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Strategies for Adapting to Climate Change in Rural Sub-Saharan Africa

A Review of Data Sources, Poverty Reduction Strategy Programs (PRSPs) and National Adaptation Plans for Agriculture (NAPAs) in ASARECA Member Countries

Jonathan Makau Nzuma

Michael Waithaka

Richard Mbithi Mulwa

Miriam Kyotalimye

Gerald Nelson

Environment and Production Technology Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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AUTHORS

Jonathan Makau Nzuma, University of Nairobi
Lecturer, Department of Agricultural Economics
jonathan_nzuma@yahoo.com

Michael Waithaka, Association for Strengthening Agricultural Research in Eastern and Central Africa
Manager, Policy Analysis and Advocacy Programme
m.waithaka@asareca.org

Richard Mbithi Mulwa, University of Nairobi
Lecturer, Department of Agricultural Economics
richard.mulwa@yahoo.com

Miriam Kyotalimye, Association for Strengthening Agricultural Research in Eastern and Central Africa
Programme Assistant, Policy Analysis and Advocacy Programme
m.kyotalimye@asareca.org

Gerald Neslon, International Food Policy Research Institute
Senior Research Fellow, Environment and Production Technology Division
g.nelson@cgiar.org

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ABSTRACT

The ten ASARECA member countries (Burundi, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda) have adopted, or are planning to adopt, a range of climate change adaptation strategies in agriculture (see Table 1 for a summary).

Of the 26 strategies mentioned, only two are common to all 10 countries, while five more are common to five or more. The strategies common to all member countries include the development and promotion of drought-tolerant and early-maturing crop species and exploitation of new and renewable energy sources. Most countries have areas that are classifiable as arid or semiarid, hence the need to develop drought-tolerant and early-maturing crops. Strangely, only one country recognizes the conservation of genetic resources as an important strategy although this is also potentially important for dealing with drought. Biomass energy resources account for more than 70 percent of total energy consumption in ASARECA member countries. To mitigate the potential adverse effects of biomass energy depletion, ASARECA countries plan to harness new and renewable energy sources, including solar power, wind power, hydro and geothermal sources, and biofuels.

Eight of the 10 countries cite the promotion of rainwater harvesting as an important adaptation strategy, either small scale with small check dams or large scale with large dam projects.

The five measures that are common to more than five countries are (a) the conservation and restoration of vegetative cover in degraded and mountain areas; (b) reduction of overall livestock numbers through sale or slaughter; (c) cross-breeding, zero-grazing, and acquisition of smaller livestock (for example, sheep or goats); (d) adoption of traditional methods of natural forest conservation and food use; and (e) community-based management programs for forests, rangelands, and national parks.

The promotion of environmentally friendly investments and Clean Development Mechanism (CDM) projects that can be funded through carbon trading is a feature of only one country.

Three examples of strategies that warrant greater region wide collaboration are the conservation of genetic materials, development and promotion of drought-tolerant species, and soil conservation. To date, the national adaptation policies of only three countries have indicated that they carry out these strategies.

Keywords: ASARECA, NAPA, PRSP, climate change, adaptation, Sub-Saharan Africa

Table 1. Climate change adaptation strategies in ASARECA member countries

#	Adaptation strategy	Country									
		Burundi	**DR Congo**	**Ethiopia**	**Eritrea**	**Kenya**	**Madagascar**	**Rwanda**	**Sudan**	**Tanzania**	**Uganda**
1	Developing and promoting drought-tolerant and early-maturing crop species	X	X	x	X	X	X	X	X	X	X
2	Exploiting new and renewable energy sources, such as solar power, hydro	X	X	X	X	X	X	X	X	X	X
3	Harvesting rainwater using small check dams; irrigation	X		X	X	X		X		X	X
4	Reducing overall livestock numbers by sale or slaughter	X			X	X		X	X		
5	Cross-breeding , zero-grazing, and keeping smaller livestock such as sheep or goats	X						X	X	X	X
6	Instituting national conservation and restoration of vegetative cover of degraded and mountain areas	X		X	X			X	X		
7	Adopting Integrated Disease Surveillance Response systems and emergency preparedness to prevent, mitigate, and respond to epidemics		X	X	X			X		X	
8	Adopting traditional methods of conserving natural forest, using food, and so on	X	X				X				X
9	Delimiting all protected areas to avoid their clearing through encroachment	X				X				X	X
10	Inaugurating community-based management programs for forestry, rangelands, national parks, and so on	X			X	X				X	
11	Strengthening meteorological services to provide timely weather and climate information early-warning systems	X						X			X
12	Promoting and strengthening aquaculture, poultry raising, and the like as alternative livelihood options					X			X		X
13	Developing and promoting guidelines for using herbal and alternative medicine					X				X	X

Table 1. Continued

#	Adaptation strategy	Country									
		Burundi	DR Congo	Ethiopia	Eritrea	Kenya	Madagascar	Rwanda	Sudan	Tanzania	Uganda
14	Conserving soil by building infiltration ditches around homes, planting grass cover, using terrace farming, digging trenches to divert runoff, mulching, and tree planting	X						X			X
15	Increasing agriculture extension activities				X				X	X	
16	Protecting the seashore by building barrier walls and using integrated coastal management				X		X			X	
17	Introducing preventive measures to restrict malaria transmission such as mosquito nets, treatment/drying up of breeding sites		X			X			X		
18	Growing soybean, yams, and sunflowers; market gardening	X									X
19	Moving herds along the rivers to find better fodder during drought	X				X					
20	Safeguarding certain local species by incorporating them in agroforestry	X		X							
21	Growing crops most sensitive to fungal diseases during seasons with low rainfall, or even during dry seasons	X									
22	Conserving genetic resources	X									
23	Changing eating behavior by reducing number of meals per day, rationing food, and consuming wild food										X
24	Launching environmentally sound investment and other programs that foster CDM funding, including emissions trading			X							
25	Enforcing laws and regulations to protect and prevent pollution and ensure local factories are environmentally friendly			X							
26	Promoting value-addition, storage, and postharvest techniques for agricultural products							X			

ABBREVIATIONS AND ACRONYMS

AIDS	acquired immune deficiency syndrome
AOAD	Arab Organization for Agricultural Development
ASARECA	Association for Strengthening Agricultural Research in Eastern and Central Africa
AWG-LCA	Ad Hoc Working Group on Long-term Cooperative Action under the Convention
CDM	Clean Development Mechanism
CSA	Central Statistical Agency
DRC	Democratic Republic of Congo
FAO	United Nations Food and Agriculture Organization
FAOSTAT	United Nations Food and Agriculture Organization online database
GDP	gross domestic product
HIV	human immunodeficiency virus
IFPRI	International Food Policy Research Institute
IGEBU	National Geographic Institute, Burundi
IPCC	Intergovernmental Panel on Climate Change
ISABU	National Agricultural and Livestock Research Institute (Burundi)
KIPPRA	Kenya Institute for Public Policy Research and Analysis (KIPPRA)
LDCs	Least Developed Countries
MOLFD	Kenya Ministry of Livestock and Fisheries Development
NAMA	Nationally Appropriate Mitigation Actions
NAPA	National Adaptation Program of Action
NBS	National Bureau of Statistics
NISR	National Institute of Statistics, Rwanda
NMA	National Meteorological Agency (Ethiopia)
ProdSTAT	United Nations Food and Agriculture Organization Production Statistics in FAOSTAT
PRSP	Poverty Reduction Strategy Program
REDD	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
SIDS	Small Island Developing States
UBOS	Uganda Bureau of Statistics
UNFCCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION

Climate change is defined as any long-term and significant change in the expected patterns of a specific region's average weather for an appropriately significant period of time. It is the result of several factors, including Earth's dynamic processes, external forces, and more recently, human activity. External factors that shape climate include such processes as variations in solar radiation, deviations in Earth's orbit, and variations in the level of greenhouse gas concentrations. Evidence of climatic change taken from a variety of sources can, in turn, be used to reconstruct past climates. Most climate evidence is inferred from changes in key climate indicators, including vegetation, ice cores, dendrochronology, sea-level change, and glacial geology.

Climate change represents one of the greatest environmental, social, and economic threats facing the planet today. In developing countries, climate change will have a significant impact on the livelihoods and living conditions of the poor. It is a particular threat to the attainment of the Millennium Development Goals (MDGs) and progress in sustainable development in Sub-Saharan Africa. Increasing temperatures and shifting rain patterns across Africa reduce access to food and create effects that impact regions, farming systems, households, and individuals in varying ways. Additional global changes, including changed trade patterns and energy policies, have the potential to exacerbate the negative effects of climate change on some of these systems and groups. Thus, analyses of the biophysical and socioeconomic factors that determine exposure, adaptation, and the capacity to adapt to climate change are urgently needed so that policymakers can make more informed decisions.

Given limited resources, adaptation strategies must target those populations most vulnerable to global change and equip those unable to adapt—generally the poorest—with the tools and incentives that will enable them to do so. ASARECA has recently carried out a study to enhance the understanding of climate change in the 10 ASARECA member countries. This report profiles the available climate change–related datasets and their accessibility and procurement details in the 10 ASARECA member countries. The report additionally assesses the incorporation of climate change adaptation strategies in national development plans and discusses each country's position in the current UNFCCC negotiations. The study was conducted using a combination of extensive literature reviews and field visits to all 10 ASARECA member countries: Burundi, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda.

The report is organized in four sections. The first provides a description of the available climate change–related databases, along with details about their sources and accessibility in each of the 10 ASARECA member countries. Section 3 is a review of the status of the incorporation of climate change adaptation strategies in national development plans, while section 4 discusses the countries' positions in the current UNFCCC negotiations. Finally, section 5 offers concluding remarks and suggestions for a way forward. In addition to the study report, separate files of existing climate change–related datasets are provided in EXCEL format. [1]

[1] A separate folder containing the EXCEL and PDF files is provided for each of the 10 ASARECA member countries. These are available from ASARECA on request.

2. OVERVIEW OF DATASETS RELATED TO CLIMATE CHANGE AND AGRICULTURE WITHIN ASARECA

Two primary sources of climate change–related datasets within the ASARECA member countries are international data sources and domestic data sources.

2.1. International Climate Change–Related Databases

Within the class of international climate change–related data sources, two distinct crop and livestock datasets can be identified: FAOSTAT and World Bank.

2.1.1 FAOSTAT

The Food and Agriculture Organization of the United Nations maintains an international online database on such aspects of food and agriculture as production, trade, consumption, and prices. With regard to crop and livestock production statistics, the FAOSTAT ProdSTAT module contains detailed agricultural production data since 1961 for all reporting countries worldwide. Given that the 10 ASARECA member countries are reporting members of the FAOSTAT database, the FAOSTAT ProdSTAT data domain provides information for the member states on crop production, acreage, and livestock for 1961–2007. Most FAOSTAT datasets are free to download from the FAO website (http://www.fao.org/). Some detailed data from the FAOSTAT database are available only through subscription. This study provides crop and livestock production data for the 10 ASARECA member countries in a separate EXCEL document for 1961–2007 or the dates that were available.

2.1.2 World Bank

The World Bank publishes an annual report, *Africa Development Indicators*, that presents a broad picture of development across Africa. Data are presented from 1965 to 2006 for 53 African countries and five regional country groups. Data are arranged in separate tables or matrixes for more than 450 indicators of development, covering basic indicators; national accounts; balance of payments; inflation; millennium development goals; Paris Declaration indicators; private-sector development; trade; infrastructure; human development; rural development and agriculture; environment and climate change; labor, migration, and population; HIV/AIDS; malaria; capable states and partnerships; governance and polity; and household welfare. The report, available on CD-ROM, cost US$275 at the time this report was written so this study did not compile data from the World Bank. In April 2010 the World Bank announced that these data would be distributed free of charge.

2.2. Domestic Member Country Databases

Each of the 10 ASARECA member countries compiles agricultural and meteorological data from public institutions, including

- National agricultural research stations
- Ministries of agriculture and livestock
- National meteorological departments
- National bureaus of statistics

This section describes the available climate change–related datasets in each of the 10 ASARECA member countries. Separate EXCEL files containing the databases in each country are also provided.

2.2.1 Domestic Climate Change–Related Datasets for Burundi

Burundi experienced political instability in the early to mid-1990s, and most data for these periods are either unavailable or unreliable. However, three distinct domestic climate change–related data types were collected. These include

- Crop and livestock production data
- Household surveys
- Meteorological data

2.2.1.1 Crop and Livestock Data for Burundi

In the 1970s and 1980s, data for individual crop varieties produced in Burundi were presented separately; after 1992, most of the national data are combined in categories of cereals, root crops, oil crops, and others. This makes it difficult to separate the contribution of different crops in the total production of a certain category. Table 2 profiles the EXCEL file containing crop and livestock data for Burundi. Crops and livestock data for the periods shown in Table 2 were collected from different institutions, as described later in this section.

The National Agricultural and Livestock Research Institute (ISABU) conducts all research in agricultural and livestock fields and has production data for different crops and livestock. Institute data are publicly available at no charge. The Ministry of Agriculture and Livestock has data on crop and livestock production. Data obtained from this ministry were used to supplement ISABU data. The data are available without charge upon request so long as the request is accompanied by proof that their use is intended for research activities. The National Statistics and Economic Studies Office (ISTEEBU) collects data from different country sectors. The institution charges a small fee (recovery cost) for the data upon proof that they will be used for research purposes. Crop and livestock data for 1992–2004 can be obtained from http://burundistats.org/statsstiques/Production_04.htm. More information about this institution is available at http://burundistats.org/statsecteurs.php.

Table 2. Crop and livestock data for Burundi

Crop/Livestock	Parameters	Time period
Bananas	Area, production, yield	1980–2007
Maize, finger millet, sorghum, rice, and wheat	Area, production, yield	1980–2007
Sweet potatoes, Irish potatoes, and cassava	Area, production, yield	1980–-2007
Beans, field beans, cowpeas, pigeon peas, groundnuts, and soybeans	Area, production, yield	1980–2007
Sesame, sunflower	Area, production, yield	1980–2007
Tea	Area, production, yield, export, prices	1972–2008
Coffee	Production, prices	1964–2007
Cotton	Production, prices	1994– 2008
Fish	Quantity	1961–2007
Cattle, sheep, goats, and poultry	No. of head	1984–2007

Source: ISABU and ISTEEBU, Burundi.

2.2.1.2 Meteorological Data for Burundi

The National Geographic Institute (IGEBU; http://burundistats.org/statsstiques/Environnement_04.htm), which is based in Gitega, Burundi's second-largest town, is mandated to collect, document, and store all climatology data from the country's different meteorological stations. IGEBU provided the climatology data on precipitation and temperature for 1971–2007. Table 3 provides an outline of the EXCEL file of

meteorological data collected in Burundi. Additional precipitation and temperature data were obtained from the IGEBU website.

Table 3. Climate data for Burundi

Measure	Time period
Precipitation (rainfall)	1961–2005
Temperature • Minimum • Maximum	1977–1988; 1992–2007

Source: IGEBU.

2.2.2 Domestic Climate Change–Related Datasets for Democratic Republic of Congo

The Democratic Republic of Congo (DRC) has immense unexploited agricultural potential. Indeed, if crop yields in the DRC's 80 million arable hectares were at the global technological frontier, the country could feed about one-third of the world's population. However, this potential has been handicapped by decades of conflict, corruption, and economic mismanagement. The protracted civil conflicts, coupled with the country's vastness, have also severely impeded agricultural data collection.

2.2.2.1 Crop and Livestock Data for the DRC

The Ministry of Agriculture is the DRC's domestic source of crop and livestock data. The ministry publishes annual reports with crop production statistics; it does not have a functional website. Even though the data are supposed to be publicly available and free, accessing them was impossible because of bureaucratic impediments. The only data available for free pertained to livestock populations and production for 1990–2002 (see the EXCEL file).

2.2.2.2 Household Budget Surveys for the DRC

Given the protracted conflicts in the DRC, undertaking household budget surveys has not been possible. The country conducted a national housing and population census in 1999 and is set for another one in 2010.

2.2.2.3 Meteorological Data for the DRC

Meteorological data for most of the DRC's regions can be accessed from the director general for meteorological services for a fee (US$10 per variable per station). During this study, some limited meteorological data were compiled from a previous study by the Institut Nationale Pour l'Etude et le Recherche (INERA) (Table 4). The meteorological data collected from two meteorological stations (Kinshasa-Ndjili and Mbinza) in 1969–2004 covered rainfall, the number of rainy days, temperature, relative humidity, and pressure.

Table 4. Climate data for the DRC

Measure	Time period
Precipitation (rainfall)	1969–-2004
Temperature (maximum and minimum)	1969–2004
Monthly wind speed	1969–2004
Monthly relative humidity	1969–-2004
Monthly radiation	1969–2004
Monthly pressure level	1969–2004
Monthly evapotranspiration	1969–2004
Number of rainy days in a month	1969–2004

Source: INERA.

2.2.3 Domestic Climate Change–Related Datasets for Eritrea

Eritrea attained independence in 1993 after a long, protracted war–first with the Italians, then with the British, who had occupied it in 1941, and finally with the Ethiopians, whose emperor had decided to annex Eritrea ten years after it was federated with Ethiopia by the United Nations in 1952. This civil conflict severely affected data collection. Consistent compilation of domestic datasets began only in 1997.

2.2.3.1 Crop and Livestock Data in Eritrea

Since 1997 the Ministry of Agriculture, through its Planning and Statistics Division, has been publishing an annual report that contains data on crop and livestock production. Crop production data for 1997–2008 (Table 5) are available at no cost from the Planning and Statistics Division upon request to the permanent secretary. Unfortunately, the Ministry of Agriculture does not have a functional website, and all data are available only in hard copy.

Table 5. Crop and livestock data for Eritrea

Crop / livestock	Parameters	Time period
Maize, barley, finger millet, pearl millet, sorghum, and wheat	Area, production, yield	1997–2008
Haricot beans, horse beans	Area, production, yield	1997–2008
Cotton, groundnut ,and sesame	Area, production, yield	1997–2008
Banana, mango, orange, and pawpaw	Area, production, yield	2001–2008
Tomatoes, onion, cabbage, and carrots	Area, production, yield	1997–2008
Fish	Quantity	1993–2008
Cattle, sheep, goats, and poultry	No. of head	1993–2008

Source: Ministry of Agriculture.

2.2.3.2 Household Budget Surveys for Eritrea

Eritrea has undertaken two household budget surveys; the 1996–1997 urban household income/expenditure survey and the 2002–2003 national living standards measurement survey. It has also undertaken two other demographic and health surveys and was undertaking an agriculture and livestock survey in 2009–2010. The data are publicly available upon request to the National Statistics and Evaluation Office; they are free and available only in hard copy.

2.2.3.3 Meteorological Data in Eritrea

Eritrea does not have a national meteorological agency. Meteorological data collection is coordinated by an office in the Ministry of Agriculture. These data are publicly available for free. Table 6 provides a listing of the meteorological data compiled from the Ministry of Agriculture.

Table 6. Climate data for Eritrea

Measure	Time period
Precipitation (rainfall)	1982–2005
Temperature	1982–2005

Source: Ministry of Agriculture.

2.2.4 Domestic Climate Change–Related Datasets for Ethiopia

Most of the data provided by the Federal Democratic Republic of Ethiopia are from 1996 (Ethiopian calendar year 1988) because of a change in governance after the separation of Ethiopia and Eritrea into separate sovereign states.

2.2.4.1 Crop and Livestock Data for Ethiopia

The Ethiopian Ministry of Agriculture and Rural Development (www.eiar.gov.et) is the country's custodian of domestic crop and livestock production data. However, the Central Statistical Agency (CSA) of Ethiopia organizes, among other surveys, nationwide surveys of crops and livestock. These surveys have been carried out annually since 1996. Survey reports are available on the agency's website (www.csa.gov.et) and can be downloaded for free. The agency shares its reports with the Ethiopian Institute of Agricultural Research. The institute provides additional, free-of-charge crop and livestock data in its library. An outline of the crop and livestock production data collected from Ethiopia during this study is provided in Table 7.

Table 7. Crop and livestock data for Ethiopia

Crop / livestock	Parameters	Time period
Cereals: teff, barley, wheat, maize, sorghum, oats, millet, and rice	Area, production, yield	1996–2008
Oilseeds: neug, linseed, groundnuts, sunflower, sesame, and rapeseed	Area, production, yield	1996–2008
Pulses: faba beans, field peas, haricot beans, chickpeas, and lentils	Area, production, yield	1996–2008
Coffee	Area, Production, Yield	1970–2008
Cattle, sheep, goats, poultry, horses, donkeys, mules, camels, beehives	No. of head/hives	1987–2008

Source: Ministry of Agriculture and Rural Development.

2.2.4.2 Household Budget Surveys Data for Ethiopia

The Central Statistical Agency (www.csa.gov.et) gathers, compiles, and publishes on its website data on different areas, including household budget surveys. The welfare monitoring surveys that have been conducted to date are the

- Ethiopia welfare monitoring survey, 1996–1997
- Ethiopia welfare monitoring survey, 1998–1999
- Ethiopia welfare monitoring survey, 2000–2001
- Ethiopia welfare monitoring survey, 2004

The agency has also conducted the following income, consumption, and expenditure surveys:

- Ethiopia household income, consumption, and expenditure survey, 1995–1996
- Ethiopia household income, consumption, and expenditure survey, 1999–2000
- Ethiopia household income, consumption, and expenditure survey, 2003–2004

The agency also conducted the population and housing census in 1987 and again in 1994. All information compiled by CSA is available on the institute's website for free.

2.2.4.3 Meteorological Data for Ethiopia

The National Meteorological Agency (NMA; www.ethiomet.gov.et) of Ethiopia collects and maintains meteorological data for all stations in the country. The agrometeorological stations collect data on rainfall, temperature, and pressure. Some of these stations have been collecting data for more than 40 years. However, the data collected for this report came from nine synoptic stations for temperature and rainfall (see Table 8).

Table 8. Climate data for Ethiopia

Measure	Time period
Precipitation (rainfall)	1996–2008
Temperature	1989–2008

Source: Ministry of Agriculture and Rural Development.

Ethiopia's meteorological data are available upon filling a request form, which requires information about intended use of the data, on the NMA website.

2.2.5 Domestic Climate Change–Related Datasets for Kenya

The three domestic climate change–related datasets in Kenya include crops and livestock data, household surveys, and climate data.

2.2.5.1 Crop and Livestock Data for Kenya

The Kenyan domestic crop and livestock database provided in this report is derived from annual reports of the agriculture-related ministries. In the recent past, the Kenya Institute for Public Policy Research and Analysis (KIPPRA) compiled data with support from the Ministry of Agriculture and in collaboration with the Ministry of Livestock and Fisheries Development (MOLFD) and the Ministry of Cooperative Development and Marketing to create the Kenya Agricultural Sector Data Compendium. The compendium provides data on all agricultural livestock products for 1963–2007. It is an update of the Agricultural Data Compendium developed by KIPPRA in 2003. The 2003 Agricultural Data Compendium was an update of the 1992 Agricultural Data Compendium of the Ministry of Planning and National Development, Long-Range Planning Division. The aim of putting the dataset together was to make available, in one convenient location, data that would otherwise be scattered in different institutions.

The data on agricultural and livestock production come from annual reports by the respective line ministries. Data on industrial crops come from relevant regulatory agencies involved in the development and marketing of cash crops; the data on food crops, oil crops, and horticultural crops are from the Ministry of Agriculture. The data on livestock population are from the Animal Production Division of MOLFD and are based on annual estimates by occasional livestock censuses carried out by field staff.

Documents used to create the compendium include:

- Statistical abstracts and economic surveys from the Kenya National Bureau of Statistics

- Bulletins from the Kenya Meat Commission, Uplands Bacon Factory, Coffee Board of Kenya, Tea Board of Kenya, Cotton Board of Kenya, National Cereals and Produce Board, National Irrigation Board, Sisal Board of Kenya, Pyrethrum Board of Kenya, Kenya Cooperative Creameries, Kenya Sugar Board , British America Tobacco, Kenya Seed Company, Kenya Breweries Ltd. , Horticultural Crops Development Authority, Kenya Bureau of Standards, Meteorological Department, Central Bank of Kenya, and Kenya Dairy Board
- Reports from the divisions of food crops, industrial crops, horticulture, and apiculture in the Ministry of Agriculture and from the Department of Veterinary Services in MOLFD. The Department of Resource Survey and Remote Sensing in the Ministry of Environment and Natural Resources

Table 9 outlines the crop and livestock production data available for 1963–2008 in Kenya. It is free and publicly available from the annual reports of the agriculture-related ministries. However, access to the Kenya Agricultural Sector Data Compendium is limited and must be formally requested from the permanent secretary of the Ministry of Agriculture (www.kilimo.go.ke), the Ministry of Livestock (www.livestock.go.ke), or the director of KIPPRA (www.kippra.org).

Table 9. Crop and livestock data for Kenya

Crop / livestock	Parameters	Time period
Maize, wheat, millet, sorghum, and rice	Area, production, yield	1963–2005
Barley	Area, production, yield	1991–2000
Bananas	Area, production, yield	1966–2006
Beans	Area, production, yield	1970–2005
Cowpeas and pigeon peas	Area, production, yield	1991–2005
Cassava	Area, production, yield	1991–2005
Irish potatoes	Area, production, yield	1973–2005
Sweet potatoes	Area, production, yield	1991–2000
Coffee and tea	Production, prices	1963–2006
Beans, field beans, cowpeas, pigeon peas, groundnuts, and soybeans	Area, production, yield	1980–2007
Cotton seed	Production, prices	1963–2006
Ground nuts, simsim, and sunflowers	Area, production, yield	1970–2000
Avocado, mango, pineapple, citrus, and passion fruit	Area, production, yield	1970–2006
Tomatoes, onion, cabbage, and carrots	Area, production, yield	1980–2006
French beans and cut flowers	Area, production, yield	1980–2006
Fish	Quantity	1963–2006
Cattle, sheep, goats, pigs, and poultry	No. of head, products	1963–2006

Source: Ministry of Agriculture.

2.2.5.2 Household Budget Surveys for Kenya

The Kenya National Bureau of Statistics (KNBS; www.cbs.go.ke) is the government body charged with gathering, analyzing, and publishing socioeconomic data for use by governments, researchers, and donor agencies. The KNBS mainly uses sample surveys to collect agricultural data. The bureau annually publishes an economic survey, a statistical abstract, and a booklet highlighting the country's leading economic indicators. Since the 1980s, the KNBS has undertaken three household budget surveys:

- The 1982 Urban Business Survey

- The 1993–1994 Urban Household Budget Survey
- The 2005–2006 Kenya Integrated Household Budget Survey

Data from the KNBS surveys are available upon request from the director general. Some data, available in publications, are available from libraries at no cost; other types of data are available only upon formal request. Some datasets and publications from KNBS can be downloaded for free from the bureau's website.

2.2.5.3 Meteorological Data for Kenya

The Kenya Meteorological Department (KMD; www.meteo.go.ke) operates 13 agrometeorological stations and 90 climatological stations. All these stations measure normal meteorological parameters on a daily basis and convey the data to the agrometeorological section of KMD every 10 days. Data gathered include temperature (minimum and maximum), wind speed, and rainfall. As Table 10 shows, Kenya's meteorological data were collected from 24 agrometeorological stations.

Table 10. Climate data available for Kenya

Measure	Time period
Precipitation (rainfall) Total annual and monthly	1963–2007
Temperature Monthly minimum temperature Monthly maximum temperature	1985–2004
Wind speed	1985–2004

Source: Ministry of Agriculture.

A publication containing these climatological statistics is available upon request. It includes long-term means of all meteorological parameters, such as rainfall, temperature, wind speed, and direction. It provides data from 90 stations and covers 1963–2007 (Table 7). In Kenya, meteorological data are provided upon request that conforms with departmental policy and the requester pays a fee of US$10 per parameter per station per month. Detailed information about how to obtain the meteorological data is available on the department's website.

2.2.6 Domestic Climate Change–Related Datasets for Madagascar

2.2.6.1 Crop and Livestock Data for Madagascar

Madagascar's Ministry of Agriculture and Livestock and Fisheries collects data on crops and livestock production (Table 11). These data can be accessed without charge from the ministry's library. The country's premier research institute, the Centre National de la Recherche Appliquée au Développement Rural (www.fofifa.mg), also maintains data on its website on different crops and livestock in the country. Information also is available from the website of the Rural Observatory Department (www.pnae.mg) of the National Office for Environment.

Table 11. Crops and livestock data for Madagascar.

Crop / livestock	Parameters	Time period
Cereals: rice and maize	Area, production, yield	1970–2006
Sugarcane, cotton, tobacco, coffee, vanilla	Area, production, yield	1970–2006
Pulses: dry beans	Area, production, yield	1970–2006
Oil crops: groundnuts	Area, production, yield	1970–2006
Salt- and freshwater fish	Production	1985–2006

Source: FOFIFA.

2.2.6.2 Household Budget Surveys for Madagascar

The National Institute of Statistics, a bureau in the Ministry of Economy, Finance, and Budget (www.instat.mg), is a government entity that collects and produces statistics and information about Madagascar. The main publication products are surveys (for example, on labor and markets) and studies and analyses of policy-relevant issues (such as poverty reduction and health). The information is available upon request from the director general of the institute. Limited data can also be accessed from the bureau's website.

2.2.6.3 Meteorological Data for Madagascar

The Directorate of Meteorology and Hydrology maintains daily, monthly, and annual meteorological data for 22 meteorological stations spread throughout the four regions (North, North East, Highlands, and South) of Madagascar (Table 12). The data are available upon request, for a fee.

Table 12. Climate data available for Madagascar

Measure	Time period
Precipitation (rainfall)	1985–2007

Source: FOFIFA.

2.2.7 Domestic Climate Change–Related Datasets for Rwanda

The Rwanda genocide of 1994 destroyed much of the databases that had been compiled in the country since independence. Reliable domestic datasets are available only from 1998.

2.2.7.1 Crop and Livestock Data for Rwanda

The Ministry of Agriculture and Animal Resources (www.minagri.gov.rw) in Rwanda is the custodian of domestic crop and livestock production data. Through the Rwanda Agricultural Development Authority and the Rwanda Animal Resource Development Authority, the ministry collects crop and livestock production statistics. The ministry also publishes annual reports that were in the local language, Kinyarwanda, until 2008. Plans are underway to publish annual reports in English, but officials from the strategic planning unit can assist in the translation of earlier reports into English.

Rwanda's crop and livestock production data are available for 2000–2008 (Table 13) from the strategic planning unit of the ministry upon request. However, these data are not easily accessible because most publications written before 2008 are in the local language. Some information can also be accessed from the ministry's website. In addition, data on tea and coffee production can be accessed from their respective marketing boards, the Rwanda Tea Authority (Office des Cultures Industrielles du Rwanda, Office du The), http://www.rwandatea.com/, and the Rwanda Coffee Development Authority (Office des Cultures Industrielles du Rwanda, Office du Café), http://www.rwandacafe.com/.

Table 13. Crop and livestock data for Rwanda

Crop / livestock	Parameters	Time period
Maize, wheat, millet, sorghum, and rice	Area, production, yield	2000–2008
Bananas	Area, production, yield	2000–2008
Beans and peas	Area, production, yield	2000–2008
Cassava	Area, production, yield	2000–2008
Irish potatoes and sweet potatoes	Area, production, yield	2000–2008
Soybeans	Area, production, yield	2000–2008
Sugarcane	Area, production, yield	2000–2008
Coffee and tea	Production, prices	1994–2008
Fish	Quantity	1999–2008
Cattle, sheep, goats, pigs, and poultry	No. of head	1980–2008
Cattle, sheep, goats, pigs, and poultry	Products	1999–2008

Source: Ministry of Agriculture (MINAGRI).

2.2.7.2 Household Budget Survey Data for Rwanda

The National Institute of Statistics, Rwanda (NISR; www.statistics.gov.rw) publishes demographic and social statistical data annually. Since 2008, the institute has published a fact book, Rwanda in Figures, which contains data on agricultural production and meteorological data. The institute has also undertaken two household budget surveys, the 2001 Integrated Household Living Conditions Survey and the 2005 Integrated Household Living Conditions Survey.

The information compiled by NISR is available for free on the institute's website. The household budget survey data also are available from the director general of NISR for free upon request.

2.2.7.3 Meteorological Data for Rwanda

The Meteorological Service under the Rwanda Ministry of Infrastructure maintains meteorological data for about 15 meteorological stations. These stations collect data on rainfall, temperature, wind speed, and pressure (Table 14).

Table 14. Climate data for Rwanda

Measure	Time period
Precipitation (rainfall)	1964–2009
Total annual rainfall (15 stations)	
Monthly rainfall (15 stations)	
Temperature	1964–2009
Monthly minimum temperature	
Monthly maximum temperature	
Pressure	1964– 2009

Source: Ministry of Infrastructure (MINIFRA).

Rwanda's meteorological data are available from the Meteorological Service (www.meteorwanda.gov.rw). The Meteorological Service also publishes agrometeorological bulletins that provide weather summaries, maps of rainfall, weather outlook, vegetation conditions, impact on agriculture, and expected weather impacts on agriculture. It is important to note that Rwanda is the only ASARECA member country that is willing to provide its meteorological data for free.

2.2.8 Domestic Climate Change–Related Datasets for Sudan

Sudan is the biggest country in Africa. It is divided into five agroecological zones: desert, arid, semiarid, semi-humid, and humid. The domestic climate change–related data can be grouped in several categories.

2.2.8.1 Crop and Livestock Data for Sudan

The main domestic crop and livestock data for Sudan can be found in different sources. The Ministry of Agriculture, Livestock, and Forestry, through the Department of Planning and Agricultural Economics, collects and maintains data on all crops and livestock production in the country's different regions. These are published annually and can be accessed from the ministry's library without charge. Some data can be obtained from the website of the Arab Organization for Agricultural Development (AOAD; www.aoad.org). More detailed data can be found in AOAD's library upon request and at no fee.

The premier research institute in the country, the Agricultural Research Corporation (www.arcsudan.sd), which is based at Wad Medani, maintains data on different crops and livestock in the country. Another source is the Bank of Sudan's website (www.bankofsudan.org). See Table 15 for an outline of the crop and livestock production data collected in Sudan.

Table 15. Crop and livestock data for Sudan

Crop / livestock	Parameters	Time period
Cereals: wheat, maize, sorghum, millet, and rice	Area, production, yield	1986–2007
Potatoes, sugarcane, and cotton	Area, production, yield	1986–2007
Pulses: broad beans, dried beans, and chickpeas	Area, production, yield	1986–2007
Oil crops: groundnuts, sesame, and sunflower	Area, production, yield	1986–2007
Vegetables: tomatoes, dry onions, and watermelons	Area, production, yield	1986–2007
Fruits: mangos, bananas, and citrus	Production	1986–2007
Cattle, sheep, goats, camels, horses, mules, and donkeys	No. of head	1986–2007

Source: Ministry of Agriculture, Livestock and Forestry.

2.2.8.2 Household Budget Survey Data for Sudan

Sudan's Central Bureau of Statistics—a department of the Ministry of the Council of Ministers—produces publications that are informed by a household budget survey and data from the respective line ministries. The bureau has, in the recent past, compiled five population censuses, the last in 2008.

Other publications by the bureau include housing censuses, consumer price indexes, and business surveys. The household budget surveys are available from the director general, Central Bureau of Statistics (www.cbs.gov.sd), upon request. Some data can also be accessed from the bureau's website.

2.2.8.3 Meteorological Data for Sudan

The Sudan National Meteorological Authority (www.ersad.gov.sd) maintains daily, monthly, and annual meteorological data from 25 meteorological stations spread throughout the country's five agroecological zones. The data collected include rainfall, temperature, wind speed and direction, atmospheric pressure, and relative humidity. In addition, the agency provides weather forecasts for use by the agricultural sector and the aviation industry. The data are available upon request, for a fee (2.5 Sudanese dollars, about US$1, per parameter per station per year). The website and data are in Arabic, but English translations are available. To access the data, write a letter to the director of the Meteorological Authority stating the amount of data needed and the purpose for which the data requested will be used. The data are then prepared and a fee is charged.

However, limited meteorological data, taken from annual reports of the Ministry of Agriculture and Livestock and Forestry, were collected for this study (see Table 16).

Table 16. Climate data for Sudan

Measure	Time period
Precipitation (rainfall)	1985–2007

Source: Ministry of Agriculture, Livestock and Forestry.

2.2.9 Domestic Climate Change–Related Datasets for Tanzania

In Tanzania, the domestic climate change–related data can be organized in several groups.

2.2.9.1 Crops and Livestock Data for Tanzania

The main domestic sources of crop and livestock data in Tanzania are the National Bureau of Statistics (NBS) and the agriculture-related ministries.

The Ministry of Agriculture and Food Security and Cooperatives (www.kilimo.go.tz) has been publishing a basic data booklet for several years. The booklet provides basic data on agriculture in the country. The data in the booklet include area, production, and yield for food and cash crops; agriculture and the domestic economy; rainfall; and agricultural inputs. Crop production and acreage data for 1980–2004 are available from the statistical unit of the Ministry of Agriculture and Food Security and Cooperatives, but it must be extracted from hard copies of the annual reports (Table 17). This data can be accessed for free once a formal request has been made to the permanent secretary. Data for 1996–2002 can also be downloaded from the ministry's website at no charge.

The Ministry of Livestock Development and Fisheries (www.mifugo.go.tz) was a department in the Ministry of Agriculture until March 2008, when it became a stand-alone ministry. Livestock populations and production data for 1980–2004 (Table 17) are available in the published annual reports of the Department of Livestock Production and Fisheries, or what is now referred to as the Ministry of Livestock Development and Fisheries. The data are accessible for free from the permanent secretary upon formal request. Background information about the Ministry of Livestock Development and Fisheries can also be found on its website.

Table 17. Crop and livestock data available for Tanzania

Crop / livestock	Parameters	Time period
Maize, finger millet, sorghum, rice, wheat, sweet potatoes, cassava, pulses, cotton, cashew nuts, and bananas	Area, production, yield	1980–-2004
Tea, coffee, sisal, and pyrethrum	Area, production, yield	1980–2004
Fish	Quantity	1986–2008
Cattle, sheep, goats, and poultry	No. of head	1988–2008

Source: Ministry of Agriculture, Food Security and Cooperatives.

2.2.9.2 Household Budget Survey Data for Tanzania

Tanzania's National Bureau of Statistics produces publications informed by data from the line ministries and the household budget survey. NBS has in the recent past compiled two household surveys. These include the

- Regional Household Survey, 2001
- National Household Survey, 2007

In addition, NBS annually publishes an economics survey and a statistical abstract. Other publications by the bureau include a population and housing census, consumer price indexes, and

business surveys. In collaboration with the Ministry of Health and Social Welfare, the NBS was preparing the 2009–2010 Tanzania Demographic and Health Survey at the time of this report in early 2010.

The household budget surveys are available from the director general, National Bureau of Statistics (www.nbs.go.tz), upon request. Some data can be accessed for free; some are sold, depending on the nature of the request. The director general determines whether to charge for the data. Some data can also be accessed from the bureau's website.

2.2.9.3 Meteorological Data for Tanzania

Tanzania's Meteorological Agency (www.meteo.go.tz) is part of the Ministry of Communications and Infrastructure. The agency maintains daily, monthly, and annual meteorological data from 26 meteorological stations spread throughout the country. The data collected include rainfall, temperature, wind speed, direction, atmospheric pressure, and relative humidity. In addition, the agency provides weather forecasts for use by the agricultural sector and the aviation industry.

Tanzania's meteorological data (US$10 per variable per meteorological station per year) cover 1961–2008. Details about available data can be viewed on the agency's website; the data can be purchased from the director general of the Tanzania Meteorological Agency upon request. Table 18 provides an outline of the meteorological data collected from Tanzania's Agriculture Ministry for this study.

Table 18. Climate data available for Tanzania

Measure	Time period
Precipitation (rainfall)	1982–2005
Temperature	1982–2005

Source: Ministry of Agriculture, Food Security and Cooperatives.

2.2.10 Domestic Climate Change–Related Datasets for Uganda

Three distinct domestic climate change–related datasets were identified in Uganda. These are

1. Crop and livestock production data
2. Household surveys
3. Meteorological data

2.2.10.1. Crop and livestock data for Uganda

The National Agricultural Research Organization (www.naro.go.ug) (NARO) carries out agricultural and livestock research in Uganda. As a public institution, it provides data without charge. More information about the agency can be found on its website. The Ministry of Agriculture, Animal Industries, and Fisheries holds most of the data on Uganda's crop, livestock, and fish production. Crop data can be compiled from the crop production division; livestock data can be accessed from the department of livestock production. The data are available at no charge from the relevant departments upon request.

Climate change–related data are also available from the Uganda Bureau of Statistics (http://www.ubos.org) upon request to the director. Other sources of crop information include the Uganda Tea Association (http://ugatea.com/), the Uganda Cotton Organization (http://cdouga.org), and the Uganda Coffee Development Authority (http://www.ugandacoffee.org). The crop and livestock data are available for a variety of periods between 1980 and 2007 (Table 19).

Table 19. Crop and livestock data for Uganda

Crop / livestock	Parameters	Time period
Bananas	Production	1990–2007
Cereals	Production	1990–2007
Tubers	Production	1990–2007
Beans and all legumes	Production	1990–2007
Palm oil	Production	2000–2007
Sugarcane and tobacco	Production	1990–1998
Coffee	Production and area	1986–2007
Tea	Production, prices	1990–2007
Cotton	Production, area, yield	1964–2007
Fruits	Production	1990–1998
Fish	Quantity	1990–2007
Cattle, shoats, and poultry	No. of head	1990–2007
Eggs	Production	1980–2007

Source: NARO.

2.2.10.2 Household Budget Survey Data for Uganda

The Uganda Bureau of Statistics (UBOS) is charged with the responsibility of gathering, analyzing, and publishing socioeconomic data for use by governments, researchers, and donor agencies. UBOS mainly uses sample surveys to collect agricultural data. In two decades, UBOS has conducted several surveys:

- Monitoring survey, 1992
- Monitoring survey, 1993
- Monitoring survey, 1994
- Monitoring survey, 1995
- Monitoring survey, 1996
- Household survey, 1999–2000
- Household survey, 2002–2003
- Household survey, 2005–2006

These data are available from the director of UBOS upon request.

2.2.10.3 Meteorological Data for Uganda

The Meteorology Department, based in Kampala, is a division of the Ministry of Land, Water, and Environment (http://www.meteo-uganda.net) and deals with the daily collection and storage of data from different meteorology stations spread across the country. Data on temperature, precipitation, relative humidity, and other parameters are readily available at a charge (UGX 5000, about US$2.60, per parameter per year). See Table 20.

Table 20. Climate data for 12 meteorological stations in Uganda

Measure	Time period
Precipitation (rainfall)	1992–2008
Temperature	1996–2008
Annual minimum	
Annual maximum	
Relative humidity	1996–2008

Source: NARO.

3. CLIMATE CHANGE ADAPTATION STRATEGIES WITHIN ASARECA

To address the negative consequences of climate change, the ASARECA member countries have adapted various adaptation strategies in different sectors and developed National Adaptation Programs of Action (NAPAs) that they have integrated into their Poverty Reduction Strategy Papers (PRSPs). NAPAs are documents prepared by Least Developed Countries (LDCs) that identify urgent and immediate activities useful for coping with climate change. These documents are presented to the international donor community for support. They provide a process for LDCs to identify priority activities that respond to urgent and immediate climate change adaptation needs. Rather than focusing on scenario-based modeling to assess future vulnerability and long-term policy at the state level, they take into account and build on existing coping strategies at the grassroots level to identify priority activities. In the NAPA process, prominence is given to community-level input, which is regarded as an important source of information, recognizing that grassroots communities are the main stakeholders. The process of NAPA preparation is usually a bottom-up approach in which stakeholders from different sectors (agriculture, health, energy, and so on) discuss and prioritize the different projects that require implementation to reduce the adverse effects of climate change. Before the final set of projects is chosen, there is usually wide consultation at all levels, and this makes the stakeholders own and support the process.

The World Bank and International Monetary Fund (IMF) developed the PRSP approach in 1999 as a way to ensure that debt relief money would go to poverty reduction and to respond to evident weaknesses in relations between poor countries and the Bretton Woods institutions. These weaknesses include the lack of a poverty focus and a lack of country ownership of reforms. PRSPs are prepared by the member countries through a participatory process involving domestic stakeholders as well as external development partners, including the World Bank and IMF. They outline a national program for poverty reduction that is the foundation for IMF and World Bank lending programs and for debt relief for heavily indebted poor countries. The papers are updated every three years and progress reports are filed annually; the papers describe and project the country's macroeconomic, structural, and social policies and programs for at least three years. These papers are regarded as a means to promote broad-based growth and reduce poverty and also assess the country's associated external financing needs and major sources of financing.

Poverty reduction and climate change have a direct relationship because climatic change consequences, such as increased intensity and frequency of storms, drought, and flooding, altered hydrological cycles, and precipitation variance have implications for future food availability. Food availability in turn has a direct bearing on poverty levels, especially for the most vulnerable groups. This, then, shows that NAPAs and PRSPs are closely interlinked, because efforts aimed at adapting to the adverse effects of climate change have a direct impact on poverty reduction. Both initiatives also are based on stakeholder consultations and are therefore country owned. They also are funded by resources from the developed world.

It should be noted that each country that developed a NAPA followed the consultative process of engaging different stakeholders to come up with the different projects and prioritize them. According to the United Nations Framework Convention on Climate Change (UNFCCC), "The steps for the preparation of the NAPAs include synthesis of available information, participatory assessment of vulnerability to current climate variability and extreme events and of areas where risks would increase due to climate change, identification of key adaptation measures as well as criteria for prioritizing activities, and selection of a prioritized short list of activities. It also includes short profiles of projects and/or activities intended to address urgent and immediate adaptation needs of LDC Parties. Upon completion, the NAPA is submitted to the UNFCCC secretariat, where it is posted on the website, and the LDC Party becomes eligible to apply for funding for implementation of the NAPA under the LDC Fund. A copy of the NAPA is also sent to the Global Environment Facility (GEF). The LDC Party can start the process of implementation under the LDF Fund which is managed by the GEF."

The nine ASARECA member countries that have uploaded their NAPAs to the UNFCCC website (only Kenya is not required to) are eligible to apply for funding for the different proposed projects.

However, different proposed projects are at different stages of implementation. This section of the report provides a brief overview of the actions, research, and investment activities included in the NAPAs and PRSPs of each of the 10 ASARECA member countries.

3.1. NAPA and PRSP in Burundi

Burundi has made substantial efforts to incorporate climate change adaptation policies in its national plans.

3.1.1 Adaptation Strategies in Burundi

The climate change adaptation strategies adopted in Burundi cover agriculture, livestock, forestry, and energy.

Agriculture

Burundi's agriculture sector has adopted these adaptation strategies:

- Growing crops most sensitive to fungal diseases during seasons with low rainfall or even dry seasons; growing crops resistant to diseases and plant pests during seasons with heavy rain
- Growing crops such as cowpeas, pigeon peas, and groundnuts in some areas to supplement the protein-leguminous plants whose production is in continuous reduction
- Encouraging planting of soybeans and sunflowers as well as market gardening, all of which are becoming more significant
- Conserving genetic resources (for example, saving ears or dry seeds in attics or repetitive transplanting or propagation by cuttings) for some drought-tolerant crops

Livestock

The adaptation strategies adopted in Burundi's livestock sector include:

- Moving herds along the rivers, where they can find better fodder, or taking refuge in other areas where they can find natural pastures during a drought
- Selling off or slaughtering animals—even at low prices; keeping smaller livestock such as sheep or goats, which are less affected by periods of drought because their sources of food are diverse (herbaceous and aerial pastures, for example)

Forestry

Burundi's forestry adaptation strategies include

- Traditional methods of conserving natural forest ecosystems. This involves respecting, in a quasi-religious way, certain ecosystems and/or elements of both animal and plant biodiversity. For instance, the cutting of trees in the Kibira forest was strictly banned. This high-altitude forest was regarded as a "symbol of the alliance between the Sky and the Earth." This traditional conservation also extends to certain thickets that are considered sacred.
- Using physical barriers otherwise known as firewalls or firebreaks. However, this method of conservation is disappearing because of the increasing space needs of the population.
- Safeguarding certain local species (for example, *Erythrina abyssinica, Cordia Africana*) by incorporating them in fields because of their role in agroforestry.

Energy

The adaptation strategies in Burundi's health sector include

- Exploiting new and renewable energy sources, especially solar energy. Photovoltaic equipment produces nearly 75 KW, which are used for lighting and for powering

telecommunications, refrigeration, and water pumping. Biogas facilities installed in several localities produce energy for home electricity, and wind energy pumps water.

3.1.2 Research and Investment Activities in Burundi

Table 21 provides a list of the climate change adaptation projects underway in Burundi.

Table 21. Adaptation projects in Burundi

Project /activity	Objective
Supporting climate forecasts for early warning	To build the human and technical capacities of the national weather service in order to establish reliable seasonal climate forecasts.
Rehabilitating degraded areas	To restore the vegetative cover of degraded areas.
Safeguarding the most vulnerable natural environments	To delimiting all the protected areas to avoid their clearing through encroachment. The other goal is to protect the natural environments not yet protected to allow savannas and clear forests and thickets to take over naturally.
Harvesting rainwater	To improve food security and the public health of the target population through irrigated agricultural production and clean water conveyance.
Controlling erosion in the area of Mumirwa	To install anti-erosion mechanisms and introduce suitable farming practices.
Protecting the buffer zones in Lake Tanganyika floodplain and around the lakes of Bugesera	To maintain the hydrological and ecological functions of the floodplain around Lake Tanganyika and the marshes of Bugesera.
Popularizing short duration and/or drought-tolerant food crops	To increase the agricultural production in order to improve food security by developing and popularizing varieties of dryness-resistant food crops in all provinces of the country affected by climate change.
Breeding zero-grazing cattle	To improve and increase agrosylvopastoral production and protect the environment.
Building capacity to promote energy- and wood-saving techniques	To increase the acreage covered by forests.
Stabilizing dynamics of river courses in Mumirwa and Imbo	To protect the landscapes and the public and private infrastructure located along the axes of drainage in the Mumirwa and the Imbo lowlands, which are threatened by erosion during periods of heavy precipitation. The ultimate goal is to ensure the socioeconomic well-being of the population by developing a physical environment adapted to the changing climate conditions.
Using education to promote climate change adaptation	To educate the public to be aware of the adverse effects of climate change, bush fires, and deforestation so that the population participates in the research to find solutions and improve systems of adaptation.
Promoting hydropower microstations	To promote the development of economic activities and the reduction of poverty, particularly outside large cities, within an environmentally friendly framework.

Source: NAPA, Burundi.

3.1.3 Integration of NAPA in the PRSP of Burundi

The principal sources of growth identified by the Burundi government in its PRSP are the agriculture, trade, industry, mining, tourism, and handicraft sectors, all of which can be impacted negatively by climate change. In agriculture, the Burundi government aims to develop and improve food production by

promoting the use of those varieties that perform the best, improving soil fertility, and upgrading cropping techniques, which would lead to significant increases in output and household income for farmers. This ties in with the adaptation strategies outlined in the NAPA.

In the livestock sector, the government will place a priority on rebuilding livestock populations and introducing genetic improvements, particularly through the distribution of breeding stock. The government will also set in place an artificial insemination program and encourage the use of forage crops and herbaceous and woody pulse species that not only provide good fodder but also improve soil fertility. In the fisheries sector, the government will develop aquaculture in suitable areas, provide small-scale fisheries with extension services, strengthen maritime legislation concerning fisheries, and reactivate subregional cooperation.

To improve and protect the environment, the government will inform and educate all stakeholders about the rational management of natural resources; train and equip specialists in water management; train and equip the environmental police; develop natural resource management plans and support and assist local communities in managing natural resources; revitalize the national commission on the environment; reforest and develop all catchment areas in a comprehensive fashion; identify and introduce substitutes to protect threatened natural resources; develop a land-use plan; and explore the use of community reforestation schemes as a source of income.

To provide employment to youth and women, the government will develop an environmentally sustainable and labor-intensive public works program for the rehabilitation and maintenance of roads and social infrastructure, marshland development, reforestation, terracing, and soil conservation. Programs undertaken by the government or municipalities will rely, as a matter of priority, on labor-intensive activities.

In health, the government intends to rehabilitate health infrastructure and make existing infrastructure operational in line with health standards; improve the availability and accessibility of essential drugs and other consumables, medical and surgical devices, and laboratory reagents in all health facilities throughout the country; and reassign health personnel to areas with staffing shortages, increase the availability of personnel in terms of quantity, and improve the quality of those hired.

3.2. NAPA and PRSP in the Democratic Republic of Congo (DRC)

The DRC has also incorporated climate change adaptation strategies in its national plans.

3.2.1 Adaptation Strategies in the DRC

The climate change adaptation strategies pursued in the DRC cover several sectors.

Agriculture and Livestock

In agriculture and livestock, the strategies include

- Conducting campaigns to sensitize people to new farming techniques
- Reforming national policies to encourage more agricultural and livestock production
- Integrating durable measures for natural resources, soil, and water management
- Promoting means of stocking food crop products

Public Health

In public health, the climate change adaptation strategies are defined to include

- Reinforcing the means of providing materials and financing public health facilities
- Sensitizing the public about diseases and training more healthcare personnel
- Revising national policy in regard to the fight against malaria

Natural Resources and Water

In natural resources, the climate change adaptation strategies include

- Sensitizing the population about the need to control use of water resources
- Formulating a policy on the sustainable use of water resources and sanitation
- Integrating climate adaptation measures in the activities of sustainable use of water resources

Coastal Zones

In the coastal zone, climate change adaptation strategies include

- Fighting the erosion of coastal areas through biological means
- Revising the policy for managing the development of coastal area cities
- Integrating adaptation measures in the management activities of ocean-bordering areas

Forestry

In the forestry sector, the climate change adaptation strategies include

- Planting tree species in the ecologies where they are best suited
- Revising policy in order to use forestry resources sustainably

3.2.2 Research and Investment Activities in the DRC

Different criteria were used to select and prioritize the projects for climate adaptation projects in the DRC. The criteria used for selection were

- Impact on groups and vulnerable resources
- Impact on the economic growth of the poor (poverty reduction potential)
- Cost effectiveness
- Synergy with action plans under multilateral environmental agreements (MEAs)

Based on these criteria, 10 projects (Table 22) were earmarked for implementation.

Table 22. Final list of priority adaptation projects for the DRC

Adaptation project
Managing and rehabilitating water reservoirs
Carrying out rural and urban electrification projects
Increasing the capacity of agriculture and pastoral production
Managing water resources
Settling rural communities, especially in areas affected by conflict
Improving communication networks through radio, TV, and other means
Managing forest resources
Increasing the capacity of the meteorological service
Fighting erosion and land degradation
Protecting coastal zones

Source: NAPA, DRC.

3.2.3 Integration of NAPA in the PRSP of the DRC

The government of the DRC has incorporated climate change in its development policy documents. These include:

- Revitalizing the livestock sector by restoring the herds decimated during the conflict period
- Restoring the diversification of cash crops
- Strengthening support for producers through the distribution of inputs and the dissemination of applied research
- Developing and organizing the agricultural markets and fisheries sector
- Improving local breeds by crossing them with highly productive breeding stock
- Instigating community establishment and management of breeding centers, with training provided by veterinarians from the extension services
- Intensifying livestock production through improved proper feeding conditions (for example, forage and concentrates) and encouraging the planting of forage crops
- Conducting an ongoing public awareness and education program about safeguarding the environment
- Implementing a strategy for the conservation of biodiversity, in particular through the protection and restoration of plant cover
- Defending natural forests and encouraging the expansion of afforested areas
- Implementing the United Nations Framework Convention on Climate Change, the protection and conservation of water and water resources, the maintenance of environmental health, and the prevention of natural disasters
- Improving and streamlining the regulations for granting forestry concessions
- Promoting controlled industrial exploitation to create new jobs and generate incomes through trade in wood, charcoal, and diverse nontimber products
- Gaining the involvement of local communities in the management and protection of forests and the environment to enhance their rights and improve their living conditions
- Developing the use of alternative primary energy forms for the production of electricity (new and renewable energy sources, solar, wind, biogas, and so on)
- Reforming the water and sanitation sectors
- Conducting inventories of the water needs of the urban and rural populations
- Drafting a water and sanitation code that emphasizes integrated water resource protection and management and defines the roles of private operators in the sector
- Creating a water and sanitation development fund

3.3. NAPA and PRSP in Eritrea

In Eritrea, the climate change adaptation policies identified in the NAPA have been incorporated in the PRSP.

3.3.1 Adaptation Measures in Eritrea

The climate change adaptation strategies pursued in Eritrea are broad and cover several sectors of the economy.

Agriculture

In agriculture, strategies include

- Improving soil fertility and moisture retention by using conservation, fertilization, and alternative cropping techniques
- Increasing water supply through irrigation, water diversion structures, ponds, wells, and the optimization of farming practices
- Controlling pests and plant diseases through regular weeding, crop rotation, and the planting of appropriate crops
- Cultivating time crops in direct response to changing patterns of rainfall
- Breeding drought- and disease-resistant high-yield crops to maintain and/or improve crop production levels

Livestock

In livestock, strategies include

- Implementing community-based development and/or rehabilitation of rangelands in specific areas
- Selecting animal species and breeds more able to cope with climatic variability
- Establishing dairy production models suitable for specific areas
- Increasing job opportunities in order to diversify household income
- Reducing overall livestock numbers while improving productivity of the livestock retained

Forestry

In forestry, the strategies include

- Encouraging afforestation of degraded landscape/watersheds by constructing terraces, microbasins, and check dams
- Promoting agroforestry practices as a way of diversifying land production systems
- Planting a mix of indigenous drought-resistant and fast-growing exotic species through community forestry initiatives
- Encouraging natural regeneration through enclosures augmented with enrichment planting in biodiversity-protected areas
- Promoting wood energy substitutes (solar, wind, kerosene, liquid propane gas, electricity) and wood consumption efficiency (for example, through use of improved stoves)
- Encouraging alternatives for wood in traditional house construction

Water resources

In water resources, strategies include

- Improving water use efficiency by introducing water-saving irrigation systems like drip and sprinkler irrigation
- Enhancing groundwater recharging mechanisms
- Developing effective soil and water conservation projects
- Increasing awareness, education, and training for farmers, Ministry of Agriculture staff, and zoba (regional) offices in resource use, particularly soil/water conservation
- Upgrading the existing national climatological network
- Increasing knowledge of water resources through stream flow gagging stations for major river basins and groundwater monitoring

- Introducing/expanding irrigated agriculture, especially spate-irrigated agriculture for crop/livestock production
- Promoting good water resource management and efficiency through new regulations
- Conducting impact and adaptation research on water resources

Marine and Coastal Zones

In marine resources, strategies include

- Strengthening integrated coastal area management practices
- Promoting research to bridge existing knowledge gaps regarding sea-level rise
- Implementing a management program for mangroves
- Introducing marine- and coastal infrastructure–protected areas
- Promoting traditional adaptation measures such as natural beach nourishment
- Providing assistance for relocation of island inhabitants
- Developing accessible community awareness programs on climate change and adaptation options

Public Health

In public health, strategies include

- Establishing drought early-warning systems
- Improving the quality of water supply and sanitation systems
- Improving emergency preparedness
- Encouraging supplementary feeding
- Upgrading health infrastructures (for example, enhancing vaccination, improving housing standards, monitoring and raising awareness of vectors and diseases)
- Developing integrated control approach for vector-borne diseases

3.3.2 Research and investment activities in Eritrea

During regional stakeholder consultations, several projects were identified for each type of key adaptation need identified under different sectors (Table 23). These projects were considered to have the potential to decrease the vulnerability of key groups and sectors relative to climate variability, extreme events, and long-term climate change.

Table 23. Potential adaptation projects in Eritrea

Sector	Potential adaptation projects
Agriculture	18
Livestock	9
Forestry	15
Water resources	29
Marine and coastal zones	14
Public health	17
Total	102

Source: NAPA, Eritrea.

A total of 102 projects (Table 23) were identified in the different sectors. Different selection criteria were used by stakeholders to rank the key projects. The selection criteria included (a) reduction of threats or impacts of climate change; (b) cost-effectiveness and feasibility; (c) impact on vulnerable groups and resources; (d) synergy with multilateral environmental agreements; (e) synergy with national plans; (f) contribution to poverty reduction; and (g) equity. Using these criteria, the original 102 projects were reduced to 22 (Table 24).

Table 24. Key adaptation activities in Eritrea

Sector	Key adaptation activities
Agriculture	Breeding drought- and disease-resistant crops
	Using biological means (such as vegetative hedges) to conserve soil and water
	Constructing diversion structures to let rainwater into spate fields (spate is a preplanting system of irrigation where use is made of seasonal rivers (wadis) that produce flash floods, are diverted by structures to irrigate fields in the lowlands)
	Constructing stone and earth bunds
Livestock	Introducing community-based pilot projects to intensify existing production models, areas, and species, especially in eastern and northwestern lowlands; selecting suitable sheep and goat breeds
	Introducing community-based pilot rangeland improvement and management in selected agroecological areas in eastern and northwestern lowlands
Forestry	Encouraging afforestation and agroforestry through community forestry initiatives
	Encouraging natural regeneration through enclosures
	Encouraging use of improved wood stoves
	Using conservation and management to protect highland forest ecosystem
Water resources	Using groundwater recharge for irrigation wells
	Introducing and expanding irrigated agriculture, especially spate-irrigated agriculture
	Implementing rural and urban water supply projects by constructing new dams, ponds, and wells
	Constructing livestock watering points
Marine and coastal zones	Strengthening the formulation and development of integrated coastal zone management
	Implementing mangrove afforestation programs
	Establishing marine protected areas
	Constructing protection areas for the most vulnerable coastal infrastructure
Public health	Offering infant young child feeding programs, including supplementary feeding, therapeutic feeding, and breast feeding
	Using epidemic forecasting, early warnings, and response (surveillance)
	Instituting gross monitoring programs at community level, including information, communication, counseling, training, organization, and guidelines for feeding programs
	Using integrated vector management, including indoor vector spraying, treating nests with insecticide, and controlling breeding sites

Source: NAPA, Eritrea.

As a final step, these highest-priority projects were then ranked by a group of technical experts, subject matter specialists, and senior policymakers, most of whom are members of the National Steering Committee, to produce a final prioritized set of projects across all vulnerable sectors. Table 25 presents

the final prioritized list of projects in Eritrea most needed to meet the urgent and immediate needs of vulnerable communities adapting to increasing climatic risks.

Table 25. Final list of priority adaptation projects for Eritrea

Sector	Key adaptation activities
Agriculture	Breeding drought- and disease-resistant crops
Livestock	Introducing community-based pilot rangeland improvement and management in selected agroecological areas in eastern and northwestern lowlands
Forestry	Encouraging afforestation and agroforestry through community forestry initiatives
Water resources	Using groundwater recharge for irrigation wells

Source: NAPA, Eritrea.

3.4. NAPA and PRSP in Ethiopia

Like its counterparts, Ethiopia has made substantial efforts to incorporate climate change adaptation strategies in its national development plans.

3.4.1 Adaptation Strategies in Ethiopia

The climate change adaptation strategies adopted in Ethiopia are categorized at the household and national levels.

Household Level

At the household level, climate change adaptation policies include

- Changing cropping and planting practices (for example, using mixed cropping to diversify risk and early planting to escape drought).
- Reducing consumption levels. During drought, households ration the amount of food consumed by each household member.
- Collecting wild foods to supplement other foods.
- Using interhouse transfers and loans.
- Increasing petty commodity production.
- Searching for employment through temporary or permanent migration; selling assets such as agricultural tools and livestock.
- Mortgaging land and obtaining credit from merchants and money lenders.
- Using early-warning systems.
- Appealing for food aid.

National Level

At the national level, climate change adaptation policies cover air quality, agriculture, natural resources management, water resources, health, and energy.

Air quality

To improve air quality, Ethiopia is

- Developing a federal strategy, standards, and law to improve urban air quality
- Launching environmentally sound investments and other programs that foster CDM funding, including emissions trading

- Implementing awareness-creation programs about the effects of greenhouse gas emissions, climate change, and natural environment

Agriculture and Natural Resources Management

In agriculture, the strategies include

- Using various water-harvesting technologies and familiarizing farmers with effective and efficient water use methods
- Implementing natural resources conservation and development projects (tree planting, soil conservation, protection of water resources, and the introduction of appropriate water-harvesting techniques)
- 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) in drought- prone areas to alleviate rain shortages that cause crop failure
- Promoting improved/productive animal breeds to reduce herd size and pressure on land
- Introducing agroforestry systems to plant multipurpose trees that can be used to produce feed, conserve soil, and produce fruits for human consumption

Water Resources

In water resources, the strategies include

- Construction of small check dams and using rainwater-harvesting schemes to meet water supply for domestic use and irrigation
- Undertaking soil conservation measures that help to reduce soil erosion and siltation and also protect against the pollution of water sources
- Implementing watershed management and water conservation programs, as well as projects that promote local community participation

Health

In health, the strategies include

- Implementing programs that help to prevent and control communicable diseases like malaria through community participation
- Organizing and implementing community-based health education programs to create the awareness and develop knowledge of personal hygiene and environmental health management
- Developing and introducing surveillance systems, introducing methods of health prevention, and instituting vector control for health workers and the community
- Providing training programs to build the human capacity to improve healthcare extension services at the local level

Energy

In the energy sector, policies cover

- Initiating and developing projects that promote the use of alternative and or nonwood energy sources (for example, biogas and fuel-saving stoves)

- Increasing awareness of the effect of pollution on the environment through Information, Education and Communication (IEC), with a focus on energy use and environmental education
- Enforcing laws and regulations to protect and prevent pollution and ensure the use of local factories that are environmentally friendly

3.4.2 Research and Investment Activities in Ethiopia

Based on the review of adaptation options identified under MEA synergy assessments, ongoing programs, development project initiatives, the initial national communication of Ethiopia to UNFCCC, and the outcomes of the regional consultative workshops conducted by the National Meteorological Agency (NMA), 37 potential adaptation options were identified and proposed for further prioritization and ranking, as well as inclusion in the NAPA to address immediate adaptation needs. Members of the National Climate Change Steering Committee, established by NMA, endorsed the criteria proposed before the prioritization process started. The criteria selected were

- Impact on economic growth of the poor (poverty reduction potential)
- Complementarities with national and sectoral plans
- Climate change risk (losses avoided by the poor)
- Synergy with action plans under MEAs
- Cost effectiveness

Based on these criteria, 11 projects worth a total of US$3.75 million were earmarked for implementation (Table 26).

Table 26. Final list of priority adaptation projects for Ethiopia

Sector	Adaptation project
Agriculture	Promoting drought/crop insurance program
	Strengthening/enhancing drought and flood early-warning systems
	Developing small-scale irrigation and water-harvesting schemes in arid, semiarid, and dry, subhumid areas
Natural resources	Improving/enhancing rangeland resource management practices in the pastoral areas
	Implementing community-based sustainable use and management of wetlands in selected parts
Environment	Instituting a capacity-building program for climate change adaptation
Water resources	Realizing food security through a multipurpose, large-scale water development project in Genale–Dawa Basin
Environment	Inaugurating a community-based carbon sequestration project in the Rift Valley system
	Establishing a national research and development center for climate change
Health	Strengthening malaria containment programs in selected areas
Forestry	Promoting on-farm and homestead forestry and agroforestry practices in arid, semiarid, and dry, subhumid parts

Source: NAPA, Ethiopia.

3.4.3 Integration of NAPA in the PRSP of Ethiopia

The government of Ethiopia has managed to incorporate climate change in its development policy documents. These include biodiversity conservation policy, agriculture policy, agriculture and rural development policy and strategy; safety nets, the Plan for Accelerated and Sustainable Development to End Poverty, and the Energy Policy of Ethiopia (EPE). Some actions in these documents that are related to climate change include

- Promoting sustainable development and sustainable use of biological diversity, and reducing climate-related vulnerabilities
- Creating strong and resilient ecosystems to thereby help to reduce the economic and social vulnerability of local people
- Focusing on the rehabilitation and reclamation of degraded land, reforestation, and the conservation, management, and protection of natural resources
- Encouraging activities that reduce poverty/improve livelihoods and simultaneously conserve and protect ecosystems
- Developing, in conjunction with the MEAs, drought-resistant plants and crop species that adapt easily adaptable to areas with moisture stress, and developing interventions to rehabilitate and maintain the biodiversity of dry land and fragile ecosystems
- Participating in UN conventions and other MEAs that emphasize environmental information networks and capacity building, as well create awareness of the impacts of climate change; developing coping mechanisms that are in conformity with policies/strategies/programs, particularly the EPE

3.5. Climate Change Adaptation Policies in Kenya

Kenya is not listed as an LDC and is therefore not required to submit a NAPA. This notwithstanding, Kenya has incorporated climate change adaptation strategies in its national planning documents.

3.5.1 Adaptation Strategies in Kenya

The climate change adaptation strategies pursued in Kenya have been classified as short-term and long-term measures.

Short-term Measures

The short-term measures include

- Drilling boreholes in Nairobi and other parts of the country. To date, 50 boreholes have been sunk in Nairobi; there are plans to sink a total of 200 boreholes.
- Using water tanks to supply water in slum areas in Nairobi and other cities and towns.
- Using water kiosks as alternatives for ensuring a constant water supply. Also, cattle troughs are to be constructed in various parts of the country for watering animals.
- Implementing a duty waiver on imported maize, an important staple crop.
- Providing seeds and fertilizer to farmers to improve production.
- Placing about 40,000 hectares under irrigation.
- Importing more than a million energy-saving light bulbs to replace the incandescent ones. These will be given to citizens free in exchange for old bulbs.
- Installing 88 mw diesel power plants, public and private, to supplement hydroelectric power; the government is also exploring other potential sources of energy such as nuclear, wind, and waste heat recovery boilers.

Long-term Measures

The long-term measures include

- Sensitizing the populace about the effective use of water
- Desilting water dams and building new dams
- Continuing programs that provide emergency food supplies to vulnerable people Providing emergency relief to hard-hit livestock farmers, especially pastoralists, during drought season
- Convincing farmers not to sell green maize, which will help improve maize yields and reduce the number of food-insecure households
- Expanding to other areas, especially rural ones, the government program that provides food subsidies to poor people living in low-income areas of towns
- Conserving water, especially by protecting water towers
- Supporting and encouraging the use of water-harvesting techniques in towns and rural areas

In the long-term, the government intends to drill more boreholes and provide additional water takers to increase water supply.

3.6. NAPA and PRSP in Madagascar

Madagascar, like other countries in ASARECA, has incorporated the strategies enumerated in its NAPA in national planning documents.

3.6.1 Adaptation Strategies in Madagascar

The climate change adaptation policies pursued in Madagascar cover agriculture and livestock, public health, natural resources and water, coastal zones, and forestry.

Agriculture and Livestock

In agriculture, the strategies pursued include

- Conducting campaigns to sensitize people to new farming techniques
- Revising national policies to encourage more agricultural and livestock production
- Integrating durable measures for natural resources, soil, and water management
- Promoting means of stocking food crop products

Public Health

In public health, the strategies pursued include

- Reinforcing means of providing materials and financing public health facilities
- Sensitizing the public to diseases and training more healthcare personnel
- Revising national policy for fighting malaria

Natural Resources and Water

In natural resources, the strategies include

- Increasing means and financing of water and natural resources management
- Sensitizing the population about the controlled use of water resources
- Formulating a policy on sanitation the sustainable use of water resources
- Integrating climate adaptation measures in activities supporting sustainable use of water resources

Coastal Zones

In the coastal zones, the government intends to

- Install embankments in coastal areas to reduce the erosion from waves
- Fight the erosion of coastal areas through biological means
- Revise the policy on managing the development of cities in coastal areas
- Integrate adaptation measures into management activities of coastal areas

Forestry

In forestry, the strategies pursued include

- Planting tree species in ecologies where they are best suited
- Fighting to control harmful plant species in these ecologies
- Revising policy in order to sustainably use forestry resources

3.6.2 Research and Investment Activities in Madagascar

Different criteria were used to select and prioritize the projects for climate adaptation projects in Madagascar. The criteria used for selection were

- Impact on groups and vulnerable resources
- Impact on economic growth of the poor (poverty reduction potential)
- Cost effectiveness
- Capital resources of the community
- Synergy with action plans under MEAs

Based on these criteria, 15 projects were earmarked for implementation (Table 27).

Table 27. Final list of priority adaptation projects for Madagascar

Sector	Adaptation Project
Water resources	Rehabilitating and/or building dams and water pans
	Establishing associations and making them more dynamic for managing water resources
Crops and livestock	Supporting crop and animal production by acquiring and distributing agricultural materials, developing income-generating activities in different regions, and promoting animal vaccination campaigns
Soil conservation	Adopting techniques to fight erosion and restore soils through soil conservation measures
Meteorology	Establishing a legal structure for the meteorological service and/or strengthening a decentralized meteorological service
Coast and marine	Constructing protection areas for the most vulnerable coastal infrastructure
	Strengthening the formulation and development of integrated coastal zone management and mangrove afforestation programs; establishing protected marine areas
Forestry	Reforesting rural zones with appropriate tree species adaptable to each area
	Promoting transfers for managing forest at local community level

Table 27. Continued

Sector	Adaptation Project
Information and communication	Identifying zones of production potential; rehabilitating communication and telecommunication infrastructure for improved commercialization
	Offering appropriate support for information, education, and communication, such as radio, and other information dissemination systems
Public health	Informing population about Causes of diseases and adequate measures to prevent transmission Necessity of visiting health centers Construction of latrines Nutrition
	Strengthening and consolidating the capacities of health services, providing better equipment and appropriate medicine, and intensifying disease surveillance
	Releasing the necessary resources for preventing disease and controlling disease vectors

Source: NAPA, Madagascar.

3.6.3 Integration of NAPA in the PRSP of Madagascar

The government of Madagascar has managed to incorporate climate change in its development policy documents. These policies affect different sectors of the economy and include

- Increased use of alternative and/or renewable energy sources, including hydro, solar, wind, wave, coal, gas, and bioenergies to reduce dependence on oil products
- Exploring alternative sources of energy production, especially local resources such as hydroelectricity
- Improving national awareness, access, and distribution of reliable and relevant information on weather forecasts; promoting regional and international cooperation on meteorological issues, especially major events such as cyclones
- Developing and implementing a national water and sanitation program to cover all aspects of water supply and usage, including safe drinking water, water tables, irrigation, industrial uses, environmental protection, and sewerage systems
- Intensifying and improving productivity, increasing cultivated surfaces, and providing assistance in the form of seed and fertilizer
- Conducting research on alternative crop potential and market opportunities
- Encouraging the diversification of activities for additional income in order to reduce vulnerability caused by world price fluctuations and bad weather
- Developing and implementing an organic agriculture strategy
- Identifying and developing regional sector specializations
- Promoting modern production practices (standards and quality)
- Ensuring all existing health centers and first-referral hospitals are staffed by medically qualified professionals who can provide basic services
- Decentralizing the management and the system of healthcare financing and decisionmaking at regional and commune levels
- Implementing a national policy of contracts for public, private, medical, paramedical, and other human resources

- Improving the capacity of health centers to prevent, diagnose, and treat tuberculosis through immunization, education, and social mobilization
- Improving access to promotional and clinical services for vulnerable groups and general population living in areas at risk of HIV
- Establishing new land, lake, marine, and coastal protected areas
- Ensuring financial sustainability for the management of protected areas and biodiversity
- Managing protected areas and land, lake, marine, and coastal biodiversity.
- Managing the clearing of vegetation and damage caused by fire
- Promoting reforestation and restoring degraded habitats
- Strengthening the framework for preventing environmental damage (including pollution) caused by businesses, miners, farmers, fishermen, and tourism
- Strengthening forest and environmental regulation, enforcement, and control
- Implementing sustainable forest management techniques and establishing forest plantations in appropriate areas to satisfy the demand for forestry products and tree seedlings and inaugurating other measures to support afforestation

3.7. NAPA and PRSP in Rwanda

Rwanda has incorporated the climate change adaptation policies specified in its NAPA in its PRSP.

3.7.1 Adaptation Measures

Rwanda has adopted climate change adaptation strategies in different sectors: agriculture, livestock, forestry, land and water resources, and health.

Agriculture

The adaptation measures adopted in the agriculture sector include

- Promotion of non rain-fed agriculture
- Increased use of modern agricultural techniques
- Cultivation of drought-tolerant crops in arid and semiarid zones
- Introduction of precocious (early-maturing) varieties in arid and semiarid zones
- Promotion of value addition and other postharvest techniques for agricultural products
- Reinforcing early-warning and rapid intervention systems

Livestock

In the livestock sector, the following adaptation measures have been adopted:

- Promotion of zero-grazing techniques
- Promotion of veterinary and phytosanitary services

Forestry

In the forestry sector, the following adaptation measures have been adopted:

- Development of alternative sources of wood energy
- Promotion of the rational use of wood energy
- Preparation and implementation of forestry development plan

Land and Water Resources

The adaptation measures adopted for land and water resources include

- Protection of basin sides in mountainous zones
- Preparation and implementation of land development plan
- Integrated water resources management (including rainwater)

Health and Others

In the health sector, the following adaptation measures have been adopted:

- Promotion of nonagricultural activities to increase incomes
- Greater access to drinking water
- Increased public access to medical insurance services
- Prevention of water-borne diseases by fighting their vectors
- Facilitation of access to health services

3.7.2 Research and Investment Activities in Rwanda

Because of financial constraints and limited capacities, specific criteria were used to select and prioritize the different options. These were (a) the impact on vulnerable groups and resources; (b) the contribution to sustainable development (sociocultural, ecological, and economic); (c) synergy with MEAs; (d) potential of risk reduction; and (e) cost effectiveness (financing). Based on these criteria, Rwanda selected seven areas in which to prepare projects for funding and implementation under NAPA. See Table 28.

Table 28. Adaptation projects in Rwanda

Project /activity	Objective	Integration in PRSP
Conserving and protecting lands from erosion and floods at district level in vulnerable regions	To reduce vulnerability of regions affected by torrential rains, erosion, and floods	Promotion of labor-intensive public works
Mastering hydrometeorological information and instituting early-warning systems for control of climate change hazards; installing and rehabilitating hydrological and meteorological stations	To gather historical and current hydraulic and meteorological data useful in all socioeconomic sectors, as well as the prevention of disaster and catastrophes caused by climate change	Integration of risk and catastrophe management in large national programs for poverty reduction, community development, and environmental protection
Realizing year round irrigation perimeters from water flows in vulnerable regions	To encourage small farmers and pastoralists to take the initiative to practice agriculture and animal husbandry in ways that avoid rain-fed practice in plots that are well-adapted for irrigation by gravity systems	Promotion of labor-intensive public works
Assisting districts in vulnerable regions to plan and implement conservation measures and water storage	To increase the capacity of the population living in vulnerable regions of the East and South East and some zones in the central plateau to cope with climate change	Promotion of labor-intensive public works

Table 28. Continued

Project /activity	Objective	Integration in PRSP
Increasing the capacity of villages in vulnerable regions of Imidugudu to adapt by improving drinking water, sanitation, and alternative energy services, and promoting nonagricultural activities	To stimulate reclassified rural habitat through improved basic services in Imidugudu villages in vulnerable zones and reduce exposure of rural population to climate change	Development of socioeconomic infrastructures (water, energy, erosion control) Promotion of agropastoral, craft industry, or labor-intensive activities
Increasing modes of food distribution and health support to deal with extreme climate phenomena	To increase national capacity to handle catastrophes resulting from climate change, including climate variability and extremes	Identification of major problems facing the communities
Preparing and implementing a national strategy of woody combustible substitution to combat deforestation and halt erosion resulting from climate change	To reduce the pressure on forests from rural and urban communities that use wood energy	Ensuring that energy consumption grows by 10% per year and rural electrification by 30%, so that 35% of the population has electricity in 2015. Promotion of labor-intensive public works

Source: NAPA, Rwanda

3.7.3 Integration of NAPA in the PRSP of Rwanda

To promote agricultural growth and help in poverty reduction, the government of Rwanda has identified essential actions: research, extension services, input development, finance, infrastructure, marketing, livestock development, cash crop development, and sector planning. In livestock, the government has encouraged the importation of improved breeds and the eradication of disease and pests.

In human health, the government will focus on preventing disease, particularly malaria and HIV/AIDS; providing increased access to basic healthcare, particularly by reducing costs to the poor and providing health information at the community level; and implementing improvements in the quality of health services.

To improve water use efficiency and sanitation, the government will improve the water supply and extend its network; encourage the community management of the water supply; increase access to sanitation services; develop a health-sector strategy; and build capacity at the central and district levels. To create employment, every government sector needs to seek opportunities for labor-intensive methods for carrying out its objectives. In particular, the development of infrastructure in rural and urban areas is well suited to a labor-intensive approach.

3.8. NAPA and PRSP in Sudan

Sudan, like the other ASARECA member countries, has a NAPA that specifies the climate change adaptation strategies that the country would like to pursue. The strategies specified in the NAPA have been incorporated in national planning documents and cover a broad range of adaptation strategies.

3.8.1 Adaptation Strategies in Sudan

The climate change adaptation strategies in Sudan cover agriculture, livestock, and forestry; water resource management; and public health.

Agriculture, Livestock, and Forestry

In agriculture, the climate change adaptation policies focus on

- Community-based forest and rangeland management and rehabilitation
- Replacement of household goat herds with flocks of sheep to reduce pressure on fragile rangelands
- Lessening of pressure on local forests through the use of mud brick building design and alternative energy sources
- Land-use conversion from agricultural activities to livestock raising
- Strengthening of agricultural and veterinary extension services, including demonstration
- Introduction of drought-resistant seed varieties
- Increased poultry and fish production
- Afforestation of areas denuded of trees
- Drought early-warning systems for disaster preparedness
- Extension services in agriculture for small-scale farmers
- Protection and/or rehabilitation of rangelands, including construction of shelter belts to reduce windstorm impact

Water Resource Management

In water resources, the climate change adaptation policies include

- Introduction of new water harvesting/spreading techniques that make use of intermediate technologies
- Promotion of greater use of traditional water conservation practices
- Rehabilitation of existing dams, as well as improvements to water basin infrastructure for increased water storage capacity, particularly in central and western Sudan
- Construction of dams and water storage facilities in western Sudan
- Introduction of water-conserving agricultural land management practices
- Improvement of access to groundwater supplies by humans and animals through the installation of water pumps
- Enhancement of capabilities of regional meteorological stations to monitor hydroclimatic variables
- Introduction of a revolving microcredit fund to support the implementation of small water-harvesting projects
- Extension services in capacity strengthening in water capture and storage techniques for small-scale farmers

Public Health

In public health, the climate change adaptation policies seek to

- Improve community sanitation and medical services, including capacities for diagnosis and treatment
- Build community awareness regarding preventive measures for malaria, meningitis, and leishmaniasis
- Introduce preventive measures, such as mosquito nets, treatment/drying up of breeding sites, to restrict malaria transmission

- Introduce early disease diagnosis and treatment programs for malaria, meningitis, and leishmaniasis
- Improve irrigation system management to reduce insect breeding sites
- Provide alternative water supply systems for domestic use

3.8.2 Research and Investment Activities in Sudan

There are 32 major adaptation projects proposed and prioritized for the five ecological zones in Sudan through regional stakeholder consultations. This second step of prioritization involved extensive national consultations to review the results of zonal prioritization processes. These consultations involved stakeholders from each of the ecological zones, as well as relevant government and civil society institutions. Those participating in the regional consultations agreed on the following final national list of priority adaptation activities projects for Sudan:

- Enhancing resilience to increasing rainfall variability through rangeland rehabilitation and water harvesting in the Butana area of Gedarif State
- Reducing the vulnerability of communities in drought-prone areas in southern Darfur State through improved water-harvesting practices
- Improving sustainable agricultural practices under increasing heat stress in the River Nile State
- Practicing environmental conservation and biodiversity restoration in northern Kordofan State as a coping mechanism for rangeland protection under increasing climate variability
- Adopting strategies to adapt to drought-induced water shortages in highly vulnerable areas in Central Equatorial State

Countries that are currently engaged in conflict are not considered "PRSP countries." Sudan falls into this category and does not have a formal PRSP.

3.9. NAPA and PRSP in Tanzania

Formulation of Tanzania's PRSP took note of the country's NAPA and incorporated climate change policies in the final document. The following sections discuss the climate change adaptation strategies proposed in the country's NAPA that have been incorporated in the PRSP.

3.9.1 Adaptation Measures

Tanzania has adopted climate change adaptation strategies in different sectors of its economy: agriculture, livestock, forestry, water resources, coastal and marine resources, health, wildlife, energy, human settlement, and tourism.

Agriculture

In the agriculture sector, the following adaptation measures have been adopted:

- Improving small-scale irrigation
- Increasing research and development for drought-tolerant seed varieties
- Increasing agricultural extension activities
- Diversifying agriculture by growing different types of crops on different land units
- Adopting water-harvesting techniques
- Using terracing and contour farming
- Using manure

Livestock

The following adaptation measures have been adopted in the livestock sector:

- Strengthening cross-breeding for resistant breeds
- Strengthening tick- and tsetse-control programs
- Strengthening livestock extension services
- Improving livestock marketing infrastructure
- Enhancing research and development in livestock production and breeding
- Promoting zero grazing

Forestry

The adaptation measures adopted in the forestry sector include:

- Collaborative forest management in various districts
- Ensured ecosystem stability through the conservation of forest biodiversity, water catchments, and soil fertility
- Nationwide tree-planting campaigns
- Encouragement of participatory forest management

Water Resources

In the water sector, the following adaptation measures have been adopted:

- Integrated water resource management
- Development of new infrastructure
- Conjunctive water use
- Protection of water catchments
- Rainwater harvesting
- Identification of new dam sites and construction of new dams

Coastal and Marine Resources

In the water sector, the following adaptation measures have been adopted:

- Marine and coastal environment management programs and projects
- Conservation of marine and coastal resources

Health

In the health sector, the following adaptation measures have been adopted:

- Institution of the Integrated Diseases Surveillance Response System to prevent, mitigate, and respond to epidemics
- Making Infectious Disease Weekending reports available at the Health Centres in district/regional hospitals
- Establishment of Emergency Plan Response Unit to coordinate and manage all health-related hazards, including epidemics, accidents, droughts, and floods
- Encouraging use of traditional/alternative medicines
- Establishment of a traditional medicines research unit at Muhimbili Medical Research Institute

Wildlife

In the wildlife sector, the following adaptation measures have been adopted:

- Conservation of wildlife resources by formulating wildlife management policy
- Provision of enhanced legal, regulatory, and institutional environment for rural communities and the private sector to participate in wildlife conservation through establishment of wildlife management areas
- Development of appropriate regulatory mechanisms that will continue to set aside protected areas where wildlife and natural areas will be conserved

Energy

The adaptation measures adopted in the energy sector include:

- Application of cleaner production technologies
- Improvement of and increase in clean thermal power generation
- Protection of hydropower water catchments
- Increase in availability of biomass resources
- Improvement of biomass to increase energy conversion efficiency
- Increased use of modern biomass in energy technologies
- End-use energy efficiency programs

Human Settlement

To protect human settlements, the following adaptation measures have been adopted:

- Coastal and beach erosion: there are plans for development of tourist hotels or buildings situated along the seashore (mainly in Dar-es-Salaam)
- Preparation of town plans to improve urban transportation and drainage systems (Central Business District Schemes
- Upgrading and making unplanned settlements official, even in low-lying, flood-prone areas; wetlands; hilly areas; and coastal areas along oceans and lakes
- Instituting housing development schemes in different regions of the country

Tourism

In the tourism sector, the following adaptation measures have been adopted:

- Establishment of national parks, forest, game, and marine reserves to ensure the sustainability of tourism as an industry
- Protection of the seashore by building barrier walls (for example, along the Ocean Road)
- Implementation of the National Tourism Policy and Action Plan
- Protection of the wildlife corridors
- Creation or strengthening of community-based management programs in areas surrounding the national parks and game reserves

3.9.2 Research and Investment Activities in Tanzania

Several project activities were ranked by the NAPA team in consultation with stakeholders as the most important priorities. See Table 29.

Table 29. Adaptation projects in Tanzania

Project /activity	Objective
Improving food security in drought-prone areas by promoting drought-tolerant crops	To promote use of drought-tolerant food crops in drought-prone areas of Shinyanga, Dodoma, and Singida regions for sustainable food production
Improving water availability to drought-stricken communities in the central part of the country	To provide water and ensure sustainable use of water in the drought-stricken areas
Shifting of shallow water wells affected by inundation in the coastal regions of Tanzania mainland and Zanzibar	To construct new water wells to give people reliable access to safe and clean drinking water and its use for other development processes
Participatory reforestation on Mount Kilimanjaro	To improve the incomes of communities around Mount Kilimanjaro by providing alternative sources of income and food through replanting trees and economic diversification
Using community-based, minihydropower generators for economic diversification	To reduce vulnerability of the local communities by providing a more predictable source of energy
Combating malaria epidemic in newly mosquito-infested areas	To address the vulnerability of the communities to malaria in the nontraditional malaria areas and strengthen their capacity to adapt to this condition

Source: NAPA, Tanzania.

3.9.3 Integration of NAPA in the PRSP of Tanzania

To facilitate crop production, farmers will be encouraged to organize themselves in groups or cooperatives in order to improve their prospects for obtaining credit from financial institutions, carry out crop-specific research and other initiatives, bolster output, and improve the quality of their products. Communities will also be encouraged to develop irrigated farming. The government will provide demand-driven research and crop extension services; it will support labor-intensive agroprocessing.

More than 50 percent of the population derives its cash income from the sale of forest products such as charcoal, honey, wild fruits, and firewood; the poorest households are the most dependent on woodland resources. The government therefore intends to find ways to incorporate environmental quality indicators in its poverty monitoring system to capture these levels of dependency. In health, the government intends to reduce malaria-related fatalities of children younger than five to less than 10 percent of the fatalities in that age group and increase the proportion of the rural population with access to safe and clean water.

The Tanzanian PRSP addresses the issues in NAPA but not as strongly as in Uganda and Burundi.

3.10. NAPA and PRSP in Uganda

In Uganda, the government has incorporated the climate change strategies specified in the NAPA in its national planning documents, as discussed in the sections that follow.

3.10.1 Adaptation Measures

The climate change adaptation strategies adopted in Uganda cover aquaculture, health, land and water resources, agriculture and livestock, and forest resources.

Aquaculture

In the fisheries sector, the following adaptation measures have been adopted:

- Promotion and strengthening of aquaculture in response to the intensification of fishing activities and consumption of aquatic plants such as the water lily (corms) during droughts and famine as an alternative livelihood option

Health

The following adaptation measures have been adopted in the health sector:

- Development and promotion of guidelines for the use of herbal medicine to treat various ailments (for example, malaria, diarrhea, wounds, worms, skin diseases, eye infections, and coughs)
- Intensified observance of hygiene practices, including water boiling and hand washing, especially during floods

Land and Water Resources

In land and water resources, the following adaptation measures have been adopted:

- Harvesting water from various sources (for example, ground, rooftop, and stem runoffs) using various approaches (such as communal dams)
- Soil conservation by building infiltration ditches around homes, planting grass cover, using terrace farming, digging trenches to divert runoff, mulching, and planting trees

Agriculture and Livestock

In the agriculture and livestock sectors, the following adaptation measures have been adopted:

- New crop and livestock husbandry practices (for example, manipulating livestock grazing and watering to cope with feed and water scarcity and high temperatures, or shifting farming and staggering cropping calendars)
- Promotion of the use of underused food resources such as yams, honey, and wild fruits
- Promotion of intensive agriculture and productivity to prevent farmers from encroaching on forests and protected areas
- Promotion of indigenous knowledge of food use (for example, sun drying, using herbal plants and ashes to store food, and using honey to preserve meat and smoking meat)
- Development and promotion of drought-tolerant and early-maturing crop species
- Bush-burning by pastoralists to improve pastures and by hunters to trap wildlife

Forest Resources

In the forestry sector, the following adaptation measures have been adopted:

- Promoting the sustainable use of forest resources to avoid exploitation
- Increasing law enforcement in protected areas to counteract intensified poaching and hunting activities

Other Strategies

Other strategies adopted in Uganda include:

- Promotion of alternative livelihood strategies (for example, burning charcoal, making bricks and crafts, driving boda bodas, or motor bike taxis). Some methods (burning charcoal, making bricks and crafts) have serious negative environmental effects, and sustainable approaches should be explored

- Strengthening meteorological services to provide timely weather and climate information in early-warning systems
- Establishing district standing or rapid response committees to deal with disasters.
- Encouraging migration to urban areas or resource-rich neighborhoods
- Selling assets and preserving starter seeds and herds for future production
- Discouraging famine-induced marriages (parents marry off their daughters to get the dowry)
- Changing eating behavior by reducing the number of meals per day, rationing food, and eating wild foods
- Using social capital by forming self-help community emergency groups and/or extended family networks

3.10.2 Research and Investment Activities in Uganda

Data collected from respondents throughout the country were put through simple qualitative and parametric analysis to identify respondents' preferences for different intervention areas. Ten key areas were identified from this analysis. These were further subjected to a three-tiered test to select the best-suited interventions. The tiers were national level, community/ecosystem level, and urgency and immediacy.

National Level

This tier considers consistency, relevance, and importance to the national development priorities of an identified intervention area and takes into account:

- Development priorities, including the poverty eradication action plan and millennium development goals
- Environment concerns, including multilateral environmental agreements (MEAs)
- Equity and gender issues, taking into consideration disadvantaged groups

Community/Ecosystem Level

This second tier focuses on the community/sectoral level; the following elements were identified:

- Enhancement of resilience to impacts of climate change
- Multiple benefits
- Replication
- Sustainability
- Cost effectiveness
- Cultural acceptance

Urgency and Immediacy

This tier focuses on urgency and immediacy of an identified and ranked intervention. The elements adopted were:

- Urgency
- Magnitude (coverage and severity/intensity)
- Immediacy

Based on these criteria, coping strategies, and technical knowledge, nine projects were identified, as shown in Table 30.

Table 30. Adaptation projects in Uganda

Project /activity	Objective
Community tree growing project National Forestry Plan	To increase tree coverage in vulnerable and resource-constrained communities
Land degradation management project	To halt and reverse land degradation in climate change–vulnerable and resource-constrained communities in Uganda
Strengthening meteorological services	To collect data and strengthen technical capacity To ensure availability, accuracy, and timeliness of weather and climate information and its use by the vulnerable communities
Community water and sanitation project	To increase access to safe water supply and improved sanitation among vulnerable communities in disaster-prone areas To strengthen community awareness of health impacts from climate change To strengthen emergency and disaster preparedness and response programs
Water for production project	To improve the use of water resources for production in vulnerable communities
Drought adaptation project	To enhance the adaptive capacity of vulnerable communities in drought-prone parts of Uganda, especially those in the arid and semiarid cattle corridor zone, in order to improve their capacity to cope with increasingly frequent droughts
Vector-, pest-, and disease-control project	To understand the linkages of these outbreaks to climate change for more cost-effective management with special emphasis on vulnerable communities and gender dimensions
Indigenous Knowledge and Natural Resources Management Project	To enhance sustainable use and management of natural resources by the vulnerable communities
Climate Change and Development Planning Project	To integrate climate change issues in development planning and implementation at all levels

Source: NAPA, Uganda.

3.10.3 Integration of NAPA in the PRSP of Uganda

To expand production and incomes in rural areas, the government has set out a large number of interventions, which are grouped under the Plan for the Modernization of Agriculture. These interventions include research and technology development, advisory services, rural financial services, rural infrastructure, and sustainable natural resource use and management. In research and development, the government is developing a national agricultural research system that will be more decentralized, efficient, effective, and responsive to the needs of the poor. In extension services, the government seeks to increase the proportion of market-oriented production by empowering farmers to demand and control agricultural advisory and information services.

The government intends to develop a strategy for the livestock sector that will cover disease control and address the needs of pastoralists. It will also undertake actions necessary to control the spread

of livestock diseases. To conserve and use water efficiently, the government will implement the water-for-production strategy and make investments based on probable returns, taking into account local livelihoods and preferences. In energy, the government will cooperate with other sectors in promoting technologies that allow the use of fuelwood to be reduced. In environment and natural resource management, the government will develop a strategy to ensure adequate funding for the recurrent costs of the national environment management authority, build capacity for environmental management at the sectoral and district levels, and develop regulations to implement the National Environment Statute of 1995.

In forestry, the government will enhance the implementation of the National Forest Plan; promote private-sector investment in privately owned forests by providing information and technical advice about the management of forests and as well as permits to grow trees in central forest reserves with secure land and tree tenure. The government will also promote the establishment of community woodlots by starting extension and advisory services for private and community members interested in tree planting, develop the national tree seed center, establish a framework for decentralized seed production, and investigate the possibility of benefiting from commercial markets for ecological services such as carbon trading in global markets, in line with the Kyoto Protocol.

To conserve wetlands, the government will assess financial, economic, and environmental factors relative to the profitability of different wetland uses; further the development and dissemination of guidelines for the wise use of wetland resources; improve community skills and diversification of wetland products in order to add value to wetland products; enforce appropriate policies, laws, procedures, and regulations to curtail the degradation of wetland resources; assess wetland resources to determine resource availability and trends; and support community initiatives that promote the wise use of wetlands.

To improve weather prediction, the government will strengthen its data collection capacity to ensure the adequacy and timeliness of data for generating weather and climate information; strengthen human capacity, including providers and users of the service; and investigate and establish the appropriate institutions to take advantage of opportunities under the carbon development mechanism. To increase the level of employment, the government will use labor-intensive techniques where technically feasible and economically cost effective and promote community participation in infrastructure development and maintenance.

In health, some actions include the provision of antiretroviral drugs; launching in 10 districts the home-based management of a fever program for combating malaria; reduction in the price of insecticide-treated materials; and introduction of free primary care in public health facilities. The actions spelled out in the PRSP are in line with the adaptation strategies and research and investment activities in the NAPA for Uganda.

4. COUNTRY POSITIONS IN THE CURRENT UN NEGOTIATIONS

Climate change is affecting both developed and developing countries, but it is putting more stress on the development budgets of developing countries. The losses arising from climate change are huge and require substantial resources. The United Nations Framework Convention on Climate Change (UNFCCC) commits parties to the integration of climate change issues in development planning. At its second session, the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) of the UNFCCC invited parties to submit to the secretariat ideas and proposals about the elements contained in paragraph 1 of the Bali Action Plan (BAP). The BAP is a comprehensive process designed to enable the full, effective, and sustained implementation of the convention through long-term cooperative action, now, up to, and beyond 2012 by addressing:

- A shared vision for long-term cooperative action, including a long-term global goal for
- emission reductions
- Enhanced national-international action on adaptation of climate change
- Enhanced action on adaptation
- Enhanced action on technology development and transfer to support action on adaptation
- and adaptation
- Enhanced action on the provision of financial resources and investment to support action
- on adaptation and adaptation and technology cooperation

The African Group (represented by Algeria) and Least Developed Countries (represented by Lesotho) presented common positions (in April 2009) on what they expect to see in the final agreement as a result of current UNFCCC negotiations. A summary of these submissions follows.

4.1. Adaptation and Means of Implementation

The African Group and LDCs expect:

- Implementation of immediate, urgent, concrete, and integrated adaptation activities and programs, including NAPAs at national, regional, and global levels.
- Development and implementation of medium- and long-term national integrated adaptation activities and programs.
- Provision of the means of implementation by strengthening institutional and technical capacities, including data collection and the analysis and interpretation of scientific and socioeconomic information to support and inform adaptation.
- Strengthening and establishment of national early-warning systems.
- Wide dissemination and promotion of the application of information, including weather and climate information at various levels (down to the community level), to support the implementation of adaptation activities.
- Integration of climate change in development planning at the local and national levels
- Creation of future Ad Hoc Working Groups on Long-term Cooperative Action under the Convention (AWG-LCA) to provide experience and information on the results of the NAPA process to help inform discussions.
- Simplification of modalities to funds for adaptation, such as revising the cofinancing requirements for LDCs and direct budget support.
- Allocation of resources for funding among countries based on the special preference and classification as stated in the Convention for LDCs and Small Island Developing States

(SIDS) and also in the Bali Action Plan, which also gives special preference to LDCs, SIDS, and African countries suffering from droughts and floods.

- Simplification and minimization of some steps required for implementation of identified adaptation options in the NAPAs.
- Promotion of the coherence and facilitation of the linkages with other international, regional, and national programs and bodies and stakeholders that are implementing adaptation and related activities, including the Nairobi Work Program.
- Addressing the concerns, especially gender and youth concerns, of all vulnerable groups whose adaptive capacity is low, recognizing that women and children are particularly affected by the impacts of climate change. Special care is to be taken to reflect indigenous knowledge and practice.
- Provision of scaled-up, new, additional, adequate, predictable, and sustainable financial, technological, and capacity-building support to address all key areas of the Adaptation Action Program in a holistic manner consistent with national and regional development objectives, programs, and plans.

4.2. Adaptation and Means of Implementation

The African Group would also like to see the following strategies implemented:

- Substantial reduction from the established baseline readings of emissions by developing countries. Quantified emission reduction commitments have been established for all developed country parties. They are measurable, reportable, and verifiable, that is, they are legally binding commitments) that are absolute and can be verified for compliance.
- Mitigation commitments by developed countries as a group. These must be at the top of the range indicated by the Intergovernmental Panel on Climate Change (IPCC) in order to achieve the lowest stabilization levels assessed by the IPCC in its Fourth Assessment Report. The aggregate number is for all developed countries, whether they ratified the Kyoto Protocol or not.
- Reduction of greenhouse gas emissions by Annex I parties.[2] They should reduce these emissions by at least 40 percent below 1990 levels by 2020 and at least 80 percent to 95 percent below 1990 levels by 2050 to make a meaningful and fair contribution to achieving the lowest level of stabilization assessed by the IPCC's Fourth Assessment Report. At these low levels, the additional climate impacts are acceptable to Africa.
- Concrete steps by developing countries to reduce emissions. They may choose from a toolbox of voluntarily registered, nationally appropriate mitigation actions (NAMA), including sustainable development policies and measures, CDM-supported activities, and others.
- Design of a REDD-Plus mechanism to accommodate different national circumstances and respective capabilities. Adequate, predictable, and sustainable funds from a variety of sources, including global carbon markets, are vital for the provision of incentives on the scale necessary for reducing emissions in Africa and globally.
- Formulation of NAMAs by developing countries. These must be reportable through national communications—if done with their own resources—or to a separate registry for those with multilateral, measurable, reportable, and verifiable support.
- The application of unilateral mitigation actions by developing countries must be differentiated from those that are supported internationally, for (a) actions with own

[2] Industrialized countries that were members of the Organization for Economic Co-operation and Development in 1992, plus countries with economies in transition. including the Russian Federation and the Baltic states.

resources, verification is by national entities working with international guidelines; and (b) multilaterally supported actions, verification is through the UNFCCC.

- Conditioning developing country action on technology, financing, and capacity building in a measurable, reportable, and verifiable manner.
- Requiring all Annex I parties to make additional legally binding mitigation commitments or actions that take into account the principles of the convention. The reduction commitments under the Bali Action Plan must be comparable in magnitude, compliance, and timeframe.
- Requiring non-Annex I parties to take mitigation actions in accordance with the principles and provisions of the convention.[3]
- Recognizing that NAMAs of developing countries are only different in the context of the enabling mechanism provided by developed countries.
- Requiring that NAMAs be measurable, reportable, and verifiable to ensure maximum environmental benefits for investment and that they be differentiated among developing countries according to reductions per unit of investment costs.
- Requiring developing countries that wish to implement NAMAs to determine/establish their reference point.
- Establishing a mechanism s for measuring, reporting, and verifying greenhouse gas emission reductions.
- Allowing developing countries, particularly SIDS and LDCs, to propose NAMAs that promote sustainable development and local social, economic, and environmental or adaptation benefits.
- Reporting voluntary actions taken by developing countries and that are not included in national communication.
- Making implementation of NAMAs of developing countries contingent on the provision of adequate financing and access to relevant technologies required to execute the activities. The urgency for undertaking NAMAs should be matched with urgency to provide support.

4.3. Financing, Technology, and Capacity Building

The finance, technology and capacity building strategies pursued by the developing countries include:

- Provision of financing, technology, and capacity building must be legally binding, with consequences for noncompliance. Action by developing countries is dependent on the level support by developed countries.
- Commitment by developed countries to a target of 0.5 percent of GDP for climate action in developing countries from new and innovative sources of public and private-sector financing, with the major source of funding coming from the public sector.
- Commitment by developed countries to providing full costs and full incremental costs, in accordance with article 4.3 of the convention.
- Provision of new, additional, reliable, and predictable financial resources through weighted assessed contribution of developed countries.
- Assessment of contributions from developed countries, taking into account GDP and historical cumulative contribution to greenhouse gas concentrations in the atmosphere.
- Governments to become key mobilizers of funds as evidenced by their actions to solve the current economic crisis.

[3] These are mostly developing countries.

- Assessment of levies from the market mechanism, including an expanded 2 percent on Kyoto mechanisms.
- Assessment of a levy on civil aviation and maritime transport except journeys originating in and traveling to LDCs.
- Solicitation of contributions from private sector and foundations.
- Commitment by developed countries to the deployment, diffusion, and transfer of technology to developing countries based on principles of accessibility, affordability, appropriateness, and adaptability of technologies required by developing countries for enhanced action on mitigation and adaptation.
- Finding means to surmount the barriers to technology transfer.
- Commitment by developed countries to strengthening the institutional capacity of developing countries to undertake climate action and to support other country-specific, capacity-building needs of African countries, consistent with the commitment and provisions of the convention.
- Establishment of a compliance mechanism to ensure that commitments to the delivery of these means of implementation (financing, technology, and capacity building) are met.
- Promotion of the wide diffusion of existing mitigation technologies, including energy efficiency and renewable technologies on a scale similar to the information communication technologies.
- Facilitation and support of access to existing clean technologies to support the development needs of major developing countries.
- Facilitation of capacity building as an integral part of technology transfer through the provision of financial resources.
- Stimulation of research, development, and production of future mitigation technologies, including appropriate REDD technologies, through cooperation with the private sector, identified and selected through open and transparent competitive international bidding process.

5. CONCLUSION

This report profiles the available climate change–related datasets, as well as details about their accessibility and procurement, in the 10 ASARECA member countries. In addition, the report assesses the incorporation of climate change adaptation strategies in national development plans and discusses the country positions in the current UNFCCC negotiations in eastern and central Africa. The study was conducted using a combination of extensive literature reviews and field visits to all 10 ASARECA member countries: Burundi, Democratic Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Rwanda, Sudan, Tanzania, and Uganda.

Even though climate change-related datasets in the 10 ASARECA member countries were readily available, the quality of the data available had some limitations that are worth noting. The study sought to collect climate change–related datasets that go back at least 30 years from 2008. While crop and livestock production as well as meteorological datasets were available for this period in some countries; other countries had datasets covering much shorter periods. This is understandable, given the history of civil conflicts in at least half of the ASARECA member countries. Nonetheless, crop and livestock production data were collected for periods ranging from one to four decades in the 10 countries.

A more interesting finding from this study was that all ASARECA member countries had incorporated climate change adaptation strategies in their national development plans. These strategies are broad and cover virtually all sectors of the economy. In addition, most ASARECA member countries report that they are implementing some, if not all, of the specified climate change adaption strategies.

Finally, the African Group and Least Developed Countries (LDCs) have presented common positions on what they expect to see in the final agreement produced by the current UNFCCC negotiations. The African Group's position paper stipulates the mitigation strategies to be adopted, as well as the means of implementing these measures. Further, the African Group's position specifies the financial and technical assistance required to enable its members to implement the proposed climate change adaptation policies. In cognizance of the vulnerability of the ASARECA member countries to the adverse effects of climate change, this study recommends that the ASARECA member countries be assisted both financially and technically to build the capacity needed to adopt the climate change adaptation policies specified in their development plans.

APPENDIX

The links to NAPAs for nine of the 10 ASARECA countries are provided in Table A.1 below. Note that Kenya is not listed in the LDC category and is therefore not required to submit a NAPA. Also, note that Madagascar and the Democratic Republic of Congo provided their NAPAs in French. The online sources for the NAPAs can be found in the UNFCCC.

Table A.1. National Adaptation Programs of Action (NAPAs)

Country	NAPA online resource
Burundi	http://unfccc.int/resource/docs/napa/bdi01e.pdf
DR Congo	http://unfccc.int/resource/docs/napa/cod01.pdf
Eritrea	http://unfccc.int/resource/docs/napa/eri01.pdf
Ethiopia	http://unfccc.int/resource/docs/napa/eth01.pdf
Madagascar	http://unfccc.int/resource/docs/napa/mdg01f.pdf
Rwanda	http://unfccc.int/resource/docs/napa/rwa01e.pdf
Sudan	http://unfccc.int/resource/docs/napa/sdn01.pdf
Tanzania	http://unfccc.int/resource/docs/napa/tza01.pdf
Uganda	http://unfccc.int/resource/docs/napa/uga01.pdf

The online resources for PRSPs can be found on the IMF and World Bank websites. Online resources for eight countries are given in Table A.2. Eritrea and Sudan have not prepared PRSPs because countries engaged or recently engaged in conflict have not yet prepared them. Sudan has prepared interim PRSPs for the northern and southern parts of the country.

Table A.2. Poverty Reduction Strategy Papers

Country	PRSP online resource
Burundi	http://www.imf.org/external/pubs/ft/scr/2007/cr0746.pdf
DR Congo	http://www.imf.org/external/pubs/ft/scr/2007/cr07330.pdf
Ethiopia	http://www.imf.org/External/NP/prsp/2002/eth/01/073102.pdf
Kenya	http://www.imf.org/external/pubs/ft/scr/2005/cr0511.pdf
Madagascar	http://www.imf.org/external/pubs/ft/scr/2007/cr0759.pdf
Rwanda	http://www.imf.org/external/np/prsp/2002/rwa/01/063102.pdf
Tanzania	http://www.imf.org/external/NP/prsp/2000/tza/02/100100.pdf
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IFPRI HEADQUARTERS

2033 K Street, NW
Washington, DC 20006-1002 USA
Tel.: +1-202-862-5600
Fax: +1-202-467-4439
Email: ifpri@cgiar.org

IFPRI ADDIS ABABA

P. O. Box 5689
Addis Ababa, Ethiopia
Tel.: +251 11 6463215
Fax: +251 11 6462927
Email: ifpri-addisababa@cgiar.org

IFPRI NEW DELHI

CG Block, NASC Complex, PUSA
New Delhi 110-012 India
Tel.: 91 11 2584-6565
Fax: 91 11 2584-8008 / 2584-6572
Email: ifpri-newdelhi@cgiar.org