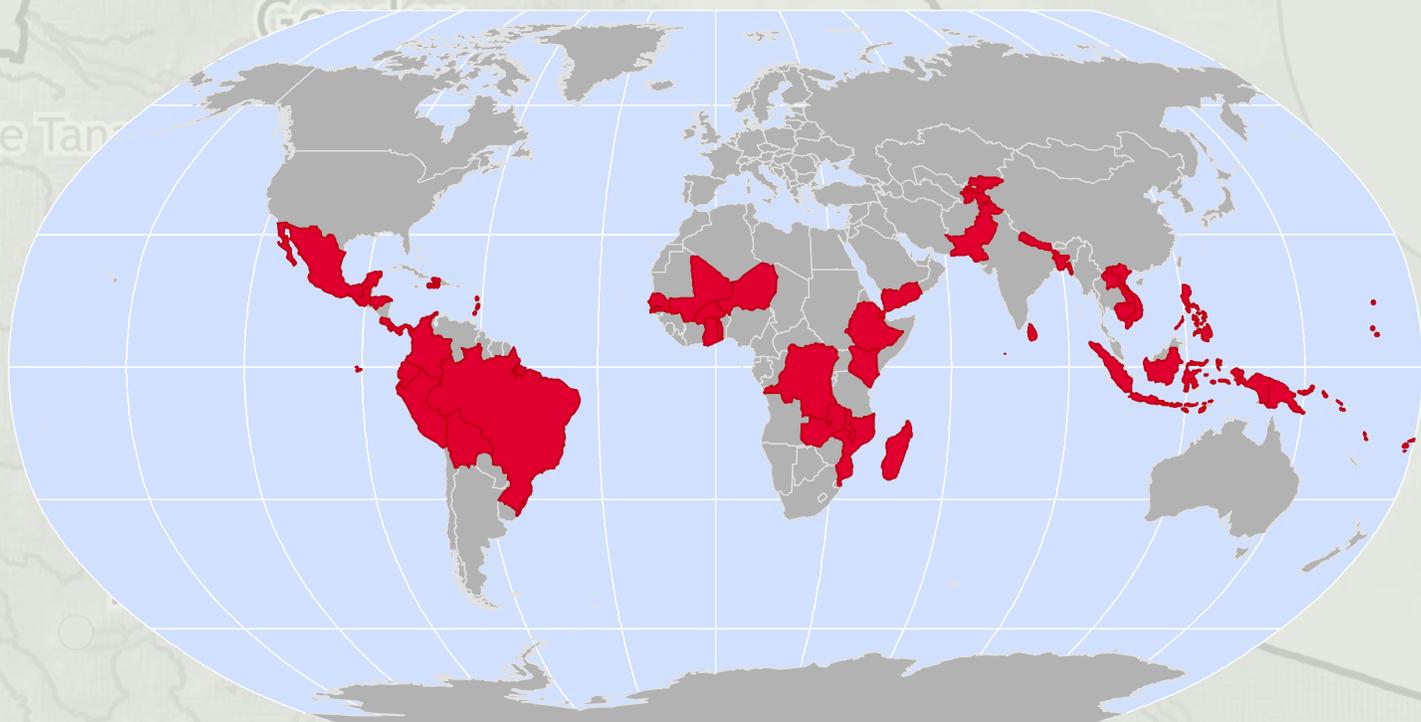
³⁴ World Bank 2010. Project Appraisal Document Vol. 1 "Ethiopia - Agricultural Growth Project"

³⁵ Climate Change National Adaptation Plan of Action of Ethiopia. 2007.

³⁶ One World Ethiopia Review - <http://uk.oneworld.net/guides/ethiopia/climate-change>

Climate Risk and Adaptation Country Profile

This Country Profile (<http://countryadaptationprofiles.gfdr.org>) is part of a series of 49 priority country briefs developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) and the Global Support Program of the Climate Investment Funds (CIF). The profile synthesizes most relevant data and information for Disaster Risk Reduction and Adaptation to Climate Change and is designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and operations. Sources on climate and climate-related information are linked through the country profile's online dashboard, which is periodically updated to reflect the most recent publicly available climate analysis.



Acknowledgments: The *Country Profiles* were produced through a partnership between the Global Facility for Disaster Reduction and Recovery, the Global Support Program of the Climate Investment Funds, and the Climate Change Team of the Environment Department of the World Bank, by a joint task team led by Milen Dyoulgerov (TTL), Ana Bucher (co-TTL), Fernanda Zermoglio, and Claudio Forner. Additional support was provided by Sarah Antos, Michael Swain, Carina Bachofen, Fareeha Iqbal, Iretomiwa Olatunji, Francesca Fusaro, Marilia Magalhaes, Habiba Gitay, Laura-Susan Shuford, Catherine Nakalembe, Manisha Ganeshan, Roshani Dangi, Anupam Anand and Li Xu. IT, GIS, and map production support was provided by Varuna Somaweera, Katie McWilliams, and Alex Stoicof from the Sustainable Development Network Information Systems Unit (SDNIS). Jim Cantrell provided design. The team is grateful for all comments and suggestions received from the regional and country specialists on disaster risk management and climate change.

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