



THE LEAST DEVELOPED COUNTRIES FUND (LDCF)

The Least Developed Countries Fund (LDCF) was established under the United Nations Framework Convention on Climate Change (UNFCCC) at its seventh session in Marrakech in 2001. The Fund, which is managed by the Global Environment Facility (GEF), addresses the special needs of the Least Developed Countries (LDCs), which are especially vulnerable to the adverse impacts of climate change. This includes preparing and implementing National Adaptation Programmes of Action (NAPAs), which aim to identify “urgent and immediate needs” of each LDC according to specific guidelines provided by the Least Developed Countries Expert Group (LEG).¹

The GEF has, as of August 2009, mobilized voluntary contributions of \$180 million for the LDCF.

First Step: A National Adaptation Programme of Action (Napa)

The rationale for developing NAPAs rests on the high vulnerability and low adaptive capacity of LDCs. There is a rapidly growing need for immediate support to projects that reduce vulnerability and increase adaptive capacity, thus supporting the LDCs to become climate resilient. NAPA preparation is an interdisciplinary and multiministerial process, where public inclusion and community ownership have an important role. Activities proposed through the NAPAs are those for which further delay could increase vulnerability, or lead to increased costs at a later stage.

Forty-eight LDCs have thus far received \$10.6 million in support to prepare their NAPAs. As of August 2009, 41 LDCs had submitted their NAPAs.²

Second Step: Napa Implementation

NAPA follow-up funding started in June 2006, after the first NAPAs were completed by Bangladesh, Bhutan, Malawi, Mauritania, and Samoa, and the Council approved the LDCF operational paper, which is based on the rules agreed by the Parties to the UNFCCC meeting in Montreal in December 2005.³

Based on LDC feedback and consultations, the GEF developed a streamlined project cycle and simplified procedures to allow LDCs to access LDCF resources more easily. LDCs have then been able to choose which of the 10 GEF Agencies (WB, UNEP, UNDP, UNIDO, FAO, IFAD, EBRD, IADB, ADB, and AfDB⁴) to partner with to develop a concrete adaptation project on the ground. The task has not been easy, as the whole world is still in an early stage of understanding the complex and cross-sectoral process of adaptation: the first round of NAPA follow-up projects focuses on implementing different type of adaptation measures across development sectors and varying environments. Adaptation is learning by doing, and the LDCF project management is thus often adaptive itself.

As of August 2009, 33 countries have officially submitted their first NAPA implementation projects



under the LDCF, and 32 project proposals have been approved and reserved the necessary funding of \$100 million for concrete action on the ground.

By August 2009, eight LDCF projects have successfully submitted full project documents with the so called CEO endorsement request, and thereafter moved to the implementation phase in Bangladesh, Bhutan, Burkina Faso, Cambodia, Cape Verde, Eritrea, Niger, and Samoa. At least 14 more projects are expected to be CEO endorsed before the end of 2009 in Benin, Democratic Republic of Congo, Djibouti, The Gambia, Guinea, Lesotho, Mali (UNDP), Rwanda, Sierra Leone, Sudan, Tuvalu, Vanuatu, and Zambia, and thus proceed with the on-the-ground implementation.

These first results have been encouraging, as they show that the LDCs, despite their small economies and limited institutional and technical capacities, are now among the most advanced in the world with respect to cutting-edge actions to reduce vulnerability and increase adaptive capacity to the adverse impacts of climate change. Building on this example, the evolving financial architecture of climate change is continuing to draw inspiration from the pioneering work of the LDCF, now an established system with a proven track record and an ongoing commitment to its LDC partners.

1. Decision 28/CP.7, Annotated guidelines for the preparation of NAPAs.
2. http://unfccc.int/cooperation_support/least_developed_countries_portal/submitted_napas/items/4585.php
3. GEF/C.28/18.
4. The World Bank, United Nations Environmental Programme; Development Programme; and Industrial Development Organization, Food and Agriculture Organization, International Fund for Agricultural Development, European Bank for Reconstruction and Development, and Inter-American; Asian and African Development Bank.

Authors

Bonizella Biagini, Tuuli Bernardini, Lars Christiansen, and Rawlestone Moore

Design

Patricia Hord.Graphik Design

Print

Professional Graphics Printing Co.

Photo Credits

Folder and Introduction: Jim Richardson/National Geographic Stock
Bangladesh: Shehzad Nooran/World Bank
Benin: Curt Carnemark/World Bank
Bhutan: World Bank
Burkina Faso: World Bank
Cambodia: World Bank
Cape Verde: Riccardo Spila/Corbis Corporation
Comoros: Michael Fay/National Geographic Stock
Democratic Republic of Congo: Dr. Gilbert H. Grosvenor/National Geographic Stock
Djibouti: Chris Newbert/National Geographic Stock
Eritrea: Volkmar K. Wentzel/National Geographic Stock
The Gambia: Bobby Haas/National Geographic Stock
Guinea: Ingrid Visser/Minden
Guinea-Bissau: Dave G. Houser/Corbis Corporation
Haiti: James P. Blair/National Geographic Stock
Lao People's Democratic Republic (PDR): W.E. Garrett/National Geographic Stock
Lesotho: Curt Carnemark/World Bank
Liberia: World Bank
Malawi: Francis Dobbs/World Bank
Maldives: Lorenzo Mondo/Shutterstock
Mali: Ray Witlin/World Bank
Mali: Curt Carnemark/World Bank
Mauritania: Scott Wallace/World Bank
Niger: Jim Richardson/National Geographic Stock
Rwanda: Arne Hoel/World Bank
Samoa: World Bank
São Tomé and Príncipe: Michael Poliza/National Geographic Stock
Sierra Leone: Curt Carnemark/World Bank
Sudan: W. Robert Moore/National Geographic Stock
Tuvalu: Ashley Cooper/Corbis Corporation
Vanuatu: Specta/Shutterstock
Yemen: World Bank
Zambia: Edwin Huffman/World Bank

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



BANGLADESH

Community-Based Adaptation to Climate Change through Coastal Afforestation in Bangladesh

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,740,000
Cofinancing	\$7,150,000
NAPA completion	November 2005
Inclusion in LDCF Work Program	September 2007
CEO endorsement	December 2008
Implementation start and completion	March 2009–February 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Forest Department, Ministry of Environment and Forest

Bangladesh is one of the most vulnerable countries to the impacts of climate change. According to Bangladesh’s National Adaptation Programme of Action (NAPA), and numerous other scientific-based assessments, the primary anticipated impacts of projected climate change, including variability, range from increased saline water intrusion to inundation of coastal lands. Key risks include drainage congestion, reduced freshwater availability, disturbance of morphologic processes, and increased intensity of flooding. These risks are classified as arising from gradual long-term climate change, changes in the frequency and intensity of extreme events (climate variability), or both.

In addition to placing coastal communities at higher risk, these projected changes will affect the

development potential of coastal regions in Bangladesh. Exposure to climate risks will be pronounced for several reasons. According to estimates by a World Bank assessment of climate change impacts in Bangladesh, a small change in peak discharge may result in about a 20 percent increase in the area flooded. Similarly, riverbank erosion is exponentially related to maximum flood levels. There is also low awareness and lack of capacity, including mechanisms to respond to anticipated impacts. Building resilience requires changes in attitude and strategic institutional arrangements, for example, integrated planning and management that incorporate the risk posed by climate change, including variability. At the same time, coastal development in Bangladesh has been suboptimal for both climatic and nonclimatic reasons.



On the one hand, vulnerability has increased due to anthropogenic activities, particularly the massive conversion of mangroves into commercial shrimp farms and demand for fuel wood, which have reduced mangrove cover that otherwise function as a natural protective barrier to coastline erosion. Along coastlines, salt-making industries and sand mining have led to the shifting and/or degradation of coastal sand dunes, thereby undermining their effectiveness both as physical barriers against flooding and as sedimentary stocks allowing for beach reorganization. The continuous increase in soil and water salinity due to receding coastlines, which result from unauthorized settlements, is also contributing to the further degradation of natural defenses.

Project Activities and Expected Impacts

The objective of the Community-Based Adaptation to Climate Change through Coastal Afforestation in Bangladesh project is to reduce vulnerability of coastal communities to the impacts of climate change-induced risks in four upazilas in the coastal districts of Barguna and Patuakhali (Western Region), Bhola (Central Region), Noakhali (Central Region), and Chittagong (Eastern Region). The project implements effective community-based adaptation measures in coastal areas that reduce vulnerability and improve adaptive capacity to climate change and sea-level rise. The project uses demonstration measures aligned with local conditions, which encompass community-based systems for the management of protective ecosystems, sustainable use of climate-sensitive natural resources, and diversification of vulnerable livelihoods. The project outcomes include enhanced resilience of vulnerable communities and protective systems to climate risks, the incorporation of climate risk reduction measures into coastal area management frameworks, and revision of national policies to increase climate risk resilience of coastal communities.

The project uses demonstration measures aligned with local conditions, which encompass community-based systems for the management of protective ecosystems, sustainable use of climate-sensitive natural resources, and diversification of vulnerable livelihoods. Envisaged demonstration projects focus on opportunities for community-based afforestation, mangrove regeneration and plantation management, erosion prevention and participative protection of coastal sediment barriers, reduction of manmade stresses on coral reefs and protective ecosystems, diversification of crops and agricultural practices, optimization of freshwater and irrigation management, and improved information flows in climate information and early warning systems.

The project also enables a strategic revision of national and subnational policies and programs to incorporate climate change risk considerations and adaptation strategies into financial decision processes, and to develop coordination and harmonization among different sectoral interventions. The project enhances the adaptive capacity of local communities to anticipate dynamic climate-related threats and protect their livelihoods, as well as improve individual, institutional, and systemic capacity at all levels of public administration to plan for, and respond to, climate change risks in coastal areas.

Synergies and Coordination

This project is coordinated with the UNDP-GEF Community-Based Adaptation (CBA) Programme and the Comprehensive Disaster Management Programme (CDMP) to ensure that the project activities on afforestation, alternative livelihoods, climate-resilient policy making, and capacity building complement ongoing community-based adaptation and disaster risk reduction activities in coastal areas. Further cooperation is done, for example, with the Bangladesh Agricultural Research Institute (BARI), the Bangladesh Rice Research Institute (BRRI), and the Coastal Land Zoning Project (CLZP) of the Ministry of Land.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



BENIN

Integrated Adaptation Programme to Combat the Effects of Climate Change on Agricultural Production and Food Security

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,498,000
Cofinancing	\$7,600,000
NAPA completion	January 2008
Inclusion in LDCF Work Program	October 2008
Expected CEO endorsement	November 2009
Expected Implementation start and completion	March 2010–March 2014
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Ministry of Agriculture

Benin's economy is heavily dependent on agriculture. Seventy percent of the active population is employed in the agriculture sector, and agriculture contributes up to 36 percent of the national GDP and 88 percent of export earnings. Agriculture, and ultimately the natural resource base available for agriculture, thus play a significant role in Benin's overall welfare. Benin's agricultural sector is generally considered to have a very low adaptive capacity for reasons linked to structural factors (high level of poverty among rural populations, weak mechanization, and intensification of production modes), but also because of natural constraints, namely the poor management of water and soils, leading to soil degradation.

Various climate scenarios have revealed climatic changes that could have a severely negative impact on the agricultural sector and consequently on the country's food security. These include, among other

things, reduced precipitation on the order of 20–30 percent at the national level, which translates into a 40–60 percent reduction in the availability of water resources; and an increase in events of violent and intense rains, frequently of 100 mm/h, potentially leading to increased flooding and erosion of poorly protected soils, with important losses of productive potential. It is highly probable that these changes will cause degraded conditions for agricultural production, as well as decreased and greater fluctuating agricultural yields. The national food situation runs a high risk of further deterioration, posing long-term threats to the progress accomplished so far in the agricultural area and to the achievement of the Millennium Development Goals (MDGs) in Benin.

Project Activities and Expected Impacts

The project addresses existing barriers to climate risk prevention through a two-pronged strategy that



includes: (a) general systemic, institutional, and technical capacity building for forecasting, assessing, and managing the impacts of climate change and variability on the agricultural sector; and (b) implementation of practical on-the-ground pilot activities to facilitate practical experience of how agricultural development can be made more resilient to the impacts of climate change.

The first prong of this strategy addresses gaps in building the necessary systemic, institutional, and individual capacity to implement climate risk management at all levels. First, the project supports the integration of adaptation considerations and practices into relevant sectoral policy-making and planning processes. Similarly, Communal Development Plans and local land management plans are screened for climate risks and will be updated in light of the additional risks brought about by climate change in Benin's agricultural areas. This exercise enables an overall assessment of the costs of climate change and adaptation in the agriculture sector and provides the economic and technical justification for allocating national budgets to provide for managing climate change risks in agriculture. Second, LDCF support is utilized to improve the quality and timeliness of the climate information in support of climate adaptation decisions.

The project, therefore, provides technical assistance to ensure that baseline activities for upgrading the national meteorological services take sufficient account of the new patterns of risks associated with increased climate variability. Project funds are also used to improve information flows among climate monitoring, forecasting, and early warning services to policy makers and farmer communities in high-risk areas. Finally, with a view to the longer term, the project takes various actions to build the capacities of the technical staff, including technical departments and extension services, and local farmers in preventing and controlling climate change impacts on agriculture. To this end, training programs are developed and conducted. Moreover, climate change adaptation and risk management modules are integrated into the education programs and curricula of national and local, professional and academic agricultural training institutes.

The second prong of the strategy involves setting up pilot activities to assist in the transition of Benin's agriculture sector toward climate resilience. These pilot activities include (a) setting up a network for production and diffusion of short-cycle rice and maize crop varieties; (b) developing climate change vulnerability maps and agricultural risk maps in the project zones; and (c) testing and disseminating climate-resilient agricultural practices including improved soil and water management, adjusted crop rotation and crop calendars, drought-tolerant fodder systems, and increased food and seed storage capacities.

Synergies and Coordination

The LDCF intervention is coordinated with other projects addressing climate change implemented by the German Agency for Technical Cooperation: institutional support within the implementation framework of the United Nations Framework Convention on Climate Change (UNFCCC) and Denmark. Also, the project is coordinated with the following agricultural programs and projects to assure maximum impact: (a) the Program to Support Rural Economic Growth (PACER), funded by Japan and the African Development Bank (AfDB); (b) a project managed by the nongovernmental organization Initiatives for Integrated and Sustainable Development, which aims to make agroclimatic information available to a number of farmers as an experiment accompanying agricultural activities; (c) a project to develop drylands, backed by the United Nations Development Programme Drylands Development Center set up in Benin's dry areas; (d) the New Rice for Africa (NERICA) rice promotion activities, which seek to reduce climate impacts on rice through strengthening capacities in the West African Rice Development Association (WARDA) Center; (e) a National Food Security Office (ONASA) support program for accumulating buffer stocks of food products, specifically maize and sorghum, in production zones that have freed up marketed surplus; and (f) a government emergency food security support program that involves the activation of 1,800 agriculture professionals in view of averting the specter of the food crisis that was triggered by the price surge for basic food products.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



BHUTAN

Reduce Climate Change-Induced Risks and Vulnerabilities from Glacial Lake Outbursts in the Punakha-Wangdi and Chamkar Valleys

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,987,555
Cofinancing	\$4,286,224
NAPA completion	May 2006
Inclusion in LDCF Work Program	October 2007
CEO endorsement	March 2008
Implementation start and completion	March 2008–February 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partners	Department of Geology and Mines (DGM), Ministry of Economic Affairs, Disaster Management Division (DMD), Ministry of Home and Cultural Affairs

Bhutan experiences a number of natural hazards annually, including climate-induced disasters such as landslides and floods, which result in extensive damage. Climate change is likely to further exacerbate some of the natural hazards to which Bhutan is prone and lead to significant additional impacts, in terms of either severity or frequency, on the country's development pathway. A majority of Bhutan's population and infrastructure development is concentrated in large river valleys. The economy is highly dependent on hydropower resources, with proceeds from hydropower export to India constituting 45 percent of the country's revenue. A major, climate-induced

natural disaster could cause great human and economic devastation.

Of the natural hazards to which Bhutan is prone, none is more significant than that of climate change impacts on glaciers. Bhutan's entire northern upper land has glacier/snow-fed lakes in the mountaintops. Rising mean temperature, attributed by the scientific community to climate change, is the main cause of glacial retreat. Recent studies suggest the rate of glacial retreat in the Himalayas is as high as 30 to 60 meters per decade. The melting of glaciers is leading to the volumes of water in downstream glacial lakes



increasing at an alarmingly rapid rate. The concern is that when the current holding capacity of the lakes reaches a critical threshold, loose glacial debris that act as dams or barriers could fail, leading to flash floods that result in severe adverse impacts on downstream communities.

Project Activities and Expected Impacts

The objective of the project is to reduce climate change-induced risks and vulnerabilities from glacial lake outbursts in the Punakha-Wangdi Valley and Chamkhar Valleys. The project will integrate climate risk projections into existing disaster risk management practices and implement corresponding capacity development measures. The project will implement demonstrative and practical measures for reducing climate change-induced glacial lake outburst flood (GLOF) risks from the potentially dangerous Thorthormi glacier lake. The lessons learned will facilitate replication in other high-risk GLOF areas, both within and

outside Bhutan. Complementary to this demonstration, the project will ensure that the existing early warning system in the Punakha-Wangdi Valley, which is not equipped to handle the full extent of potential GLOF risks, is expanded to incorporate coverage of this growing risk. Lessons learned from this initiative will enable scaling up of early-warning systems in other disaster-prone areas downstream of potentially hazardous glacier lakes.

At the national level, the expected adaptation benefits include improved government capacity to deal with dynamic, climate-induced hazards and to design, implement, evaluate, and replicate systems for GLOF risk reduction and preparedness. Vulnerability of communities in high-risk GLOF areas is reduced as the project catalyzes cost-effective management of glacier lake levels and adjustment of communal early-warning systems to climate change-induced hazards.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



BURKINA FASO

Strengthening Adaptation Capacities and Reducing the Vulnerability to Climate Change

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,300,000
Cofinancing	\$20,144,595
NAPA completion	December 2007
Inclusion in LDCF Work Program	May 2008
CEO endorsement	April 2009
Implementation start and completion	April 2009–April 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	National Council for Environment and Sustainable Development

Located mostly in the dry Sahelo-Sudanian climatic zone, Burkina Faso is extremely vulnerable to the impacts of climate change. Two major long-term risks have been identified: (a) reduction of annual rainfall by -3.4 percent (2025) to -7.3 percent (2050, including a reduction of precipitation levels by 20–30 percent by 2050 between July and September, which are key months for crop growth); and (b) increase of average temperature by 0.8 degrees Celsius (2025) to 1.7 degrees Celsius (2050). Despite a number of autonomous measures to overcome current climate pressures, anticipated climate change is likely to compound problems facing the agriculture sector even further. Given the dominance of the sector—86 percent of the

working population is engaged in pastoral and agroforestry activities, and agriculture accounts for 40 percent of the national GDP—adaptation is of paramount importance.

Project Activities and Expected Impacts

The LDCF project in Burkina Faso implements interventions to reduce vulnerability of communities and food production systems that are threatened by changes in mean climatic conditions and climatic variability. These interventions include two main subthemes: improving systemic, institutional, and individual capacity to respond to climate change in the agricultural sector; and demonstrating best practices in climate-resilient agropastoral



production for sustainable improvement of food security, thereby fostering capacity building, policy revisions, and upscaling at the national level.

The first subtheme ensures that key national agriculture and water policies fully reflect anticipated climate change risks and that policy changes delivering vulnerability-reduction benefits in the context of emerging climate risks are implemented. Additionally, institutional arrangements for supporting early warning on climate-induced food shortages are improved, as well as communication plans on updated climate change-induced risks. These interventions are informed by, and fully linked to, the community-level pilot adaptation measures described below.

The second subtheme is based on existing initiatives to support agricultural intensification and diversification, and land and water conservation measures. It focuses on piloting a range of adaptation measures at the community level, including climate-resilient irrigation approaches;

developing livestock feed (forage and agro-industrial feedstuff) storage facilities in the center region; improving the resilience of forage facilities; and developing improved food reserve facilities, including management practices, taking into account climate change risks. With this range of pilot demonstration activities, the project facilitates learning and replication, which can be supported through adjustments in policy and institutional support structures, as mentioned above.

Synergies and Coordination

The project closely interacts with the following programs currently under implementation in Burkina Faso: (a) a project on Livestock Development of Liptako Gourma, (b) a program for water resources valorization, (c) an agricultural development program supported by Denmark, (d) a project fighting the silting/stranding of the Niger river basin, (e) a project on supporting local development of Comoé-Léraba-KénéDougou, and (f) a project on natural resources management.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



CAMBODIA

Building Capacities to Integrate Water Resources Planning in Agricultural Development

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$2,145,000
Cofinancing	\$2,340,350
NAPA completion	March 2007
PIF clearance	December 2007
CEO approval	April 2009
Implementation start and completion	July 2009–June 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partners	Ministry of Agriculture, Fisheries and Forestry; Ministry of Water Resources and Meteorology

The LDCF project in Cambodia increases the adaptive capacity of key stakeholders in water resource management to address the impacts of climate change. The project focuses on the water resource needs of the agriculture sector. The project identifies, prioritizes, and drives the policy reforms necessary to overcome constraints to the design, planning, and implementation of technically and economically feasible measures on adaptation to climate change in the agricultural sector.

Interventions supported by this project focus on the needs of the poor agricultural communities that are most vulnerable to the impacts of climate

change. The project builds the capacity of selected local communities to adapt to changes in water and land resources resulting from climate change. Part of this process includes improved capacity to conserve and manage fish stocks as an element of integrated rural livelihood development through integrated packages of small rural livelihood interventions. Complementing this capacity development process, which occurs at the national level, the project also builds the capacity of selected local communities to adapt to changes in water and land resources resulting from climate change in order to promote sustainable agricultural development.



Project Activities and Expected Impacts

The objective of this project is to enhance adaptive capacity, at the national, institutional, and local levels, to climate change–induced changes in water resources availability for the agricultural sector in Cambodia. The project assists in the development of capacity in the area of development planning and selection of local adaptation options appropriate to address the climate change risks in the water resources sector.

Capacity within local institutions to manage agricultural water resources in a changing climate is increased through Commune Council Plans and budgets addressing inherent climate risks in target districts, training engineers in climate-resilient irrigation design, instituting conflict resolution measures in areas prone to climate-induced water shortages, and establishing a community-based climate information system on floods and drought events.

Locally appropriate adaptation options are demonstrated to reduce exposure to climate-induced risks through improving rainwater harvesting facilities in 20 target villages, demonstrating resilient farming methods to climate-induced changes in rainfall intensity and distribution, as well as resilient design and management of reservoirs, irrigation canals, ponds, and dykes.

Lessons learned in project pilot sites will be replicated in other vulnerable areas of Cambodia. To support this, the project designs and

implements public awareness and environmental education programs on climate risk reduction, establishes learning networks for climate-resilient farming practices, extends the Service Centre for Farmer Water-Use Committees (FWUC) with climate change learning capability, disseminates project lessons through TV and radio, and generates modifications to national policies on climate change adaptation as lessons are derived from the project activities.

Synergies and Coordination

NGOs and Executive Committees of the two pilot provinces play a leading implementing role together with the two lead project ministries. The Ministry of Environment (MOE), which has the mandate over climate change matters, sits also on the Project Board, adopting lessons learned from the project to prepare for modifications to national climate-related policies. These management arrangements support the strengthening of institutions responsible for climate change adaptation issues, specifically as related to agricultural water management. Coordination with other agencies further enhances the dissemination of learning on adaptation. The project collaborates also with other key development partners such as the International Fund for Agricultural Development (IFAD), the French Agency for Development (AFD), the Danish International Development Agency (DANIDA), and others to support a coherent and synergetic approach to climate change adaptation in Cambodia.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202–473–0508
Fax: 202–522–3240

August 2009
www.theGEF.org



CAPE VERDE

Building Adaptive Capacity and Resilience to Climate Change in the Water Sector

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,410,000
Cofinancing	\$63,699,027
NAPA completion	December 2007
Inclusion in LDCF Work Program	May 2008
CEO endorsement	August 2009
Implementation start and completion	August 2009–July 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	National Institute for Water Resources Management (INGRH)

As a small island state with limited rainfall, Cape Verde is already restricted in its access to fresh water resources. The Initial National Communication (INC) to the United Nations Framework Convention on Climate Change by Cape Verde (1999) identified four sectors as particularly vulnerable to climate change: water, agriculture, forestry, and coastal development. The INC further identified limitation on water resources as a result of climate change as one of the main constraints to economic development in Cape Verde. Models of future climate change suggest that temperature increases of up to 4 degrees Celsius can be expected by 2100, and decreases in rainfall by up to 20 percent. In the more immediate planning horizon (next 10–20 years), climate induced changes include seasonal water shortages at an increasing number of economically important sites, and year-round

shortages at other sites. In addition, climate variability is predicted to increase, with more storms, floods, and droughts and a shorter rainy season. Clearly, climate change and variability in Cape Verde are possible threats to the entire development process and to all the island's communities.

Over the past two decades, the government of Cape Verde has been relatively successful in introducing economic reforms, maintaining economic stability, and generating GDP growth. The government has established poverty alleviation programs as part of its socioeconomic development strategy and progress toward achieving MDG targets has been encouraging. The problem, however, is that the gains achieved and expected are under additional threat from the impacts of climate change.



Project Activities and Expected Impacts

This project addresses priorities identified in Cape Verde's National Adaptation Programme of Action (NAPA) and lays the foundation for the sustainable use and management of water resources under conditions of climate change. The project ensures that in selected local municipalities water resources remain sufficient under conditions of climate change, thereby providing a basic resource for livelihoods, agriculture, and local industries. At the national level, the project ensures that there is capacity to provide the services, that the national water supply is in line with growing demands, and that water is not a constraint to development, tourism, and poverty reduction.

Several small-scale investments are presently taking place to increase water management capacity locally. However, these are insufficient to manage climate change associated risks. In addition, many highly vulnerable sites do not benefit from these investments. This LDCF project, therefore, builds on these existing investments to include larger or more sophisticated investments in water capture, storage, and distribution. In addition, a series of investments to increase water resources availability is undertaken in highly vulnerable sites in order to increase the resilience of local development against climate change and variability. The investments, where possible, build upon traditional water management practices and technologies. These small-scale investments not only demonstrate appropriate approaches, they also bring direct relief to some marginal and vulnerable communities in Cape Verde. Finally, field knowledge and expertise on how to adapt to climate change are greatly increased through a series of demonstration and action research projects.

At the national level, the project builds the adaptive capacity of institutions and individuals involved in managing the water sector. For example, the project assures access to improved information and improved climate change models, notably at the subnational level. In addition, communities,

municipalities, and national stakeholders gain a thorough understanding of climate change, its implications for Cape Verde, and alternative approaches. Tools for integrating climate change and increasing climate change resilience are made available at national level and in selected municipalities. These tools address risk management, capacity to plan for climate change, and capacity to introduce alternative, climate change-resilient, development scenarios. With this capacity, water serves as a foundation for economic development and poverty alleviation, rather than becoming a major constraint for stakeholders.

Synergies and Coordination

This project has been conceived to complement several other projects, programs, and initiatives within the water and related sectors in Cape Verde. The national investment budget includes a series of programs and projects related to integrated water resources management, with an allocation of almost \$14 million for 2007–08. These projects address sustainable water management, watershed management, information collection and monitoring, construction of small-scale water harvesting mechanisms, and enhancement of the management infrastructure. In addition, many international agencies have engaged in related investments, including (a) a European Union project supporting water distribution and sewage treatment, (b) a French project supporting natural resources management and the development of tourism in rural areas, (c) a Japanese project supporting the establishment of bore holes, and (d) a German project supporting water supply.

Furthermore, the project is coordinated with the United Nations Development Programme/GEF Strategic Pilot on Adaptation (SPA) project Responding to Coastline Change and Its Human Dimensions in West Africa through Integrated Coastal Area Management, in which Cape Verde also participates. This project aims to pave the way for adaptation measures that deal with coastal zones issues through regional collaboration.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



COMOROS

Adapting Water Resource Management in Comoros to Increase Capacity to Cope with Climate Change

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,850,000
Cofinancing	\$5,600,000
NAPA completion	November 2006
Inclusion in LDCF Work Program	June 2009
Expected CEO endorsement	April 2010
Expected Implementation start and completion	July 2010–July 2014
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	National Direction of Environment and Forests, Ministry of Agriculture, Fisheries and Environment

Comoros comprises three islands in the Indian Ocean: Grand Comoros, Anjouan, and Moheli. It is a Highly Indebted Poor Country (HIPC), ranking 136 of 177 in the Human Development Index (HDI) in 2004. The natural resource–related sectors of agriculture, fisheries, forestry, and sand and coral mining contributed nearly half of the GDP in 2004; the remainder came from remittances, construction, and small-scale industry and commerce. Between 70 and 80 percent of the population engages in subsistence farming, and agriculture, e.g., vanilla, ylang ylang, and cloves, generates 98 percent of export revenue. At present, national agriculture production accounts for only 40 percent of the country’s food needs, the remainder of which is imported. With population growth outpacing economic growth, the government struggles to provide basic social services and must cope with a chronic deficit. Most of the Millennium Development Goals (MDGs) are off track.

Comoros is already facing the effects of climate change. Comoros’s National Adaptation Programme of Action (NAPA) reports a rise in annual temperatures of about 1 degree Celsius over the past 30 years and a shortening of the rainy season from six months to two to three months. Over this same period of time, the frequency of cyclones has increased, inflicting serious economic and human costs. The Intergovernmental Panel on Climate Change (IPCC) estimates sea-level rise at about 4 mm a year. At the same time, the mining of sand, gravel, and coral is leading to extensive coastal erosion. In the past 20 years, 90 percent of the beaches have disappeared on Grand Comoros, increasing the island’s vulnerability to sea-level rise.

Water resource management presents a serious challenge to the government. Both changes in temperature and rainfall patterns, such as prolonged dry seasons, affect the quantity and distribution of water resources. Water quality is also a serious



problem in Comoros. Along the coast, a projected 20-cm rise in sea level by 2050 is likely to produce increasing levels of saline intrusion in coastal aquifers, which will particularly impact Grand Comoros, where coastal boreholes are the only source of water. On the island of Anjouan and Moheli, rivers are the only source of water supply. As temperatures rise and rainfall run-off into rivers fall, water quality on the two islands will become significantly compromised.

Project Activities and Expected Impacts

The objective of the LDCF project in Comoros is to reduce the risk of climate change on lives and livelihoods from impacts on water resources. Building on the NAPA assessment and the Second National Communication, begun in early 2008, the project addresses the country's vulnerability to climate change by focusing on the project site and capacity building. This is important, as institutionalizing the ability to monitor climate change assures greater sustainability by creating the ability to continue to understand ongoing changes to climate.

The project includes the following three components:

Component 1. *Support institutional development to integrate climate change into water resource management:* Capacity development like knowledge development, training, and equipment is needed for stakeholders such as the institutions in charge of water management, community structures involved with water resource management, and the national water supply company. In the project planning phase, a rapid needs assessment is conducted in order to develop a capacity development plan based on priority needs. A coordinated cross-government policy process is strengthened to consider changes needed to water management policy and regulatory and fiscal instruments to manage the effects of climate change. These efforts build upon existing plans to develop a Sustainable Development Commission and Water Management Policy, supported by the UNDP. Project results are analyzed through this coordinated policy process for their implications on national water and adaptation policies.

Component 2. *Demonstration of pilot water interventions that can mitigate climate change risk, targeted to vulnerable communities:* This component focuses on technologies to improve water access and quality that simultaneously mitigate climate change,

such as soil conservation measures, water harvesting, and remedial work on existing boreholes. An Integrated Water Resource Management (IWRM) plan is followed. This approach is particularly important in Comoros, where, because of the country's small size, fresh and saline water sources must be managed in a coherent way. Lessons learned on the cost-effectiveness and sustainability of the measures undertaken inform the work undertaken in Components 1 and 3.

Component 3. *Development of knowledge products to communicate results to policy makers and the international community:* Knowledge products are developed on lessons learned for policy makers, communities, and donors, and a national knowledge platform is developed to retain and facilitate learning from project implementation. The project also contributes learning from the Comorian experience to the Adaptation Learning Mechanism (ALM) and IW Learn, in particular on the question of adaptation financing needs and on efficient ways of allocating public financing into adaptation.

The most significant barriers to ensuring climate change-sensitive water management policy and investments are the scarcity of baseline data, the inability or near inability of the general populations and the government to pay for water provision, underdeveloped regulations and policy instruments at the national and island level, and low levels of human capacity to implement these policies. The project addresses these constraints by working in a complementary manner to baseline investments made by the UNDP and the GEF in the area of water resource management.

Synergies and Coordination

Project activities are linked to number of initiatives currently underway or planned in Comoros, including an African Development Bank (AfDB) project addressing water supply concerns; a United Nations Environment Programme (UNEP) programme Preparing for the threat of Sea Level Rise and Adapting to Water Stress with activities in Comoros; a French Development Agency (AFD) project to map underground hydrological resources on the three islands; a UNDP/Bureau of Crisis Prevention and Recovery integrating climate risk management into disaster risk reduction policy; and a GEF SIDS Integrated Water Resource Management (IWRM) project, which provides support for developing an IWRM plan in Comoros.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



DEMOCRATIC REPUBLIC OF CONGO

Building the Capacity of the Agriculture Sector to Plan for and Respond to the Additional Threats Posed by Climate Change on Food Production

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,410,000
Cofinancing	\$4,100,000
NAPA completion	September 2006
Inclusion in LDCF Work Program	October 2008
CEO endorsement	November 2009
Implementation start and completion	March 2010–March 2015
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	N/A

Climate models predict that by 2050, the Democratic Republic of Congo's (the DRC) average annual temperature is likely to increase by 2.5–3.7 degrees Celsius, with seasonal droughts occurring more frequently and lasting longer. It is also anticipated that annual rainfall will increase in the "Cuvette" region (Province of Equateur), while appreciable decreases will occur in the rest of the country and extreme climate events will increase in intensity and frequency. Decreased rainfall will be felt most severely in the southern part of the country, especially in the belt of tropical climate savannahs where over 70 percent of the rural population lives. It is expected, for example, that by 2020, the Katanga province is likely to experience only five months of rainy season compared to seven months today. Farmers in such regions do not have access to varieties of agricultural seeds that are adequately adapted to these climate disturbances.

The current changes affecting the seasonal cycles and climate parameters directly threaten the production of basic food staples for rural communities and, by extension, have implications for food security for the entire Congolese population. In effect, agriculture in the DRC—the foundation for 90 percent of the country's population—continues to be exclusively pluvial or itinerant. As rainfall changes, particularly through shortened rainy seasons, or as the average soil temperature increases, harvests are threatened and populations rendered vulnerable, in both cities and the countryside. The consequences of climatic changes and variability, through yield changes, have already been felt in all of the agro-ecological zones of the DRC. For example, at the end of the 2005–06 farming season, many farmers from the city of Moanda, in the Bas Congo province, harvested barely a basket of maize for the equivalent of 15 kg of old seeds, as rainfall became rarer in the region.



Project Activities and Expected Impacts

Considering these impacts on the Congolese agricultural sector, a number of urgent adaptive measures to secure food crop production have been identified. On the one hand, the project implements interventions at the national and subnational levels in terms of improved meteorological monitoring and forecasting. On the other hand, pilot interventions are implemented at the local level (farmers, communities, and agricultural extension services) to ensure improved reactivity and resilience to climate change-induced pressures in the entire sector, and to facilitate learning, which can later be scaled up to the national level.

At the national and subnational levels, the project responds to current capacity gaps in the management of climate change risks in the agricultural sector. These include, among others, insufficient and dilapidated equipment for agrometeorological stations, ageing and insufficiently trained staff to carry out agrometeorological measurements, and outdated methodologies for archiving and safeguarding observation data. This in turn implies that farmers are confronted with outdated guidance on appropriate dates for sowing various crops. The project, therefore, supports capacity building for farmers and meteorological services at the national, regional, and local levels, with a view to establishing updated vulnerability/risk and impact maps, seasonal forecasting, and agrometeorological bulletins for agricultural services. An agrohydrometeorological assistance system is being set up particularly to enable development of dynamic agricultural calendars and calendars to project dates marking the beginning and end of the rainy season. This is further accompanied by a measure to strengthen capacities among agricultural actors to enable them to design and implement strategies that respond to climate risks, both at the sector level and the level of farms and parcels. To this end, synergies between research

institutes and meteorological and agricultural services are being promoted, and the implementation of a national monitoring system for yields and an early-warning mechanism for food shortages is being established. Finally, improved knowledge and forecasting of climate changes in progress allows for development of technological packets adapted to new meteorological risks, which are being made available to farmers and technical services in the Ministry accompanied by a suitable training program.

At the local level, the project implements pilot adaptation measures in four vulnerable regions, (Bas Congo, Equateur, Kasai Oriental, and Katanga). This includes improving the resilience of food production systems by introducing proven adaptation measures and, where and when agriculture is heavily threatened by emerging climate change hazards, livelihood diversification options. Direct agricultural adaptation measures to be implemented include diffusion of climate-tolerant varieties of maize, cassava, and rice; selected farming techniques and climate-resilient soil, water, and crop management techniques; and updating of crop calendars and technological packets available to farmers to help them cope better with climate variability.

Synergies and Coordination

In the agricultural and livestock sector, the government has implemented, with support from various donors, the following programs and projects, with which this project is coordinated to maximize project impacts: (a) the Multi-sectoral Rehabilitation and Reconstruction Program (PMURR) with the World Bank; (b) the Project to Support the Rehabilitation of the Agricultural Sector (PARSAR) with the African Development Bank (AfDB); and (c) the Lake Tanganyika Integrated Rural Development Program (PRODAP).

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



DJIBOUTI

Reducing Impacts and Vulnerability of Coastal Productive Systems

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$2,277,000
Cofinancing	\$1,950,000
NAPA completion	October 2006
Inclusion in LDCF Work Program	September 2008
Expected CEO endorsement	December 2009
Expected Implementation start and completion	January 2010–May 2013
GEF Agency	United Nations Environment Programme (UNEP)
Other executing partner	Ministry of Natural Resources (MUHEAT)

As an arid coastal state, Djibouti is highly vulnerable to climate disasters. The majority of the Djiboutian population is found near the coast, and is particularly at risk from sea-level rise and flash floods, as previously seen in 1927, 1989, 1994, and 2004. The vast majority of Djibouti's rural population is highly vulnerable to climatic uncertainty, as they live in deserts or marginal infertile areas, often with highly erodible soils and limited water supply. Because Djibouti does not have permanent surface water bodies, it relies primarily on groundwater and on the seasonal flow of wadis. Climate models to the horizon of 2050 show that impacts on Djibouti's coasts, where most of its population is concentrated, are already significant, and will continue to increase with projected changes in climate. Djibouti's Initial National Communication (INC) to the United Nations Framework Convention on Climate Change (UNFCCC) predicts a potential temperature increase of between 1.7 and 2.1 degrees Celsius, and a potential sea-level rise of 8 to 39 cm. Initial studies of Djibouti's vulnerability to climate change revealed a significant impact on the fragile water balance at country level. The situation in the country will be aggravated by decreased precipitation between 4 and 11 percent, as well as

changes in the pattern of precipitation in terms of geographic distribution, frequency, and intensity. This combination of factors is likely to lead to increased severity of dry spells and more intense wet extremes accelerating erosion and floods. This could have a potentially disastrous impact on the availability of water, particularly in coastal areas.

For example, groundwater recharge will decrease as precipitation drops, while flash floods from wadis may occur more often due to the increase of rare but violent precipitation events, with potential increased risks of lives lost. Sea-level rise is likely to further exacerbate these impacts, particularly with respect to saltwater intrusion into the coastal aquifers, which will adversely impact the already declining water quality. Combined with excessive pumping and overexploitation, sea-level rise poses a severe risk to the country's urban areas. Further, fragile coastal ecosystems, coral reefs, estuaries, and mangroves, which play a crucial role in the livelihood of coastal communities and act as ecological buffer zones, are already showing signs of degradation due to climate change and human pressures. Pressures on the country's remaining mangroves



are expected to increase with predicted changes in the precipitation pattern, with drought and erosion leading to siltation of seasonal waterways and rapid runoff and sedimentation, resulting in a semipermanent closing off of the mangrove.

Project Activities and Expected Impacts

Because of its small size, many of the natural systems in Djibouti are linked and its resources and technical capacity are limited. This project therefore takes an integrated approach to coastal zone management and climate change. It addresses several of the root causes of vulnerability together. The project objective is to address the impacts of climate change on coastal ecosystems and communities by implementing a set of urgent measures that strengthen the capacity to predict future changes, while helping local populations adapt through the adoption of more sustainable production methods, particularly in the areas of water management, agriculture, fisheries, and tourism. This is achieved through a combination of three inter-related components: policy, ecosystem rehabilitation, and disaster prevention and response.

The policy component of the project reinforces institutional as well as technical and technological capacity to implement integrated coastal zone management in the context of a changing climate. It includes a blend of policy initiatives to encourage an enabling environment at the country level, as well as technology transfer in order to address the impacts of climate change on productive coastal systems, in particular in the water, fisheries, and coastal agriculture sectors.

Without this project, planning and development of the coastal zone in Djibouti would continue without due attention to the consequences of increased vulnerability. There would be a continued lack of information and knowledge about existing resources and impacts, such as groundwater potential, soil salinity, coastal erosion and their impacts on the economy.

The ecosystem rehabilitation component of the project addresses the increased risk of extreme climate-induced events due to environmental degradation. These include increased risks of floods, diminishing levels of seasonal rivers and aquifers, increased severity of droughts, and sea-level rise and its associated consequences. This component includes the implementation of physical measures to rehabilitate coastal ecosystems in order to restore their resilience to the above-mentioned impacts. Alternatives for local communities are developed as a means of releasing pressure on the mangroves and on water resources. For example, the rehabilitation of mangroves yields multiple benefits: by serving as a natural barrier to seawater intrusion, the mangrove helps maintain pasture in the surrounding areas. Similarly,

the project addresses issues related to the availability of freshwater for current and future communities by promoting water extraction technologies adapted to decreased rainfall in conjunction with urban center development planning in Khor Angar. Without the project's interventions, degradation of key coastal climate buffers, such as the important mangrove systems at the two project sites, would continue. Deforestation and unsustainable exploitation of these systems would continue unabated as few alternatives exist for local populations. This would increase environmental vulnerability as well as remove an important source of livelihoods as these grounds are an important area for fishing of high-value species.

The prediction and disaster prevention component of the project strengthens the country's capacity to measure and monitor the impacts of climate change, as well as the targeted communities' and the government's ability to respond to them. The ability to measure, anticipate, and prevent potential disasters, including early-warning systems, is the primary focus of the activities implemented. It builds on an existing flood early-warning system currently under development that has not factored in climate information, and that coordinates with current efforts to implement a project for the protection of the capital, Djibouti, against flooding. Without this project the country would continue to rely on ad hoc disaster relief efforts rather than preventing serious losses before they occur. Over the long term, climate-induced risks would continue to be overlooked in decisions concerning coastal development.

Synergies and Coordination

The project builds on plans and policies developed by the government of Djibouti in relevant sectors, as well as on synergies with ongoing and planned projects. For example, the project builds on current efforts by multilateral agencies such as the World Bank and United Nations Environment Programme, to install an early warning system for wadi flooding and extend lessons learned from recently developed disaster management and response tools to the national level or in project sites. The project also builds on initiatives aiming to promote sustainable livelihoods and food security, such as the Food and Agriculture Organization Special Programme on Food Security, which foresees interventions to develop surface water harvesting and fisheries development. Other linkages are established with projects implemented by various partners in other regions of the country, including solar energy projects by the International Fund for Agricultural Development (IFAD), designed to limit fuel wood harvesting, or the GEF-supported project Conservation of the Environment of the Red Sea and Gulf of Aden (PERGSA) for conservation areas.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



ERITREA

Integrating Climate Change Risks into Community-Based Livestock Management in the Northwestern Lowlands

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,756,380
Cofinancing	\$6,600,350
NAPA completion	May 2007
Inclusion in LDCF Work Program	September 2007
CEO endorsement	August 2009
Implementation start and completion	August 2009–July 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Government of Eritrea

Eritrea's livestock production system and related livelihood opportunities for pastoralists are highly vulnerable to long-term climate change, including variability. Climate models suggest that Eritrea will likely experience rising temperatures and decreasing rainfall over the coming decades. Resultant impacts will include decreasing and more variable run-off, increased occurrence of dry spells, and multiyear droughts, and will be felt heavily in the pastoral sector through diminishing soil moisture and decreases in rangeland productivity. The productive and reproductive efficiencies of the pastoral system have been declining progressively over the past decades due to a number of baseline issues, but these pressures are now compounded by the impacts of climate change. With crop cultivation and animal husbandry accounting for 60 percent of rural incomes, and incomes from livestock in specific regions such as the lowlands being even more important, anticipated climate change will have serious repercussions on rural poverty and well-being.

Over the years, pastoralists have developed a production system that adapts to the fluctuations in feed and water

supply availability. The major river basins and the rangeland areas with relatively higher rainfall and soil fertility serve as the dry season camp, while the open grazing land of the drier areas form the wet season camp. The routes that pastoralists, including their livestock, use to travel between seasons are well defined and based on known water points, feed, and tree shade. The movement involves mainly the larger animal species, but in areas where heat stress is acute, all livestock species are forced to move seasonally.

The Northwestern rangelands, the wet season camp, are especially sensitive to the impacts of drought. Recurrent droughts and high temporal and spatial variability of rainfall produces negative impacts on water resources availability by depleting underground water through evaporation. Inadequate recharge of underground aquifers of rangelands results in lower drinking water availability for livestock and reduces livestock productivity as a result of lower biomass productivity. In effect, the rangelands are already under severe pressure from drought. Recent records show that frequent droughts and interannual precipitation variability



between 1992 and 2004 have contributed toward the annual deaths of thousands of livestock species such as cattle and camels.

Thermal stress is increasingly exceeding thresholds that animals can tolerate, leading to shortening of grazing hours, which occur mostly at night or in the early morning; decreased feed intake; and interference with animal productive and reproductive functions. Without adaptation interventions, the linkage between pastoralists and land will be adversely affected and lead to adverse economic impacts, changes in social structure and cultural identity, and even political instability.

Project Activities and Expected Impacts

Reducing the vulnerability of the livestock sector to climate change, including variability, necessarily involves addressing the linkages between agriculture and water resources, as well as those barriers to livestock management that have little to do with climate change. Traditional coping practices have been affected by land- and ground water-use change, desertification, poverty, and border conflicts. Land- and ground water-use change is occurring in most of the rangelands and in particular, those areas with higher rainfall, such as the southwestern lowland and the riverine areas.

The conversion of some rangelands into rain-fed cropping, even in areas with insufficient rainfall, and the conversion of others for irrigated farming, are placing pressure on livestock as grazing regions are more and more confined to marginal areas. The movement of livestock is increasingly restricted due to land fragmentation. In the more arid rangelands, the process of desertification is also increasing pressure on rangelands. Desertification has caused conversion of perennial grasslands to savanna dominated by annual grasses.

Both government and donor projects and programs are tackling these issues with varying degrees of success. This project is linked directly to these ongoing efforts aiming to address the additional threats posed by climate change. This is done through various pilot activities in three specific communities in the particularly vulnerable arid north-western lowlands, and broader-based technical capacity building for communities and relevant institutions.

In the first part, the project tests options for more climate-resilient water and livestock management systems at the local level, piloting infrastructure for irrigation technologies and management practices that support dry-season crop production. This includes the following activities: (a) development of community-scale irrigation infrastructure systems using

rainwater harvesting and spate irrigation; (b) establishment of a community-level information system that integrates regular seasonal, annual, and decadal forecasts of on water resource availability into the operational design and maintenance of the community-scale irrigation system; and (c) and empowering pastoralists and other community stakeholders to pursue alternative climate resilient livelihoods.

The second part focuses project activities on targeted capacity- building initiatives that develop the skills of key stakeholders to systematically integrate climate change risks into pastoral land and water management. These activities occur in the context of agricultural and food security-related strategies, policies, and measures at the national, subnational, and community levels. Specific outputs include personnel trained in forage conservation techniques and in managing and distributing water based on available climate information; improved knowledge on reseeding of the rangeland with climate-resilient varieties; extension support staff and other relevant stakeholders trained in climate change risk management; awareness on the part of policy makers of climate change risks and needs pertaining to livestock and water management in rangelands; and development of a rangeland management plan incorporating climate change risks over the next 30 years. The need to incorporate climate change risks on a policy level to create an enabling policy framework to address climate change in a more holistic and systematic manner is also addressed.

Synergies and Coordination

The project is fully linked to existing baseline projects and programs sponsored by the government and international donors, including the Integrated Rural Development Project (IRDP), the Lutheran World Federation Nutrition Project, and the Gash Barka Livestock and Agriculture Development Project. All are community development initiatives that cover the northwestern lowland, aiming to contribute to the livelihood of the populations engaged in traditional livestock production and increase the contribution of the agricultural sector to the national economy by improving productivity of crops, livestock, and community. Furthermore, the project draws on technical assistance from the Drylands Development Centre, that specializes in assisting countries in development projects in the drier parts of the world, as well as the Water Governance Facility, a joint United Nations Development Programme-Swedish International Development Cooperation Authority initiative that seeks to advance socially equitable, environmentally sustainable, and economically efficient management of water resources.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



THE GAMBIA

Strengthening of the Gambia's Climate Change Early-Warning Systems

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$1,056,000
Cofinancing	\$2,015,000
NAPA completion	January 2008
PIF clearance	August 2008
Expected CEO approval	November 2009
Expected implementation start and completion	December 2009–October 2011
GEF Agency	United Nations Environment Programme (UNEP)
Other executing partner	Department of State for Fisheries and Water Resources

From the late 1960s to the present, The Gambia has experienced the impacts of climate change as a negative trend in rainfall, which has placed tremendous pressure on natural resources and ecosystems. Observations also show changes to spatial patterns and temporal changes in rainfall in the last 60 years, including increased frequency of heavy rainfall above 50 mm/day, and a record number of lowest and highest rainfall years. Most of the current trends in rainfall are expected to continue for the coming decades, making The Gambia highly vulnerable to flooding and drought disasters.

The need to strengthen early-warning systems for extreme events by integrating climate change

information applications has been clearly demonstrated in The Gambia. Climate information ranging from seasonal forecasts to longer-term climate change projections need to be coupled with baseline social, ecological, and economic information that indicate vulnerabilities in key sectors. Climate information is required, for instance, to monitor and respond to climate-influenced diseases and health problems, design drainage infrastructure, and support land-use planning, for example, to help farmers anticipate adverse climate conditions before the onset of planting seasons.

Project Activities and Expected Impacts

While The Gambia has already implemented some measures and policies for early warning and



disaster prevention, they do not adequately address the consequences of climate change. Furthermore, effective people-centered and climate change-adjusted early-warning systems require risk knowledge, monitoring and warning services, dissemination and communication, and response capability. The Gambia's capacity gaps are apparent in each of these areas.

This project, therefore, strengthens the foundations for effectively monitoring, communicating, and responding to climate-related risks. This effort includes both urgent and immediate needs for addressing climate variability as well as longer-term capacities to respond to future climate changes. The project is structured around three components that address the four elements of effective people-centered early-warning systems mentioned above.

Responding to the inadequacy of the existing hydrological and meteorological networks in providing sufficient high-quality data for a fully operating early-warning system, the first component addresses additional capacity needs necessary to operate a national early-warning system. This includes training of senior-level hydrological and meteorological personnel to develop the skill sets necessary for data analysis and transformation into early-warning information; upgrading the capacity of hydrological and meteorological networks, for example, new/upgraded hard- and software; maintaining archives, including quality control and digitization of historical data; obtaining systematic social and environmental data for vulnerability analysis; and securing institutional mandates for collection and analysis of vulnerability data.

The second component addresses the fact that people often fail to heed warnings from early-warning systems since the warnings do not address their values, interests, and needs. Messages are often insufficiently targeted to the users and do not reflect an understanding of the decisions stakeholders need to make to respond to the warning. Individuals may perceive the warning as

irrelevant or find it impossible to heed, for example, because they are reluctant to abandon the assets upon which livelihoods such as livestock depend, or that have personal importance such as belongings. Furthermore, most warnings are delivered to the whole population through the media and are not tailored to the needs of individual groups. Through project funding, professionals in weather, climate, and hydrology are trained to produce information products to meet the planning and operational needs of the various user groups in the country, thereby ensuring that urgent warning information goes the "last mile" to reach all vulnerable populations in a timely manner. Also, capacity-building sessions on the production and interpretation of weather, climate, and hydrological information are held with the various user groups in order to ensure understanding and use of the information. Appropriate and effective means of disseminating the various information products to the various user groups are also developed and implemented through a number of concrete demonstration activities.

The third component reinforces existing regulations and laws, and builds institutional capacity to manage climate risks and factor these in to planning and zoning decisions. This is achieved by systematically reviewing relevant policies for climate sensitivity and subsequently revising them to factor in climate change adaptation needs.

Synergies and Coordination

The project draws on lessons, tools, and climate predictions from a number of recent regional assessments, including: Development of Regional Climate Change Scenarios for Sub-Saharan Africa, Assessing Global and Regional Climate Change Scenarios for West Africa, and Capacity Building in Analytical Tools for Estimating and Comparing Costs and Benefits of Adaptation Projects in Africa. Furthermore, the project coordinates its activities with work done under the UN Inter-Agency Working Group for Disaster Reduction, established in 2005.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



GUINEA

Increased Resilience and Adaptation to Adverse Impacts of Climate Change in Guinea's Vulnerable Coastal Zones

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,377,000
Cofinancing	\$5,250,000
NAPA completion	July 2007
Inclusion in LDCF Work Program	January 2009
Expected CEO endorsement	December 2009
Expected implementation start and completion	March 2010–November 2014
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Ministry of Sustainable Development and the Environment

Based on assessments undertaken for both the Initial National Communication (INC) and Guinea's National Adaptation Programme of Action (NAPA), climate change is expected to have intense and acute impacts on low-elevation coastal zones (LECZs). Existing baseline pressures, such as erosion, are likely to be compounded by increased salinization and flooding resulting from climate-driven pressures. The resultant impacts on coastal zones are expected to present serious development challenges to Guinea. Coastal lands play a key role in national food security in terms of agricultural production focused on rice, and over one-third of the country's population is located in coastal lands. If climate change considerations are not taken into account, a number of major investment programs in agriculture and industry currently planned in coastal zones, a significant proportion of which are expected to be in highly vulnerable areas, are likely to be at risk.

The coastal plains of Forécariah and Boffa are among the most vulnerable LECZs selected for immediate implementation of the NAPA. These plains possess vast

cultivated estuarine rice fields protected by a dense row of mangroves. Thousands of farmers make these plains the rice granary of Lower Guinea. Additional climate change-related pressures, such as increasing surface temperature, decreased precipitation, and sea-level rise (SLR), are expected to inundate lowlands, modify the taxonomic structure, and destroy infrastructure and natural defenses like mangroves. This is likely to lead to saline intrusion, shortages in drinking water, and loss of productive agricultural land and/or decreased yields.

Climate change scenarios suggest that annual average temperature in the coastal zone will increase by 0.2 to 3.9 degrees Celsius. Rainfall variability is predicted to increase, overall precipitation to decrease by as much as 30 percent by 2050, and SLR-related erosion to increase. The INC's projected scenarios for Guinea suggest a high likelihood of increased tidal amplitude that might cause abrasive actions from residual currents. Assessments demonstrate that, over long periods, SLR could cause a major loss of rice fields, ranging possibility from 17 to 30 percent in 2050 to 37 to 60 percent in 2100.



These findings suggest that both soft and hard coastal protection infrastructures and agriculture systems will become increasingly vulnerable. Even if vigorous measures curb human-induced global emissions, the combined effects of the principal climate risks will still compromise livelihood security. To ensure food security, implementation of adaptation activities is critical for the 26 percent of Guinea's population that lives along the coast.

Project Activities and Expected Impacts

The Guinea LDCF project addresses several NAPA priorities directly relevant to coastal adaptation. Special attention has been paid to Priority 5, *Protection of cultivation in coastal regions*. The outcomes and outputs of the proposed project are also relevant to aspects of the following priority NAPA interventions: Priority 2, *Developing knowledge and good practices* with a focus on ecosystem and natural resource management issues; Priority 3, *Promotion of adaptation technologies in mangroves*; Priority 5, *Protection of cultivation in coastal regions*; and Priority 6, *Improving information, education and communication on climate risks* with a focus on legislation and guidance on the sustainable use of natural resources and environmental education for coastal populations.

Given the inter-relatedness of the priority projects, a logical and cost-effective strategy is to implement them in an integrated and programmatic manner. LDCF resources are used to integrate climate risk reduction into planning, policies, and programs in coastal areas at the national and subnational levels. Local action plans for adaptation are developed on a pilot basis and the national master plan for urban coastal cities, including the capital Conakry, is reviewed and amended to take climate change and variability into account. This is complemented by capacity building of key stakeholders in socioeconomic groups such as loggers, fishmongers, fishermen, and local politicians responsible for implementation of the regulatory texts on risk management related to SLR.

The project also contributes to informing pragmatic adaptation responses through demonstrations. In particular, the project promotes adaptation to saline intrusion and increased erosion due to SLR, which is expected to contribute to agricultural production for farmers and restore natural pastures, among other things. Effective coastal management systems, primarily "soft" or small scale in nature, are designed and

implemented to reduce coastal inundation, for example by re-establishing zoning/green habitats in priority regions and developing climate-resilient livelihood practices for communities. Finally, good practices are disseminated for potential replication in other areas.

By following a programmatic approach to adaptation, the project enhances the resilience of coastal areas' long-term development to anticipated impacts. Expected adaptation benefits include strengthening of technical capacities in coastal management, decentralized and accessible information, and building social and organizational capacity to integrate climate risk reduction into long-term planning frameworks.

Synergies and Coordination

The implementation of the project is overseen by a Steering Committee that brings together representatives from different ministries, nongovernmental organizations, and local government from the relevant coastal zones. The National Council for the Environment and Sustainable Development (NEX) is entrusted with execution, with oversight from the UNDP Guinea Country Office.

The project also coordinates activities with the GEF-funded *Guinea Current Large Marine Ecosystem (GCLME)* intervention. The project *Combating Living Resources Depletion and Coastal Area Degradation in the Guinea Current Large Marine Ecosystem (GCLME) through Ecosystem-based Regional Actions* focuses on the priority problems and issues of the GCLME that lead to unsustainable use of fisheries and other marine resources, and the degradation of marine and coastal ecosystems by human activities.

Synergies are also built with the following projects: (a) the World Bank-GEF *Coastal, Marine and Biodiversity Management* project, 2008–13; (b) *the Program of Support to Villagers Communities phase II (PACV2)*, which includes marine and coastal biodiversity management; and (c) other projects taking place in the coastal areas related to food security, such as the recent French Agency for Development (AFD) project *Improving Rice Production in Mangrove Areas to Reduce Poverty*, and other initiatives from the European Union and the Japanese and German governments related to biodiversity conservation, poverty reduction, and capacity building.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



GUINEA-BISSAU

Strengthening Resilience and Adaptive Capacity to Climate Change in Guinea-Bissau's Agrarian and Water Sectors

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$4,543,000
Cofinancing	\$12,840,000
NAPA completion	February 2008
Inclusion in LDCF Work Program	August 2009
Expected CEO endorsement	June 2010
Expected implementation start and completion	September 2010–September 2015
GEF Agency	United Nations Development Programme (UNDP)
Other executing partners	State Secretariat for the Environment and Sustainable Development (SEADS); Ministry of Agriculture and Rural Development (MADR); Water Inter-Ministerial Committee (CIMA); Water Technical Committee (CTA), and General Directorate for Meteorology

The NAPA report highlights that gradual increases in temperature, and thereby evapotranspiration, and reductions in rainfall will significantly reduce the productivity of the agrarian sector and exacerbate water scarcity in Guinea-Bissau. Farming engages over 90 percent of national households and contributes 62 percent of GDP. The economy is therefore largely dependent on farming, which in turn relies heavily on rainfall intensity and regularity, in spite of the largely underexploited potential for irrigation. Although updated data on water resource use and water availability are nonexistent, the NAPA indicates that decreased rainfall will have a significant

impact on both. It could in fact render the planting of certain crops inviable in the drier regions, where farmers will have to increasingly resort to livestock for their livelihood, which would in turn require different skills, technology, and higher upfront investment for already impoverished households. Under these conditions, the "coping range" of rural populations will be significantly impacted by climatic change, given that large parts of the population and the economy are involved in, and dependent on, the sectors that are highly susceptible to climate risk.



Project Activities and Expected Impacts

The LDCF project builds directly on Guinea-Bissau's two top NAPA priorities in the agricultural and water sectors and is structured around two parallel capacity-building strategies. One side of this strategy focuses on general training and capacity building, including activities such as the training of key national stakeholders on climate change and adaptation planning, facilitating a process to mainstream adaptation into key development plans and sectoral policies, and improving the quality and dissemination of climate data as a foundation for decision making locally and nationally. The other side of the strategy focuses on the practical demonstration of relevant local adaptation measures in the food and water sector—primarily through pilot activities in individual villages. These pilots aim to demonstrate a wide selection of potential adaptation options such as techniques for efficient water use in crop production systems and rural water supply, climate-resilient food production methods (improved grain storage, crop diversification, use of short-cycle seeds and varieties that are less demanding of water or resistant to prolonged droughts), climate-resilient small ruminant breeding, and climate-resilient water resource management schemes,

(microreservoirs, small dykes, and dissemination of low-cost irrigation systems). If successful, these two parallel strategies provide Guinea-Bissau with a solid institutional and human capacity for scaling up adaptation planning, and practical on-the-ground experiences that can be replicated outside of the pilot regions.

Synergies and Coordination

The project closely interacts with the following projects and programs currently under implementation in Guinea-Bissau: (a) a project for rehabilitation of the agrarian and rural sector financed by the African Development Bank (AfDB) and the government of Guinea-Bissau; (b) a project for rural rehabilitation and community development implemented by the International Fund for Agricultural Development (IFAD); (c) the EU's *Food Security Information Project*; (d) the EU and NGO-financed projects *Structural Reduction of Food Insecurity in Guinea-Bissau and Strengthening of Agricultural Production Systems in Oio and Quinara Regions*; (e) a national rice development project financed by the government of Kuwait; (f) the Chinese-funded *Technical-Agricultural Cooperation Project for the Development of Small Valleys*.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



HAITI

Strengthening Adaptive Capacities to Address Climate Change Threats on Sustainable Development Strategies for Coastal Communities

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,960,000
Cofinancing	\$7,100,000
NAPA completion	December 2006
Inclusion in LDCF Work Program	September 2008
Expected CEO endorsement	March 2010
Expected implementation start and completion	June 2010–June 2014
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Ministry of Environment

Growing scientific evidence shows that new climate trends and new climate risks patterns are now emerging in Haiti as a result of global warming. Both the Initial National Communication (INC) to the United Nations Framework Convention on Climate Change (UNFCCC) and the National Adaptation Programme of Action (NAPA) established that the annual average temperature across the country is expected to rise in the range of 0.8°C to 1°C by 2030 and in the range of 1.5°C to 1.7°C by 2060. It is predicted that these changes will be accompanied by increasing rainfall variability, decrease in precipitation in the range of -5.9 to -20 percent by 2030, and increased frequency and intensity of extreme floods and droughts.

Haitian observations tend to confirm these scientific findings: people report dry seasons lasting longer and rainy seasons less, but they are more intense. Anticipated increases in sea levels and sea surface temperatures are also likely to be primary causes for increased beach erosion, salinization of fresh water aquifers and estuaries, coastal erosion, and increased coral reef bleaching throughout the island. There is a trend suggesting increased frequencies of hurricanes, to which the southern peninsula is especially vulnerable. The impacts of these climatic changes pose a direct threat to the island's tightly populated coastal settlements and their

economies. The densely populated slum districts of Haiti's coastal cities are located to a large degree in flood plains, rendering the poorest even more vulnerable to catastrophic hydrometeorological events.

While current climate change exerts indisputable pressures on Haiti's coastal areas, a number of non-climate-driven problems seriously increase the vulnerability of low-elevation coastal zones (LECZs) to climate hazards and limit their capacity to adapt. The main immediate threats to Haiti's coastal systems include uncontrolled and unplanned urbanization along the coast, boosted by rapid population growth and booming rural migration; unsustainable farming practices, such as overgrazing, overpumping of coastal aquifers, and clearing of mangroves for agriculture and charcoal production; and pollution of coastal water bodies and ecosystems due to suboptimal or nonexistent urban waste and wastewater treatment systems. The effect of these pressures leads to loss of natural coastal buffer zones and exacerbates exposure to climate change and sea level rise (SLR) impacts. Combined with current baseline stressors on LECZs, climate change effects are likely to hamper attainment of Millennium Development Goals and national development objectives in Haiti if risk reduction responses are not put into motion.



To address these challenges, the sustainable solution for Haiti is to establish a national system that can support the process of adaptation of the coastal development sector in a continuous and sustainable way, and that can address both climate-driven and baseline problems in an integrated manner. However, several barriers exist today that prevent Haiti from achieving the above solution, including inadequate planning and technical environments, which impede promotion of climate risk management in the coastal development sector; insufficient institutional capacities and donor coordination, which limit opportunities to identify and channel adaptation resources in relation to needs; and inappropriate coastal development practices that do not account for climate change and potentially increase coastal areas' vulnerability to emerging climate risks and disasters.

Project Activities and Expected Impacts

The LDCF project aims to overcome these barriers and to strengthen the adaptive capacity of populations and productive sectors in coastal areas to address increasing climate change risks. This includes three basic project activities: (a) improving institutional capacity to plan for and respond to increasing coastal hazards, (b) mainstreaming climate risks into existing humanitarian and development investment frameworks, and (c) local pilot activities to demonstrate how to enhance climate change resilience in the LECZs.

First, the project fosters a policy shift from reactive crisis management to proactive risk management. LDCF funding is used to train policy makers and key technical staff, and help them incorporate climate hazards into coastal zone planning. Furthermore, the project informs climate change–considerate legislation for the management of coastal areas and facilitates alignment of existing coastal management programs with a view toward stronger integration and climate resilience.

Construction and development standards are also reviewed and upgraded so that key features of climate impacts in Haiti are incorporated into the design of coastal infrastructure and equipment, and adaptation requirements for the LECZ are properly incorporated into the design of the new Environmental Information System for Haiti. Furthermore, it strengthens institutional set-ups and mechanisms to adapt to anticipated climate change impacts, and ensure that information flows are improved among climate monitoring, forecasting, and early-warning services to municipalities and communities in high-risk coastal areas. Disaster prevention, rescue and early recovery measures, and plans are also upgraded to take into account the additional risks induced by climate change.

Second, the project helps make the costs of climate change on human development in LECZ more explicit in order to mobilize the donor community and stimulate the creation of a National Adaptation Coalition. More specifically, a Multi-Donor Programmatic Partnership for Climate Risk Management (CRM) is put in place, including a package of interventions

to address climate change risks and policy, regulatory and institutional reforms, and capacity building. Investments are to be executed and funded in a coordinated way, from a variety of sources, including national budgets, bilateral development cooperation agreements, country assistance programs of multilateral agencies, and private foundations.

Finally, the project implements a suite of specific community-based adaptation measures to demonstrate how to withstand the impacts of extreme weather events like hurricanes and floods as well as increased erosion, submersion, and salinization caused by SLR. New risks assessment procedures and zoning regulations are tested in order to align municipal planning processes with emerging coastal hazards and shoreline changes. The project also produces and implements shoreline management plans in selected high-risk areas so as to ensure climate resilience of current coastal development processes and provide a cohesive framework for carrying out coastal adaptation activities at the field level. Specific attention is paid to the maintenance of “buffer zones” in the LECZ, through the protection and restoration of natural coastal defenses, such as mangroves and sand beaches systems, by using environmentally friendly technologies and sustainable land management methods.

Additionally, the project pays particular attention to the development of suitable systems to secure sources of potable water for coastal communities prone to saline intrusion resulting from accelerated SLR and more frequent flooding. Innovative coping mechanisms such as rainwater harvesting, micro surface and ground water recharge, and treatment facilities are piloted and demonstrated for scaling up over time and in future projects. It is expected that the results achieved through the pilot activities feed into the process of institutional strengthening of key central agencies by providing concrete examples and field guidelines for the development of climate-proofed investment plans and long-term development policies.

Synergies and Coordination

This project concept has been discussed with different actors of the government of Haiti, such as the Ministries of Environment, Interior, and Planning and External Cooperation. The project closely interacts with the following programs currently under implementation: The World Bank *Emergency Recovery and Disaster Management Project*, European Union *Local Capacity Building for Better Risks Management*, Inter-American Development Bank *National Programme for Early Flood Warning*, UNDP *Strengthening of the National Disasters Risks Management System and Environmental Management Support Programme*, French Agency for Development, AFD *Flood Management Programme in Jacmel's Municipality*, Spanish Agency for International Cooperation, AECI *Integrated Watershed Management in the South-East Provinces*, and Ministry of the Environment/Inter-American Development Bank *Enhancing Environmental Management Capacities in National Institutions*.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



LAO PEOPLE'S DEMOCRATIC REPUBLIC (PDR)

Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$4,999,995
Cofinancing	\$4,545,450
NAPA completion	May 2009
Inclusion in LDCF Work Program	September 2009
Expected CEO endorsement	August 2010
Expected implementation start and completion	September 2010–August 2014
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Department of Planning, Ministry of Agriculture and Forestry (MAF)

The two primary climate change–related hazards expected in Lao PDR are floods and droughts, along with their adverse impacts on food security and agricultural production. Climate change is expected to have a range of impacts, including increases in annual mean surface temperatures of around 0.1–0.3 degrees Celsius per decade; a longer annual dry season; more intensive rainfall events; and more frequent and severe drought and flooding events. The 4th IPCC report indicates that the Mekong basin is expected to experience increasing maximum monthly flows of +35–41 percent and decreasing minimum monthly flows of 17–24 percent over the course of this century, which will substantially increase flooding risks in the wet season and water scarcity in the dry season.

Project Activities and Expected Impacts

The LDCF project in Lao PDR aims to reduce national and local food insecurity resulting from climate change by reducing farmer vulnerability to extreme floods and drought events. First, the project compiles all existing climate hazard and vulnerability information from a multitude of previously dispersed sources, and makes it available for detailed local analysis and application in the agricultural sector. Second, the capacities of key stakeholders responsible for planning and management in the agricultural sector are increased through targeted training, and key policies and plans are reviewed to take into account the impacts of climate change in the agricultural sector. Third, demonstration activities



are undertaken in selected pilot communities particularly vulnerable to one or both of the main agricultural climate change vulnerabilities: the risk of increasing frequency and severity of droughts, and more intense flooding episodes. Taken together, these pilots aim to provide the insights necessary for addressing climate change-induced drought and flooding risks in an integrated manner, and eventually enable scaling up of successful strategies at the national level. Together, these three aspects of capacity building provide Lao PDR with a solid institutional and human capacity for scaling up adaptation planning, but also practical on-the-ground experiences that can be replicated outside of the pilot regions.

Synergies and Coordination

The project closely interacts with the following programs currently under implementation in Lao PDR: (a) flood management and mitigation programs being implemented by the Mekong

River Commission; (b) Asian Development Bank (ADB) support for community-managed irrigation systems and flood and drought management; (c) UNDP/ United Nations Environment Programme (UNEP) *Poverty Environment Initiative (PEI)*, which aims to build the long-term capacity of the Lao government to integrate environmental concerns into national development plans, investment management processes, and poverty reduction strategies; (d) World Wildlife Fund (WWF) and International Union for the Conservation of Nature (IUCN) activities related to climate change impact research; (e) the Northern Uplands Programme, which is currently being designed by the French Agency for Development (AFD), the European Commission (EC), the Swiss Agency for Development and Cooperation (SDC), and the German Agency for Technical Cooperation (GTZ); (f) ADB and International Fund for Agricultural Development (IFAD) project *Sustainable Natural Resource Management and Agricultural Productivity* in southern Lao PDR.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



LESOTHO

Improvement of Early-Warning System to Reduce Impacts of Climate Change and Capacity Building to Integrate Climate Change into Development Plans

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$1,814,500
Cofinancing	\$1,763,000
NAPA completion	June 2007
PIF clearance	April 2009
Expected CEO approval	December 2009
Expected implementation start and completion	October 2010–February 2012
GEF Agency	United Nations Environment Programme (UNEP)
Other executing partners	Ministry of Natural Resources; Ministry of Planning, Economic and Manpower Development; National Curriculum Development Centre (NCDC); Ministry of Communications, Science and Technology; Disaster Management Authority; Ministry of Agriculture and Food Security

Lesotho is one of the chronically poverty-stricken landlocked LDCs. It is prone to natural disasters, drought, and desertification, has a fragile mountainous ecosystem, and is particularly vulnerable to the impacts of climate change. In its Initial National Communication (INC) to the United Nations Framework Convention on Climate Change (UNFCCC), Lesotho predicts warmer future climatic conditions and changing precipitation patterns in such a way that good seasonal rains that characterize the summer season could shift to late autumn. This is likely to have serious implications for agro-ecological conditions in the country, as the growing season is pushed forward and perhaps shortened. An increase in precipitation in winter may result in heavier snowfall occurrences and strong winds.

Meanwhile, the country is already paying the high costs of global warming. The natural phenomena that have potential for disastrous effects are tornadoes, droughts, strong winds, hail storms, and heavy snowfall. These events leave large numbers of people perilously vulnerable to life-threatening situations and crop/animal damage, wreaking havoc with food security. The fragile soil/terrain characteristics add to the list urging the country to actively engage in measures and policies addressing climate change.

Among key priority needs identified in the National Adaptation Programme of Action (NAPA) were the improvement of early-warning systems to reduce the impacts of climate disasters and hazards, and capacity building and policy reform to integrate climate change into sectoral development plans.



Project Activities and Expected Impacts

The project also seeks to integrate climate change issues into national policy development debates and legislative frameworks by building capacity at both institutional and systemic levels to bring climate change into national planning.

Climate change monitoring and prediction: The project aims to improve the existing meteorological observation network and develop a sound climate-observing system for monitoring climate change. This is achieved through upgrading existing observation equipment and installing new equipment to cover all essential climate parameters.

The project also improves infrastructure and technical capacity for climate prediction, including impact studies at the national level. This is realized through upgrading and capacitating the operational forecasting office to better simulate the local climate and evolution of extreme events at a resolution fine enough to allow accurate spatial and temporal forecasting. The enhanced system is designed to complement and support the needs of an integrated risk communication system described below. The project also devises and implements a system for tailor-made products for sectors like agriculture, water resources, forestry, and social well-being.

Monitoring climate change requires mechanisms for monitoring socioeconomic and environmental vulnerabilities, particularly the impacts on livelihoods. A socioeconomic database linked to the climate database is established to provide interlinkages between climate and various sectors and essential inputs for climate change impact analyses. The database is designed as part of a broader system aimed at modeling and monitoring the indicators in livelihood vulnerabilities.

Climate change risk communication systems: An effective early-warning communications strategy is developed to encourage the population to actively respond to climatic changes. Appropriate and effective communication channels including communication networks for the transmission of data from stations to monitoring centers and from monitoring centers to local communities are developed.

Climate change policy: Existing national initiatives to develop climate change policy frameworks and institutional mechanisms focusing on integration of

climate change into national development plans are strengthened. These frameworks ensure increasing levels of climate change integration, awareness, and education.

Training: The project develops and implements a training program aimed at capacitating technical and operational staff for climate change early warning. This includes building capacity within the national early-warning unit, focusing on preparedness, and management of climate induced disasters.

Public awareness and education: The project seeks to enhance existing public awareness and education strategies and materials in affected communities in support of the climate change risk communication system described above. This creates a core buy-in from the policy makers and public in support of integrating adaptation into development and encouraging public engagement. This is meant to ensure the sustainability, communication, and replicability of the project.

Synergies and Coordination

The Disaster Management Act of Lesotho recognizes the importance of strengthening early-warning systems for disaster management and prevention, and a National Capacity Self Assessment (NCSA) exercise prioritized strengthening the institutions responsible for the implementation of Multilateral Environmental Agreements (MEAs). Lesotho is currently engaged in the Second National Communication (SNC), and the time is right to initiate formulation of a national climate change policy, as the project seeks to accomplish.

The country periodically reviews its national curriculum to meet the present-day requirements in the education system. It is hoped that the project builds awareness in the national education system concerning the need to include climate change information in the national curriculum, particularly at the primary and high school levels. The project also seeks the inclusion of climate change subjects in the curriculum for the tertiary institutions, including sensitization for design of research work on climate change, with a focus on agriculture, water resources, land-use management, and vulnerability assessments. The research work is coordinated in partnership with other established centers in the region, such as the University of Cape Town, South Africa, and the Southern Africa Forest Fire Network.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



LIBERIA

Enhancing Resilience of Vulnerable Coastal Areas to Climate Change Risks in Liberia

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,300,000
Cofinancing	\$3,000,000
NAPA completion	July 2007
Inclusion in LDCF Work Program	March 2009
Expected CEO endorsement	March 2010
Expected implementation start and completion	June 2010–June 2014
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Environment Protection Agency (EPA)

Liberia is a country of huge resource potential, richly varied geography, and tremendous human capability. As it emerges from recent civil war, Liberia has made significant development strides in promoting sustainable development policies, engaging in international environmental processes, and seeking to strengthen its human and institutional capacity. However, climatic risks pose a serious challenge to its emerging development priorities, with the potential to undermine development prospects and attainment of the Millennium Development Goals (MDGs). The National Adaptation Programme of Action (NAPA) identified vulnerability of coastal zones to climate change as a priority area for intervention through the LDCF. Most of Liberia's population live in close proximity to the coast and will experience serious consequences from sea-level rise (SLR).

According to the Liberian Environment Protection Agency, it is projected that about 95 km² of land in the coastal zone of Liberia will be inundated as a result of a 1-meter SLR (scenario B2), and about 50 percent, 48 km², of the total land loss due to inundation will be the sheltered coast. Three of Liberia's main coastal cities are at immediate risk

from climate change-induced SLR. With a 1-meter SLR, parts of the capital city of Monrovia and its environs, including West Point and New Kru Town and River Cess, Buchanan, and Robertsport cities, would be submerged and about US\$250 million worth of land and infrastructure would be lost. Inundation would be followed by shoreline retreat that would vary along the coast from 10 meters in the higher cliffed zone between Mamba Point and Sinkor, to about 20 meters in the lowlands on the Bushrod Island. Key economic sectors are clearly under threat from accelerated SLR, and displacement of people from Monrovia and Buchanan, important cities for the economic growth and development, is already increasing.

Furthermore, climate change projections for the year 2050 suggest that SLR will intensify the abrasive effects of residual currents. The plains are increasingly exposed to saline intrusion and acidification, causing significant degradation. Recent observations clearly corroborate these long-term trends: soil productivity has suffered a marked decrease, resulting in significantly decreased incomes for communities in the area.



Coastal settlements and economies of Liberia are extremely vulnerable to the projected impacts of SLR. Besides the additional pressures resulting from climate changes, the major root causes for the growing vulnerability of coastal areas include: (a) uncontrolled and unplanned urbanization along the coast, aggravated by domestic migrations resulting from the civil war; (b) unsustainable agricultural practices leading to clearing of mangroves and degradation of coastal vegetation systems; (c) sand mining; and (d) oil pollution and illegal solid and sewage wastes dumps. These non-climate-driven pressures result in reduction of natural buffering functions of coastal zones and dangerously limit their capacity to adapt to emerging threats.

Project Activities and Expected Impacts

To tackle this challenge, the required solution in Liberia is to promote a national adaptation process that generates a paradigm shift and support a climate-resilient coastal management regime. This new adaptive system is characterized by adapted systemic and institutional frameworks governing coastal development and Integrated Coastal Zone Management (ICZM); adoption of coastal management practices more consistent with the threats from SLR; increased information flows on climate change, including variability, between producers and users; strengthened abilities to design and implement early adaptation actions and long-term resilience plans; and well-managed and disseminated adaptation knowledge and lessons to stimulate a sector-wide change toward resilience.

Liberia's NAPA prioritized a number of urgent interventions to remove the barriers that hinder the country from implementing climate-resilient ICZM and pilot measures in priority coastal cities. Drawing on the methodology outlined in the Adaptation Policy Framework, the proposed project covers a significant part of the additional costs associated with enhancing Liberia's resilience and reducing vulnerability to climate change impacts in coastal regions, as well as incorporating climate change risks into national development programs. Contributions toward the reduction of vulnerabilities to climate change are achieved through the pursuit of specific outcomes, including: (a) integrating concerns into policies and planning processes at the state and national levels, (b) implementation of risk reduction strategies and measures at pilot sites, (c) strengthening technical capacity to integrate climate risks into management of coastal regions, and (d) capturing and disseminating lessons learned to key stakeholders.

Expected adaptation benefits include strengthening of technical capacities in key sectors, development of social and organizational capacity, and general awareness about the adverse impact of climate change. The project also promotes a programmatic approach to adaptation planning among various stakeholders, development partners, and donors, and facilitates the mainstreaming of climate risk reduction into planning frameworks, policies, and programs in Liberia, with an emphasis on such measures in vulnerable coastal areas. In the face of climate change and Liberia's subsequent adaptation to its adverse impacts, the project also supports future scaling up and replication, and identifies possible investment opportunities for adaptation. Finally, the project is catalytic in fostering a broader programmatic adaptation framework in Liberia.

Synergies and Coordination

The project elaborates on the current efforts of the National Disaster Relief Commission. With support from the UNDP/Bureau of Crisis Prevention and Recovery (UNDP/BCPR), drafting of a national disaster relief policy and provision of emergency relief to victims of floods in coastal communities are ongoing.

Additionally, the project closely collaborates with and builds on the baseline of the following national initiatives:

- **Guinea Current Large Marine Ecosystem (GCLME).** The project *Combating Living Resources Depletion and Coastal Area Degradation in the Guinea Current Large Marine Ecosystem (GCLME) through Ecosystem-Based Regional Actions* has a primary focus on the priority problems leading to unsustainable use of fisheries and other marine resources and the degradation of marine and coastal ecosystems by human activities;
- **UNDP-UNEP Poverty and Environment Initiative (PEI).** The overall goal of this initiative is to contribute to poverty reduction and improved well-being of poor and vulnerable groups. Through UNDP, Liberia intends to tap into this initiative by piloting projects that enhance environmental sustainability;
- **United Nations Military Mission Beach Erosion Assessment.** The project intends to carry out a comprehensive assessment of the coastline of Liberia in collaboration with the relevant national institutions, and prepare an Integrated Coastal Area Management Plan (ICAMP) for Liberia.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



MALAWI

Climate Adaptation for Rural Livelihoods and Agriculture (CARLA)

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,623,950
Cofinancing	\$24,505,250
NAPA completion	March 2006
Inclusion in LDCF Work Program	July 2008
Expected CEO endorsement	March 2010
Expected implementation start and completion	March 2010–March 2015
GEF Agency	African Development Bank (AfDB)
Other executing partners	Environmental Affairs Department (EAD), Ministry of Mines, Natural Resources and Environment; Department of Irrigation, Ministry of Irrigation and Water Development

Malawi is heavily dependent upon rain-fed subsistence agriculture, with more than 80 percent of the population generating their daily livelihoods from small-scale agriculture and around 60 percent of the population with insecure access to food on a year-round basis. While the newest climate models for Malawi show no conclusive trend in average rainfall, they do indicate a later onset of the rainy season. This causes shorter rainy seasons with higher average precipitation intensities, which, coupled with rising temperatures, lead to longer dry seasons and more frequent and severe droughts. Faced with increasing rates of climate

change-induced extreme weather events such as recurrent floods and droughts, the current baseline initiatives aimed at fostering sustainable economic growth and improved rural livelihoods in Malawi are at a high risk of failing. This in turn could lead to deteriorating food security and failing livelihoods among the large group of already vulnerable rural Malawians, as well as to the deterioration of the Malawian economy as a whole. Malawi has large natural resources, in particular fresh water, which could be used to cushion the effects of climate change, but these are vastly undeveloped at present.



Project Activities and Expected Impacts

The project builds directly on baseline activities supported by the African Development Bank's Smallholder Crop Production and Marketing Project (SCPMP), which supports irrigation development, including development of small-scale irrigation schemes, development of land for crop production, and improvement of cropping intensity and productivity, and a farmer support program, including support for water users, associations, training in water management, and crop production and pest control technologies.

The project adds a climate change adaptation perspective to the baseline investments through two key components: investments aimed at improving agricultural practices, land management, natural systems, and rural livelihoods through targeted adaptation interventions; and the creation of an enabling environment for climate risk management.

Specifically, the first part includes activities to enhance water distribution; promote better irrigation efficiency; change irrigation schedules; and promote water recycling, groundwater capture, and system rehabilitation. As a result of

climate change risks, attention is also given to water harvesting, including the construction of small dams, and the management of catchments of dams and rivers providing irrigation water, thus reducing siltation of dams/rivers for irrigation.

The second part creates an enabling environment for climate risk management to maximize positive impacts of the above mentioned investments, sustain their impacts in the long term, and lay the foundation for replication of best practices beyond the direct project activities. Activities address (a) plans, policies, legislation/regulations, and resource allocation; (b) institutional coordination; (c) generation and tailoring of knowledge on climate risk management for specific user groups, particularly in the context of the investment component; and (d) awareness raising.

Synergies and Coordination

The project is integrated into the ongoing investments by the African Development Bank's *Smallholder Crop Production and Marketing Project (SCPMP)*, which assures maximum synergy with efforts to improve food security at the national level.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



MALDIVES

Integration of Climate Change Risks into the Maldives Safer Island Development Programme

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$4,743,000
Cofinancing	\$4,290,000
NAPA completion	March 2008
Inclusion in LDCF Work Program	March 2009
Expected CEO endorsement	January 2010
Expected implementation start and completion	March 2010–February 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Ministry of Environment, Energy and Water

Maldives is one of the nations most vulnerable to the predicted impacts of climate change, especially sea-level rise (SLR). More than 85 percent of land area is estimated to be less than 1.5 m above mean sea level. The country consists of small, low-lying coral reef islands, which are vulnerable to both short-term changes in sea level, e.g., flooding produced by storms and swell waves, as well as long-term SLR. There have been recent incidences of swells and storms affecting more than half the populated islands, resulting in loss of property and adverse impacts on water resources and agriculture. Forty-four percent of settlement footprints on all islands are within 100 m of the shoreline, and more than 70 percent of all critical infrastructures are within 100 m of coastline.

The National Adaptation Programme of Action (NAPA) has identified settlement planning and natural

hazard mitigation as key approaches in combating SLR-related effects. The proposed project addresses the NAPA priorities 1 and 2 aiming at reducing the vulnerability of the population to climate change and climate-related natural disasters through re-evaluation and improvement of the national *Safer Island Strategy*, which refers to a range of larger islands that should provide safe havens for people forced to migrate before or after extreme natural disasters. "Safe Islands" offer communities ecologically safe zones and structures to mitigate the impacts of climate change and prevent losses during emergencies and disasters. Elevated areas and buildings enable also vertical evacuation, and all basic services are intended to be provided during emergencies.

The "climate smartness" of the strategy and the *Safer Island Development Programme (SIDP)* still require



strengthening through consideration of critical information on climate change impact projections and scenarios and their reflection in land-use planning, infrastructure development, and coastal zone management. Also strengthening and reinforcement of natural protective functions based on the geophysical setup of Safe Islands are strongly recommended, as opposed to an arbitrary, single standard set of planning measures for all islands. Replication of defensive features of natural environments involves proper topographic profiling, soil profiling, revegetation and drainage, and a new planning perspective for land reclamation and coastal protection activities.

Project Activities and Expected Impacts

Capacity development: LDCF resources enable establishment of a climate information system that ensures the systematic collection, analysis, and dissemination of climate risk information for practical tasks related to SIDP planning. Technical and planning staff at the atoll and island levels are trained in climate risk analysis, hazard mitigation, and adaptive planning, thereby addressing efficient response to long-term climate risk challenges.

Policy support: LDCF resources are used to assess, prioritize, and demonstrate anticipatory, adaptive, and innovative measures in coastal development, coastal protection, and resilient land-use planning, zoning, and farming on islands that are designated to become Safer Islands in the SIDP. Additional technical and engineering studies are undertaken to ensure long-term resilience of communities living on, or moving to, Safer Islands. This strengthens understanding of hazard and vulnerability dynamics on all Safer Islands, and develops guidelines for resilient land-use planning, natural hazard mitigation, coastal development, and land reclamation. Revising and systematically integrating climate change risk reduction measures into SIDP policies and practices is crucial.

Climate risk reduction: Priority mitigation and adaptation measures on Safer Islands are defined and integrated into composite risk reduction action plans. They integrate a suite of innovative coastal protection, land-use planning, and land reclamation

measures based on technical and engineering analysis delivered by the project. The design of individual demonstration measures is aligned with local conditions at the pilot sites and guided by the selection principle of low-cost replication potential. This moves the scope of the project toward support of natural protective structures and ecosystems, diversification of climate-sensitive natural resources and crops on islands, resilient land zoning and management of natural buffer zones, and improved information flows from climate information and early-warning systems. Focus is on long-term resilient practices of land reclamation, erosion prevention, soil and vegetation management, participative protection of coastal sediment barriers, and optimization of freshwater and drainage management. Piloting of a suite of interconnected adaptation measures in- and outside of the SIDP enables analysis and evaluation for a following scaling-up plan.

Knowledge management and learning: The lessons generated through this project are highly relevant to other Small Island Developing States (SIDS). Targeted knowledge-sharing activities within Maldives and beyond ensure dissemination of lessons learned through the global Adaptation Learning Mechanism (ALM) platform. The project assists in developing a critical mass of coastal zone adaptation experience in SIDS.

Synergies and Coordination

The project builds on, and closely coordinates with, the UNDP/United Nations Environment Programme-supported detailed risk assessments of nine potential Safer Islands; detailed cost-benefit analyses of two potential Safer Islands by United Nations International Strategy for Disaster Reduction (UNISDR); and the Maldivian government-funded *Safer Island Development Program*.

The Maldives is working on developing its Second National Communication (SNC) to the Climate Convention. The included Vulnerability and Adaptation Assessment directly ties into the climate knowledge and information-related deliverables of this project and ensures that relevant climate models and scenarios are actively applied in the re-evaluation of the SIDP.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



MALI

Enhancing Adaptive Capacity and Resilience to Climate Change in the Agriculture Sector in Mali

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$2,600,000
Cofinancing	\$6,865,000
NAPA completion	December 2007
Inclusion in LDCF Work Program	February 2008
Expected CEO endorsement	December 2009
Expected implementation start and completion	March 2010–November 2014
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Ministry of Agriculture, Livestock and Fisheries

The agriculture sector contributes over 50 percent of the Mali national GDP and provides the primary means of livelihood for more than 70 percent of the population. It is characterized by a wide diversity of production systems due to the country's various agroclimatic gradients with herders exclusively in the Sahelian zones, and a combination of farmers, herders, and agroherders in the Sudano-Guinean and Guinean zones.

Current changes in climatic conditions are causing degraded conditions for agricultural production and clearly represent a priority threat to the sector development and food security in Mali. As highlighted in both the Initial National Communication (INC) and the National Adaptation Programme of Action (NAPA), climate forecasts for Mali indicate rising temperatures and decreased rainfall, with increased inter- and intra-annual variability. The Sudano-Sahelian zone would be

the area most affected by precipitation changes. According to current observations, many rural areas of Mali already experience severe droughts, irregular rainfalls, and reduction in agricultural yields.

Mali's farming systems and livestock breeding are extremely vulnerable to climate change and variability due to significant reliance on rain-fed agriculture and ongoing practices regarding crop selection, water resource and rangeland management, drought preparedness, and household income generation that are not compatible with increasing aridation and climatic variability. Additional vulnerability drivers relate to increasing demographic patterns, including climate-induced refugee movements into regions least affected by drought, which cause intense pressure on productive arable lands; shortage of basic investment in market mechanisms in rural areas; and lack of land tenure regulation that hinders development of the sector.



Through this project, addressing the current baseline issues like stimulating rural economies, improving agricultural productivity, and promoting sustainable land management involves the application of resilience-building corrective strategies aimed at integrating climate change concerns into national agriculture frameworks, and managing adaptation knowledge and disseminating good practices to stimulate a sector-wide transition.

Project Activities and Expected Impacts

The proposed NAPA follow-up addresses inter-related NAPA priority measures in a coherent and programmatic way through one integrated project. It assists Mali make the transition toward climate-resilient food security through: (a) enhanced ability of small farmers and pastoralists to cope with increasing climate variability; (b) systematic integration of the risks associated with climate change, including variability into key agriculture development policies, plans, and legislation; and (c) strengthened institutional capacity to prepare and respond to looming climate change threats on food production. With its simultaneous focus on enhancing food security, promoting resilient rural household livelihoods, lowering climate risks, and facilitating access to adaptation technologies, the project brings together the crucial elements needed for demonstrating climate-proofing and fostering a paradigm shift in agricultural development in Mali.

Improved national capacities to prevent and manage the impacts of climate change on agricultural production and food security: The project raises the profile of climate risks management at the level of policy makers, technical staff, and local communities and contributes to building the necessary policy, institutional, and legal frameworks to systematically address looming threats from climate change on food production and security. This is achieved through economic assessment of the impacts of climate change on the agricultural sector and establishment of a national funding strategy for adaptation; revised national agriculture sector budgets for addressing adaptation; full training and equipment of key stakeholders with climate risks management tools, options, and practices; a Green Paper and an awareness-raising campaign aimed at policy makers.

Climate resilience of agricultural production systems and most vulnerable agropastoral communities strengthened: Larger or more sophisticated investments in upgraded agrometeorological assistance systems in partnerships with United Nations Development Programme/Bureau for Crisis Prevention and Recovery (UNDP/BCPR) to better monitor, forecast, and manage food crisis situations. Appropriate agropastoral farming systems are established in the most vulnerable agricultural areas, e.g., use of drought-tolerant crop and pastoral species, application of climate-resilient soil and water conservation techniques, improved crop and livestock management schemes. Adequate financial climate risks transfer instruments like weather insurances, community-based insurance schemes, revolving and compensation funds, employment programs and climate-resilient alternative livelihoods strategies are developed for communities at highest risk.

Linkages are made to UNDP-GEF's Adaptation Learning Mechanism (ALM) to ensure that lessons from this project reach a broadest possible audience. Knowledge materials, technical guidelines, and lessons papers are produced and disseminated to key stakeholders, as well as a national media plan and communication campaign and project Web site.

Synergies and Coordination

The project is coordinated with the following initiatives: The support project for diversification and competitiveness in the agricultural sector in the Upper Niger Valley Authority (OHVN) zone in Mali funded by the government of Mali, the African Development Bank (AfDB) and Japan; the *Irrigation Scheme Intensification Project* in the Baguinéda zone funded by the government of Mali and the Arab Fund for Economic and Social Development (AFESD); the project to support and multiply the Asawak Zebu breed in Mali, funded by the government of Mali and the Kingdom of Belgium.

Additionally, the project intends to capitalize on other initiatives, such as the Mali component of the GESFORCOM community-based forest management project, and the already completed French Global Environment Fund (FFEM) *Sorghum Agro-Biodiversity project*. During the project preparation phase, further consultations are held to ensure duplication is avoided and synergies maximized.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



MALI

Integrating Climate Resilience into Agriculture Production for Food Security in Rural Areas of Mali

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$2,400,000
Cofinancing	\$4,200,000
NAPA completion	December 2007
Inclusion in LDCF Work Program	June 2009
Expected CEO endorsement	December 2010
Expected implementation start and completion	February 2011–January 2015
GEF Agency	Food and Agriculture Organization of the United Nations (FAO)
Other executing partner	Ministry of Agriculture, Livestock and Fisheries

Mali's climate is characterized by strong interannual rainfall variability. Since 1968, there has been an enhanced recurrence of dry years and prolonged drought, which has contributed to the increased vulnerability of rural people and the deterioration of the fragile ecosystems on which they depend. Climate change projections predict that Mali will face an even hotter and drier future; by 2025 average temperatures will increase by 2.71 to 4.51 degrees Celsius, while rainfall is predicted to decrease by 8 to 10 percent. These changes in temperatures and rainfall pose a direct threat to food security in Mali's agriculture-based economy.

Mali's National Adaptation Programme of Action (NAPA) reports that the country's agropastoral sector, which accounts for 75 percent of the population, will be adversely impacted by climate change. Crop yields in Mali may decrease by 5.5 percent and forage yield may fall by 20 percent. This would affect major food crops such as millet, sorghum, rice, and maize, as well as livestock. As a result,

the proportion of the population vulnerable to food insecurity and hunger may rise as high as 68 percent. Small farmers and pastoralists are especially vulnerable because of their limited knowledge of and capacity to adapt to climate variability and change.

Problems not driven by climate change, such as unsuitable agricultural management practices and increasing population pressures leading to the expansion of agriculture into fragile ecosystems, as well as a lack of capital investment and positive incentives for sustainable development, are likely to be aggravated by climate change. Adaptation of the agriculture system is not an end in itself, but a means to address Mali's overall development objectives. A mix of both technical solutions, such as different crop and planting practices, and institutional solutions is needed to support rural communities in an integrated and effective manner.



Project Activities and Expected Impacts

The overall goal of the LDCF project in Mali is to lessen the impact of climate variability and change on vulnerable farmers and pastoral groups by lessening climate impacts on the natural resources that are critical to sustaining agriculture production and food security. The project addresses key adaptation activities in the agriculture and agropastoral sectors that are addressed in the NAPA and are closely linked with rural food security, namely: (a) adoption of improved agricultural management practices able to cope with climate change, (b) development of new varieties for crop/pasture systems adapted to climate variability, (c) rehabilitation of climate change-derived degradation, and (d) support for capacity building on effects of climate change.

The project's interventions focus on three vulnerable regions identified in the NAPA and on three different production systems: cereal, mixed crop/livestock, and a pastoral production system. The project comprises three components.

Component 1. *Piloting of improved climate-resilient agricultural practices:* This component aims to increase the long-term resilience of cropping systems and help reduce the impact of agriculture on the natural resource base. Improved soil and crop management practices are tested and adopted by small farmers as pilots, and existing stress-tolerant cultivars and species multiplied and distributed to farmers and agropastoralists, and the most promising varieties established in three different ecosystems and adapted to the most representative cropping system.

Component 2. *Capacity building and promotion of improved agricultural practices through Farmer Field Schools (FFS):* This component helps increase skills and information about climate change and the associated risks for agricultural production and food security at the local, regional, and national levels. The FFS approach, a form of adult education that was first adopted in Mali in 1998, is used to support farmers' learning through field observations. Among other things, the project trains government and farmer trainers in adaptation practices for sustainable crop and pasture production, and community-based sustainable grassland management; prepares FFS learning materials on local adaptation measures; provides

tools and trainings to 20,000 farmers and two pastoral communities to enable them to adopt more efficient soil, water, and input management practices; and develops information tools to facilitate the decision-making process of farmers through site-specific provisions of weather forecasts that improve farmers' ability to make adjustments in cropping management decisions.

Component 3. *Climate change considerations mainstreamed into agriculture sector policies and programs:* This component develops capacities for integrating interventions related to adaptation of the agricultural sector to climate change by supporting the cross-sectoral decision-making processes necessary for climate-resilient development. Agricultural issues and themes are integrated into environmental and climate change interventions. District-level policy makers, agencies, donors, and development partners (a) provide support and coordination of interventions and relevant processes to avoid overlapping activities, (b) identify gaps and opportunities to mainstream climate adaptation into agriculture sector policies, (c) mainstream adaptation practices in the agricultural biodiversity and pastoral sector and develop policy elements for pastoral communities, and (d) develop a set of good operational practices and lessons learned for enhanced adaptation to climate risk for dissemination and replication at the national level, and for supporting a shift from reactive response to proactive preparedness.

Synergies and Coordination

The LDCF project is coordinated with a number of initiatives in Mali, including the African Monsoon Multidisciplinary Analyses (AMMA); the project *Recherche Interdisciplinaire et Participative sur les Interactions entre les Ecosystems, le Climat et la Sociétés d'Afrique de l'Ouest* (RIPIECISA); the Institut de Sahel (CILSS) rehabilitation and coordination process; the *Community-Based Risk Screening-Adaptation and Livelihood project (CRISTAL)*, managed by the International Union for the Conservation of Nature (IUCN); the *Programme for Support to the Agriculture Sector in Mali (PASAM)*; the World Bank/United Nations Development Fund/GEF project Restoring Agricultural and Pastoral Productivity; and the International Fund for Agricultural Development/GEF project on community-based natural resource management and biodiversity conservation in the Inner Niger Delta.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



MAURITANIA

Reducing Vulnerability of Arid Oasian Zones to Climate Change and Variability through Improved Watershed Management

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,960,000
Cofinancing	\$4,500,000
NAPA completion	November 2004
Inclusion in LDCF Work Program	April 2009
CEO endorsement	April 2010
Implementation start and completion	January 2011–January 2015
GEF Agency	International Fund for Agricultural Development (IFAD)
Other executing partners	Ministry of Environment and Sustainable Development; Ministry of Rural Development; Ministry of Water and Sanitation

The West African climate, particularly in the Sahel, has undergone recurrent variations of significant magnitude since the early 1970s. The whole region, including Mauritania, has experienced a marked decline in rainfall since around 1968–72. Mauritania has experienced chronic drought over the course of the last 30 years, which has had negative impacts on the rural communities that have been subjected to increased water stress. Their response has been to further exploit both surface and groundwater resources with little planning. A major environmental vulnerability related to climate change is the drop of water tables, which results both from current usage practices and years of precipitation deficits. The supply of water to cities

and large towns in Mauritania is drawn from groundwater from the nearby oasian zones. Current practice is resulting in frequent deficits for human consumption and agriculture needs in these oasian zones.

Project Activities and Expected Impacts

This project's aims are twofold. It seeks to conserve water supply by creating catchment devices to promote the infiltration of runoff to replenish groundwater in the oasian zones. At the same time, the project aims to improve management of water demands by improving the hydroclimatic information needed to ensure sustainable use of a diminishing resource.



The long-term goal of the project is to improve water management in light of climate change impacts in order to improve ecological functioning and human well-being. The project addresses urgent issues through improved environmental management and shows how climate change information and improved data on water can be used to enhance resource management and decision making at several levels, including technical-, policy-, and community- level demand-side management.

The project enhances the capacity of the population for improved local water management through improved awareness and implementation of water management strategies and techniques appropriate to a changing climate. The project also aims at ensuring that the correct information and policy management systems are put in place to improve medium- and long-term planning to sustain water resources in an increasingly arid climate.

Synergies and Coordination

IFAD, its United Nations partners, and the government of Mauritania are seeking complementarities with other development partners, for example, through the joint donor intervention matrix for 2006–10 in response to the second Mauritanian Poverty Reduction Strategy Paper and related action plan. IFAD is leading the Terrafrica process in Mauritania through the preparation and implementation of a country strategic investment framework for Sustainable

Land Management (SLM). An ad-hoc SLM committee was established by law and is coordinating all SLM investment in the country, including activities that aim at mitigation and adaptation to climate change. Therefore, coordination with the IFAD/GEF-supported project *Participatory Environmental Protection and Poverty Reduction in the Oasis of Mauritania* is ensured.

With respect to capacity building, the project aims to link with the regional *Climate Change Adaptation Capacity Support* project supported by the Canadian International Development Agency (CIDA) and implemented by the AGRHYMET Regional Centre (ARC). Coordination is ensured with the World Food Programme (WFP) work in providing food security of poor rural households and mitigating vulnerability to unpredictable weather conditions through environment protection.

Coordination is also ensured with and cofinancing received from an IFAD *Support to Rural Poor to address Climate Change in Africa* program, which is under preparation and aims to reduce climate change risks and vulnerability in selected poor rural communities in Africa by developing community-based adaptation and mitigation activities through local risk management, expanded and climate-proofed options and land productivity, increased individual skills, and expanded community participation in decision making and implementation.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



NIGER

Implementing NAPA Priority Interventions to Build Resilience and Adaptive Capacity of the Agriculture Sector to Climate Change

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,960,000
Cofinancing	\$11,060,000
NAPA completion	July 2006
Inclusion in LDCF Work Program	April 2009
CEO endorsement	August 2009
Implementation start and completion	September 2009–August 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	National Council for Environment and Sustainable Development

The Sahelian eco- and agricultural systems are very sensitive to even small changes in climate and climate variability. Rainfall patterns are extremely erratic, and can cause floods one year and drought the next. The projected increase in temperature and following evapotranspiration and decrease in rainfall will further increase climate vulnerability in a society that is already heavily dependent on rainfed agriculture and pastoralism for survival. The adaptive capacity of the Nigerian farmers and pastoralists to deal with such challenges is at best marginal, and non-climate-driven problems such as maladaptive farming practices, including for example overstocking with livestock and ploughing of erodible soils, low market access due to poor or nonexistent roads, and rapidly increasing rural

populations leading to expansion of agriculture into previously marginal areas, further exacerbate the situation. Existing problems, such as periodic food shortages, unsuitable agricultural practices, and recurrent water shortages, will undoubtedly only increase, unless climate resilience strategies are integrated into development efforts in Niger.

Project Activities and Expected Impacts

The project contributes to the building of adaptive capacity to climate change in the agricultural sector of Niger. First of all, the project focuses on increasing the resilience of food production systems and food insecure communities faced with the impacts of climate change. This includes a wide spectrum of new adaptation initiatives implemented



in a selection of pilot communities. Innovative water harvesting measures are being tested for increasing crop productivity. The “Zai” methodology, for example, entails digging holes of 0.5 m diameter at intervals of 1–2 m, and filling these holes with a mixture of compost, manure, and topsoil. Rainwater runs off the bare soil surface between the holes and ultimately drains into them. In this way, each “Zai” hole becomes a biological hotspot, with greater soil water and nutrient content than the surrounding soil. Crops such as millet, sorghum, and maize are sown in the “Zai” holes, and their productivity is greatly increased relative to plants sown outside of the holes. Another initiative to be implemented is the dissemination and testing of more drought-resilient varieties of traditional crops such as millet, sorghum, and maize.

The barriers to widespread use of such crop varieties include technical capacity and financial constraints. Seeds must be bought, and poor rural farmers cannot afford this cost. The project can be instrumental in establishing mechanisms for the sustainable diffusion of drought-adapted crop varieties to vulnerable communities. The facilitation of food banks is another activity implemented to increase the climate change resilience of local food security. Food shortages often occur for a brief period at the end of the dry season in rural communities, a phenomenon that is likely to increase with climate change. Food banks are one method of supplying food during critical periods. This activity is sustainable, because once the food bank is established a self-sustaining business is generated, whereby food is bought at a discounted rate from the government, stored in the bank, and then sold to the rural communities. A final measure implemented to counter the threat of climate change-induced impacts on crop productivity is to improve water management practices.

The Niger River is currently underutilized as a source of irrigation water for several reasons. One is that rainfall patterns have been predictable and therefore reliance on more expensive alternative sources of water has not been a priority. Second, utilization of surface water resources through irrigation has been constrained due to a shortage of funds. At present, only 10 percent of the 270,000 hectares of land suitable for irrigation has been developed in Niger.

A second leg of the project focuses on increasing the institutional capacity of the agricultural sector, especially in regard to information and extension services to farmers. This includes, among other things, distributing seasonal weather forecasts and providing local advice concerning the design of water and crop management strategies. The project also supports the incorporation of adaptation to climate change issues into provincial and local development and risk management plans.

Synergies and Coordination

Niger is also one of the project countries of the United Nations Development Programme-GEF/ Small Grants Programme (SGP) Community-Based Adaptation (CBA) Programme. It is likely that many of the community-based interventions that are likely to emerge for funding through the CBA mechanism also focus on agriculture-related activities. The CBA initiative is therefore a timely complement to this LDCF project and exchanges have already commenced between GEF/SGP and coordinators of the LDCF project. Coordination and synergies are also being secured with other related projects funded through government and bilateral sources, such as the Niger government’s *Special Programme of the President*, the Canadian government’s *Fight against Poverty Fund*, and German Agency for Technical Cooperation’s *LUCOP – Fight against Poverty* project.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



RWANDA

Reducing Vulnerability to Climate Change by Establishing Early-Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in Flood-Prone Areas

LEAST DEVELOPED COUNTRIES FUND

LDCF grant	\$3,641,000
Cofinancing	\$3,400,000
NAPA completion	May 2007
Inclusion in LDCF Work Program	February 2009
Expected CEO endorsement	October 2009
Expected implementation start and completion	December 2010–December 2013
GEF Agency	United Nations Environmental Programme/United Nations Development Programme (UNEP/UNDP)
Other executing partner	Ministry of Natural Resources

Rwanda is characterized by a mountainous landscape and ecosystems particularly vulnerable to climate change. A north-south mountain chain forms part of the divide between the Nile and Congo watersheds, two of Africa's largest. The Congo basin is made up of short waterways leading to Lake Kivu, and the Nile basin covers almost all the country. Most of the rivers start from the slopes of the crest known as the Gishwati ecosystem. Its ecology is very dynamic and complex, and the lakes and rivers constantly change their size and shape according to rainfall and river flow. Rains can be very heavy, sometimes causing violent floods.

The Gishwati region is experiencing irregular and unpredictable rainfall. The analysis of climate data,

undertaken during the National Adaptation Programme of Action (NAPA) preparation and based on the Initial National Communication (INC), shows that the period between 1991 and 2000 was the driest since 1961. At the same time, excess rainfall has led to significant economic, environmental, and social damage, including population displacement. The analysis of rainy seasons shows a progressive tendency for short rainy seasons accompanied by decreases in agricultural production. Variations of standardized absolute maximum temperatures in Kigali are alarming.

Rainfall is particularly important as rain-fed agriculture dominates food and cash crop production in Rwanda;



many of the poorest and most vulnerable communities depend on rain for their livelihoods. Rainfall variability both within and between seasons is a fundamental factor that creates production uncertainty. This is a priority NAPA project due to its direct relationship to poverty reduction goals, food security, and observed climate changes. It aims at reducing both the vulnerability of the Gishwati ecosystem and the Nile-Congo watersheds, while positively affecting food security, health conditions through better nutritional status, and environmental sustainability.

Project Activities and Expected Impacts

Climate risk assessment and forecasting: The project increases coordination, collection, and analysis of data. Focus is on strengthening the current information infrastructure for sound scientific analysis of trends in climate change and its socioeconomic impacts, and thus increasing the capacity of communities and institutions to adapt. Benefits are derived from a range of innovative climate-based analytical tools and software that allow for a far greater understanding of the temporal and spatial agricultural implications of short- and long-term climatic variability and thus allow stakeholders to develop tailored climate risk management strategies.

Climate change adaptation planning and response strategies: Focus is on correcting the underdeveloped response mechanism of the Rwandese early-warning system. Improved information is provided in appropriate formats to policy makers and communities. Activities aim at promoting the use of robust science for the formulation of adaptation strategies in the present and future. An early-warning and response approach is used to increase capacity to identify, predict, and, most important, respond promptly to long-term droughts and floods and also to sudden and damaging climate events, which have begun to increase. Capacity increase is also developed for climate-resilient decision making from the national to the local levels.

Demonstrations of adaptation practices in the Nile-Congo crest watersheds and Gishwati ecosystem: Restoration of the ecosystem on which the communities' economic activities heavily depend through short-term measures to address immediate

risks, including the reversal of maladaptive practices and the application of selected agricultural techniques that contribute to improved integrated catchment management practices aimed at restoring the natural buffering capacity. Medium- to long-term measures aim to build both human resources and institutional adaptive capacities to sustain project impacts: (a) design and implementation of a capacity development program to equip communities with necessary knowledge and skills, and (b) establishment of an institutional framework at a watershed level where adaptation solutions can be negotiated among different stakeholder groups. The framework is integrated into the regional development and land-use planning.

Knowledge management, public awareness, and dissemination of lessons learned and best practices: Local and national knowledge on adaptation is developed. This component is designed to ensure that adaptation efforts demonstrated through this project can be sustained and replicated through greater public and private engagement, involvement, and knowledge on good practices. Lessons are shared through the Adaptation Learning Mechanism (ALM) Web platform.

Synergies and Coordination

The project is harmonized with the One UN pilot initiative in Rwanda, which brings the UN agencies together and covers specific outputs under the United Nations Development Assistance Framework (UNDAF) Result 4 *Management of environment, natural resources, and land is improved in a sustainable way*. This work is jointly supported by United Nations Environment Programme (UNEP) and UNDP, among other agencies, and can become another flagship case of achieving synergy effects by One UN.

The project can also identify synergies with a GEF project *Building Capacity for Sustainable Land Use and Management in Rwanda* and a UNEP managed GEF Strategic Priority on Adaptation (SPA) project *Integrating Vulnerability and Adaptation into National Development Policy and Planning in Southern and Eastern Africa*. Outputs of these projects can reinforce each other to establish an effective land management system against land degradation and climate change impacts.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



SAMOA

Integrating Climate Change Risks into the Agriculture and Health Sectors

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$2,255,000
Cofinancing	\$2,150,000
NAPA completion	December 2005
PIF clearance	May 2007
CEO approval	January 2009
Implementation start and completion	April 2009–March 2012
GEF Agency	United Nations Development Programme (UNDP)
Other executing partners	Ministry of Natural Resources and Environment; Ministry of Health, National Health Services; Ministry of Agriculture and Fisheries

As a Least Developed Country (LDC) and a Small Island Developing State (SIDS), Samoa is particularly vulnerable to the adverse effects of climate change. A recent climate risk profile identified plenty of possible impacts of changing climate in Samoa.

Flooding will result in large bodies of stagnant water, leading to increases in mosquito populations that transmit diseases, including filariasis, dengue fever, typhoid, diarrhea, as well as a number of gastrointestinal infections. Extreme rainfall events will lead to overflow of sewerage systems and the spread of pathogens, and flash flooding associated with extreme rainfall events to serious injuries and loss of life. Coastal and surface flooding will cause widespread damage to infrastructure, such as buildings, roads, and utilities, and general inundation of coastal areas. Heavy rainfall is likely to cause major damage to crops, as in February 2005, when

the supply of fresh food products decreased and contributed to higher market prices. Crops like pawpaw were almost completely wiped out. Heavy rainfall can further cause serious erosion in certain parts of the country, and loss of soil undermines the viability of plantations and other forms of subsistence agriculture and causes sedimentation in coastal waters threatening fish stocks.

Drought, on the other hand, is likely to affect access to safe drinking water and cause loss of agricultural and livestock productivity, compounded by the fact that Samoa does not have extensive irrigation networks or water storage facilities to buffer the effects of drought. Dehydration and respiratory problems can result from increased levels of particulates in the air, and heat stress associated with the rise in average daily temperatures will become more common.



Drought will also undermine the incentive for farmers to continue working their land, and thus national food security. Marine ecosystem studies have shown a correlation between increased sea surface temperatures and incidents of fish poisoning. With reef fish being a major part of the Samoan diet, there is a real threat of more cases of fish poisoning. Damaged marine ecosystems, such as coral bleaching, add pressure to the already depleted fish stocks. This will lower the availability of fish for consumption, which will cause dietary problems for those who depend on reef fish for nutrients. Offshore fish catch is also highly dependent on sea surface temperatures.

The incidence of agricultural pests and diseases will increase as a result of drought causing stress in crops and livestock, lowering their resilience to disease and pests. Strong winds associated with cyclones are predicted to result in widespread damage to crops, ruining household plantations and increasing market prices and dependence on imports. Loss of land due to sea-level rise will further reduce farming land in the coastal zone.

Project Activities and Expected Impacts

Given all potential impacts described above, the government of Samoa has recognized the need to incorporate climate risks and adaptation into the agricultural and health sectors. The objective of this project is to increase the resilience and adaptive capacity of coastal communities in Samoa to the adverse impacts of climate change on agricultural production and public health. In order to achieve adaptation benefits the project aims to:

Introduce a systematic process for capturing, analyzing, processing, and disseminating climate risk information for vulnerable sectors demonstrated in the priority development segments of food production and public health

Inform sectoral policy processes and investment decisions through tangible climate risk data, provided in an accessible way and backed up by a strong underlying climate data information system

Introduce targeted education/health promotion activities for public service providers and sectoral planners about climate change projections, their

impact on human health and livelihood security, and available short-term risk reduction and long-term climate change adaptation options

Demonstrate and analyze the benefits of crop diversification and drought- and saline-resilient crops at the community farming level, strengthening the options available to local farmers to deal with climatic uncertainties and unpredictable dynamics in local food markets

Analyze the relationship between climate trends and vector-borne, water-borne, food-borne and heat-related illnesses and thus provide a critical mass of data and knowledge for the design of more effective disease prevention programs

Enable exchange of experiences between Pacific Small Island Developing States on matters of climate change monitoring and agriculture/health sector adaptation.

The project also enhances the technical and organizational capabilities of the Samoa Meteorological Division to monitor climate trends and provide climate risk and early-warning communications to the agricultural and health sectors to help augment existing disaster risk management processes. It also improves the capacity of Samoa's public health planners and public health workers to reduce the impact of climate change on public health.

Synergies and Coordination

The project proponent is the Ministry of Natural Resources and Environment (MNRE), which has overall responsibility for climate change activities in Samoa. Collaboration potential is taken into account with UNEP and other UN agencies during the project implementation in the spirit of the ongoing UN Reform process.

Extensive stakeholder consultations have been undertaken through the NAPA Expert Working Group representing the related key sectors. The National Climate Change Country Team has also been closely involved in the development of the NAPA and subsequent activities to prepare for implementation. The team represents a strong partnership between government agencies and nongovernmental organizations and other stakeholders.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



SÃO TOMÉ AND PRÍNCIPE

São Tomé and Príncipe: Adaptation to Climate Change

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,885,750
Cofinancing	\$3,575,000
NAPA completion	November 2007
Inclusion in LDCF Work Program	August 2009
CEO endorsement	October 2010
Implementation start and completion	January 2011–December 2015
GEF Agency	The World Bank
Other executing partner	Ministry of Natural Resources, Energy and Environment

Studies conducted as part of the NAPA preparation documented that São Tomé and Príncipe has experienced the following climate-related phenomena during the last few decades: (a) temperature increases; (b) decrease in rainfall and subsequent decrease in riverflow and water supply; (c) deaths of artisanal fishermen and loss of fishing equipment because of increased fog, strong winds, and increased turbulence at sea disrupting traditional navigation and safety-at-sea practices; (d) destruction of fishing vessels along harbors and beaches because of increased storms; (e) increase in women's poverty because of loss of their husbands' lives and fishing equipment; (f) longer dry seasons leading to drought conditions that,

followed by torrential rains, lead to landslides, flooding, and groundwater contamination; (g) increasing coastal erosion leading to loss of houses and infrastructure, and isolation of local communities; and (h) decreased tourism. Climate change is likely to aggravate such long-term trends, putting additional pressure on already vulnerable Saotomean coastal communities.

Project Activities and Expected Impacts

The LDCF project tackles challenges related to the impacts of climate change on Saotomean coastal development in two main areas: coastal erosion and loss of coastal property caused by sea-level rise combined with the effects of increasing



precipitation intensity; and increased loss of life and canoes caused by extreme weather events such as storms, fog, and changes in wind patterns.

The project is structured around both direct physical interventions and capacity building. Among the more “direct” activities, for example, the project constructs shelters to function as refuges for boats during storms and thus limits the economic impact and livelihood losses associated with such events, and provides sea safety equipment, such as simple radar reflectors and life vests to artisanal fishermen, consequently reducing the amount of lives lost at sea due to climate change–induced extreme events, for example, fog, turbulence, and strong winds. Such concrete physical interventions are in turn supported, and reinforced, by broader capacity building measures, such as training fishermen in sea safety under changed climatic conditions and establishing an early-warning system disseminating

timely forecasts to coastal communities prior to extreme events.

Synergies and Coordination

The project closely interacts with the following programs currently under implementation in São Tomé and Príncipe: (a) a national support program for development of the fisheries sector; (b) a program funded by the Spanish Agency for International Cooperation for Development (AECID) supporting the national support program focusing on capacity building and market creation in the fisheries sector; (c) a partnership with the Portuguese Institute for Environment aimed at improving modeling of the weather and sea conditions in São Tomé and Príncipe; (d) Portuguese funding for Civil Protection Services; (e) European Union (EU) funding for coastal protection and protection of coastal infrastructure.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202–473–0508
Fax: 202–522–3240

August 2009
www.theGEF.org



SIERRA LEONE

Integrating Adaptation to Climate Change into Agricultural Production and Food Security

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,074,280
Cofinancing	\$2,935,000
NAPA completion	June 2008
Inclusion in LDCF Work Program	September 2008
Expected CEO endorsement	October 2009
Expected implementation start and completion	May 2011–May 2015
GEF Agency	International Fund for Agricultural Development (IFAD)
Other executing partners	Ministry of Lands, Country Planning and Environment; Ministry of Agriculture and Food Security

Sierra Leone's economy depends heavily on its natural resources. Agriculture is the largest economic sector, in 2006 contributing to approximately 46 percent of GDP and employing over 65 percent of the labor force. Rice is the main agricultural production and it is mainly cultivated for subsistence purposes.

The impacts of climate change are already tangible in the country. Indeed, Sierra Leone is experiencing climatic hazards such as seasonal drought, strong winds, thunderstorms, landslides, heat waves, floods, and changed rainfall patterns. As reported in Sierra Leone's National Adaptation Programme of Action (NAPA), poor communities have suffered the most from climate change impact, as floods destroy their crops and increased droughts cause water shortages in some areas of the country. In particular, crop production, being highly vulnerable to climatic

change, has been affected by prolonged periods of dry days even during the rainy season (July–September) and heavy rains in March that prevent farmers from burning their fields resulting in weeds expansion. As an example of predicted climate change impact on crop production, temperatures above 25 degrees Celsius are expected to retard rice production and lead to decreased yields. Other production, such as maize, millet, and cocoa, are projected to be negatively affected by climate change. Considering that food production depends entirely on subsistence farming, a decline in agricultural productivity—coupled with the increasing trend of food prices—is expected to ultimately worsen current food security problems.

Project Activities and Expected Impacts

The objective of this LDCF project is to lessen the impact of climate change on vulnerable rural groups,



as well as on natural resources critical for sustaining agricultural production and increasing food security. The project consists of three main components focused on both implementation of concrete adaptation measures to reduce the vulnerability of the country's food production, and broader-based capacity-building measures at the national and local levels.

The first component aims at improving the resilience of rice farming to climate variability, in order to ensure food security in the long term. This objective is achieved through various concrete activities, including mapping and characterization of the vulnerability of inland swamp rice production, establishing 100 hectares of climate-proofed inland rice fields in inland valley, and making rice production/yields more resilient to climate change through the adoption of climate-resilient rice varieties and more efficient soil and water management practices.

The second component aims to promote integrated Natural Resource Management (NRM) and climate-resilient irrigation practices. The NAPA of Sierra Leone emphasizes that food security problems, exacerbated by climate change, can be minimized if adequate irrigation systems are installed in the uplands and viable drainage and water control systems are implemented in the lowlands. More concretely, this includes the following activities: (a) increasing water efficiency for irrigation in the uplands, (b) promoting small-scale irrigation schemes, (c) improving drainage system and water control measures in lowland sites, and (d) training of farmer-based organizations (FBOs) on sustainable water management. In view of the likely increase in agricultural demand for irrigation water, optimization of agricultural irrigation is fundamental. Improved and more efficient irrigation schemes not only help rural farmers sustain production in periods of low rainfall, but also contribute to suppressing weed growth in rice fields. With regard to the drainage systems, it is important to address the possible impact of climate change on their capacity and resilience.

The final component focuses on capacity building and targets two different audiences: national professionals

mainly at the meteorological department with the involvement of other key stakeholders, such as policy makers, at the national level; and the general public, with particular attention to women and children. Concerning the capacity of national government professionals, training is provided to different categories of personnel such as forecasters, observers, and instrument technicians in the meteorological department. Also, recognizing that weather and climate information is critical for agriculture, 16 weather stations are being improved or established to improve the functionality of the monitoring system.

Synergies and Coordination

This intervention is closely linked to the *Rural and Agricultural Development Project (RADEP)* that the International Fund for Agricultural Development (IFAD) is currently implementing. The RADEP global objective is to overcome rural poverty in the project area by increasing the income of the target groups, improving rural household livelihoods, and strengthening the capacities of local institutions. By linking with the RADEP, coordination with relevant activities of the projects that are complementary to the latter are ensured. In particular, links are being established with: (a) the Food and Agriculture Organization (FAO)/government of Italy-supported project *Food Security through Commercialization of Agriculture (FSCA)*, which supports the establishment and strengthening of sustainable FBOs and from which both the RADEP and the IFAD/LDCF project could benefit in the area of capacity building of farmer-based organizations; (b) the second phase of the FAO/government of Germany-assisted project, *Development of a Sustainable Seed Programme* in Sierra Leone, which coordinates efforts to increase capacity for seed production and processing and widespread dissemination; (c) the *Japan International Cooperation Agency-funded Agricultural Development Project in Kambia*, which develops technical packages for rice and vegetable production; and (d) the program *Enhancing Smallholder Access to NERICA Seed for Alleviating Rural Poverty in Western and Central Africa*, implemented by the Africa Rice Centre with a grant from IFAD.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



SUDAN

Implementing NAPA Priority Interventions to Build Resilience in the Agriculture and Water Sectors to the Adverse Impacts of Climate Change

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,300,000
Cofinancing	\$3,500,000
NAPA completion	June 2007
Inclusion in LDCF Work Program	January 2008
CEO endorsement	September 2009
Implementation start and completion	November 2009–November 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Higher Council for Environment and Natural Resources (HCENR)

Sudan's Initial National Communication process established that average annual temperature will increase between 0.8–1.7 degrees Celsius by 2030 and will be accompanied by increasing rainfall variability, particularly during the rainy season. Agroclimatic zones will shift southward, rendering small-scale farmers and pastoralists living in many parts of the country increasingly unable to sustain current production levels of sorghum, millet, and fodder for livestock. The potential impact of these changes on national food security could be severe, especially for rural livelihoods of small-scale farmers and pastoralists.

These changes in temperature and rainfall patterns represent a priority threat to food security in Sudan's agriculture-based economy. Agriculture, including livestock, provides the primary means of livelihood for more than 80 percent of the population; accounts for almost all of the domestic supply of staple food, sorghum, millet, and animal production; is responsible for more than 70 percent of the national energy consumption in the form of fuel wood and other biomass sources; and is roughly 90 percent dependent on rain-fed agricultural practices.



Some of the root causes for the growing vulnerability of Sudan's farmer/pastoralist communities to climate change include ongoing practices that are not compatible with increasing climatic variability regarding crop selection, water resource management, communal rangeland management, drought preparedness, and household income generation. In addition, there is a lack of awareness, technical capacities, and knowledge to make informed decisions.

Project Activities and Expected Impacts

The major objective of the project is to implement an urgent set of measures that minimize and reverse food insecurity and enhance the adaptive capacity of small-scale farmers and pastoralists to climate change, including variability. In meeting this objective, the government of Sudan has prepared a project proposal that aims to implement key adaptation activities identified in the National Adaptation Programme of Action (NAPA) as urgent and immediate priorities, and that are intimately linked to food security, namely water resource management, rain-fed agricultural production, and rangeland productivity. Specifically, the project includes three components. The first pilots priority adaptation measures identified in the NAPA in five specific rural areas in different vulnerable agro-ecological zones across Sudan. The second aims to strengthen institutional and individual capacities to implement climate risk management responses in the agriculture sector. The third focuses on knowledge management, codification of best practices, and replication.

The priority measures that have emerged from the NAPA consultation for improving food security in the face of climate change include improved water harvesting techniques, heat-resistant plant varieties, new commercial crops, improved small-scale

irrigation techniques, wind barriers, intensification of tree planting along irrigation channels, rehabilitation of vegetation cover, and communal rangelands for enhancing livestock resilience. Village-level microfinance institutions for revolving, risk absorption, and livestock funds are also established in some of the target communities to build adaptive capacity and livelihood resilience.

Building institutional and individual capacity to implement climate change adaptation and risk management involves the implementation of activities that build capacity in federal and state institutions regarding the incorporation of short- and long-term climate change risks into ongoing and future national development planning processes. Additionally, activities should build capacity at the local community level to understand how to respond effectively to changing climatic conditions through early-warning systems and alternative production strategies responsive to the particular food security threat forecasted.

Synergies and Coordination

The adaptation activities are undertaken in close synergy with the National Strategic Plan for Sudan, which provides a framework for focusing and coordinating Sudan's development efforts over the next five years. The project also has strong resonance with two remarkable GEF regional initiatives dealing with sustainable water and land resources management in Sudan: the World Bank/United Nations Development Programme Nile Basin Initiative (NTEAP II) on the one hand, and the TerrAfrica Strategic Investment Program (SIP) on the other hand. The project establishes close links with these two programs by setting up flexible coordination and collaboration mechanisms and knowledge and information sharing, as well as joint programming whenever suitable and possible.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



TUVALU

Increasing Resilience of Coastal Areas and Community Settlements to Climate Change

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,000,000
Cofinancing	\$3,080,000
NAPA completion	May 2007
Inclusion in LDCF Work Program	August 2008
CEO endorsement	October 2009
Implementation start and completion	October 2009–October 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	Ministry of Natural Resources and Environment

Tuvalu is composed of four reef islands and five atolls, and is located in the South Pacific. Because of its location, Tuvalu is on the front lines of adaptation as it is already experiencing the impacts of climate change. Tuvalu is already experiencing a notable increase in the frequency and intensity of extreme hydrometeorological events as well as the climate change–related accelerated rise of sea level. These events have an adverse impact on the low-lying islands of Tuvalu. With a coastline that is less than 1 meter above sea level, these events erode the country's very scarce land resources and increase the salinity of groundwater lenses. The consequence is that freshwater availability and agricultural yields are decreasing.

Project Activities and Expected Impacts

The project implements effective community-based adaptation measures in coastal areas that reduce vulnerability and improve adaptive capacity to climate change and sea-level rise. The project uses demonstration measures aligned with local conditions, which encompass community-based systems for the management of protective ecosystems, sustainable use of climate-sensitive natural resources, and diversification of vulnerable livelihoods. Envisaged demonstration projects focus on opportunities for community-based afforestation, mangrove regeneration and plantation management, erosion prevention and participative protection of coastal sediment barriers, reduction of manmade stresses on coral reefs and protective



ecosystems, diversification of crops and agricultural practices, optimization of freshwater and irrigation management, and improved information flows on climate and early-warning systems.

The project also enables a strategic revision of national and subnational policies and programs to incorporate climate change risk considerations and adaptation strategies into financial decision processes, and to develop coordination and harmonization among different sectoral interventions. The project enhances the adaptive capacity of local communities to anticipate dynamic climate-related threats and protect their livelihoods, as well as improve individual, institutional, and systemic capacity at all levels of public administration to plan for and respond to climate change risks in coastal areas.

Synergies and Coordination

The project is part of the proposed *GEF-Pacific Alliance for Sustainability (G-PAS)*, which is led by the World Bank on behalf of all GEF Agencies. It complements the activities proposed by the UNDP-GEF *Pacific Adaptation to Climate Change (PACC)* and the *Integrated Water Resources Management (IWRM)* projects, and ensures that the alignment of these projects in a programmatic manner maximizes the degree of learning and replication of high-impact adaptation solutions. The PACC, through its pursuit of enhancing the long-term resilience of key economic sectors, is a holistic framework for a regionally coordinated and nationally executed strategic program on addressing climate change adaptation. The key focus on PACC interventions in Tuvalu is on the expansion of rainwater storage capacity, which is an

adaptation option complementary to the bundle of community-based adaptation (CBA) activities selected and demonstrated through the proposed project. While the G-PAS technically seeks to increase the efficiency and effectiveness of GEF Trust Fund support to Pacific Island Countries (PICs), this project provides a complementary operational mechanism for a regional partnership with national-level activities that are anchored in and led by a Pacific Island Country. Through this programmatic setup, LDCF, SCCF, and funding by the GEF Trust Fund play a catalytic role in leveraging national-level investments to meet the additional costs of climate change adaptation in Tuvalu.

UNDP also ensures exchange of knowledge with other CBA projects, most notably the GEF Strategic Priority on Adaptation (SPA)-funded CBA Programme and the LDCF-funded project *Community-Based Adaptation through Coastal Afforestation in Bangladesh*. CBA demonstrates a range of community-based adaptation options at the interface between ecosystem management and livelihood protection in 10 different pilot countries, whereas the LDCF project in Bangladesh focuses on livelihood diversification and participatory greenbelt management in low-lying, flood-prone communities. Together with the proposed project, these experiences deliver a critical mass of knowledge about CBA in coastal zones, which enables documentation of livelihood-based and low-cost alternatives to large-scale infrastructure projects that have limited chance for short-term replication. Channeling of this knowledge through the Adaptation Learning Mechanism (ALM) platform enables exchange of project experiences with governments around the globe.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



VANUATU

Increasing Resilience to Climate Change and Natural Hazards

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,000,000
Cofinancing	\$3,210,000
NAPA completion	December 2007
Inclusion in LDCF Work Program	November 2008
CEO endorsement	November 2009
Implementation start and completion	February 2010–December 2014
GEF Agency	The World Bank
Other executing partner	Vanuatu Meteorological Service

Vanuatu comprises about 80 islands with a land area of 12,336 sq. km spread over 1,300 km from north to south in the western Pacific Ocean. It is located in the “ring of fire” and the “cyclone belt” of the Pacific. Its archipelagic characteristics, together with limited financial and technical capacity, make it extremely vulnerable to a range of natural hazards. Since 1939, Vanuatu has experienced 124 tropical cyclones, 45 of which carried hurricane-force winds. Cyclones typically occur during the warmer months between November and April, but Cyclone Rita in May 1991 and Cyclone Gina in June 2002 occurred out of season.

Vanuatu is also affected by the cycles of El Niño, which brings changes in precipitation patterns associated with increased mean temperatures leading to drought, and La Niña, which brings increased rainfall. Of the 111 countries on the Commonwealth Vulnerability Index (CVI), Vanuatu is ranked the most vulnerable. Climate scenario models and historical trends suggest warmer and drier conditions in the future in much of Vanuatu, although some parts of the country may receive more rainfall due to the greater frequency of tropical depressions and storms likely to develop around the islands. Cyclones are also likely to become more intense and frequent. El Niño-type conditions associated with prolonged dry seasons may become more frequent.

The country’s vulnerability is further heightened by a number of socioeconomic factors. The economic base is narrow, comprising a large subsistence agriculture sector and a small monetized sector. Some 65 percent of GDP comes from small-scale agriculture, with the balance coming from fishing, offshore financial services, and tourism, which is becoming the main foreign exchange earner. The domestic market for agricultural products is limited. About 80 percent of the population is rural and depends on agriculture, although productivity is quite low.

Climate change is likely to impact all sectors, especially agriculture, water, coastal and marine resources, infrastructure, and tourism. Agriculture is entirely rain-fed and is susceptible to changes in rainfall distribution. Intense and prolonged rainfall could damage seedlings, result in greater run-off and soil erosion, and encourage conditions that promote pests and diseases. Drought combined with higher temperatures could increase thermal stress on plants. Projected increases in sea surface temperatures and increased ocean acidification are likely to put pressures on the marine food chain, particularly reef systems and other calcifying organisms such as planktons. Livelihoods associated with these marine food chains will be negatively impacted. The incidence of vector-borne diseases such as malaria and dengue fever,



and water-borne diseases such as dysentery and diarrhea, are likely to increase and shift in distribution.

Project Activities and Expected Impacts

There is a high level of awareness among key stakeholders in Vanuatu of the above-described risks. Vanuatu is the only Pacific Island Country to have completed both a National Adaptation Programme of Action (NAPA) and a National Action Plan (NAP) for Disaster Risk Reduction (DRR). A recent Global Fund for Disaster Risk Reduction (GFDRR) stock-taking exercise, built on the NAPA and the NAP, also identified the relevance of the links among climate change adaptation, and disaster risk reduction for the Pacific Islands. Furthermore, the government is committed to following through on the Hyogo Framework to integrate the management of climate change adaptation and disaster risk reduction. Additionally, there is a commitment to merge the National Advisory Committee on Climate Change (NACCC) and the National Disaster Management Committee (NDMC). The Vanuatu LDCF project is designed to be consistent with the strategies above and to (a) address the main climate and weather related hazards facing Vanuatu; (b) address immediate priorities already identified through the NAPA, NAP, and other consultation processes, such as the GFDRR stock-take; (c) support the country's sustainable development priorities; (d) take account of the existing and potential capacity for implementation; and (e) increase the likelihood of achieving results.

The overarching goal of this project, which is cofinanced by the European Commission (EC), is to mainstream climate change adaptation and climate-related disaster risk reduction into core aspects of the Vanuatu economy and resource management systems through the following components:

Component 1. Mainstreaming climate change adaptation (CCA) and DRR at national, provincial, and community levels: Activities include incorporating CCA and DRR into policy, planning, fiscal, and budgetary processes at all three levels; increasing awareness and education to foster links among national, provincial, and community levels of governance on CCA and DRR; strengthening the integration of CCA and DRR at the institutional level; and improving organizational arrangements.

Component 2. Strengthening capacity in data analysis, mapping, and vulnerability assessments: The main activities include strengthening and applying capacity in the capture and analysis of geophysical, hydrological, and climate-related data; hazard risk mapping; climate forecasting and dissemination; and vulnerability assessments.

Component 3. Implementing climate resilience measures in targeted sectors: The indicative list of actions is consistent with addressing the "ridge to reef" characteristics of small island ecology: linking to the threatened livelihoods of vulnerable communities, scaling up successful practices, and highlighting the importance of the issues to the economy and the likelihood of success. The activities include enhanced resilience of watersheds through integrated water resource management; increasing adaptive capacity of coastal communities, especially related to water security; building capacity for mainstreaming DRR and CCA in land-use policies, plans, and regulations in support of the Ministry of Lands; enhancing climate and disaster risk management in the tourism sector by preparing hazard risk profiles for a range of existing tourism facilities in vulnerable areas, developing guidelines for the tourism sector for future infrastructure and facilities development, such as designation of tourism development zones and building codes; and demonstrating the benefits of DRR and CCA through selected activities.

The sectoral activities are supported by cross-cutting activities from Components 1 and 2. Specific sites for implementation are carefully selected based on risk profiles, with the expectation of scaling up and replication to other parts of the country in a future program.

Synergies and Coordination

Several project activities are closely linked to an agriculture project to be supported by the European Commission (EC), which encourages increased climate resiliency. The proposed project is included in the regional GEF program *Pacific Alliance for Sustainability (GEF-PAS)*. Vanuatu is currently implementing several projects that aim to reduce its vulnerability to climate change while contributing to the country's wider sustainable development goals. The LDCF project is closely coordinated with these activities to ensure optimization of synergies and avoidance of duplication. These projects include for example: *Pacific Islands Global Climate Observing System (PIGCOS)*; promotion of renewable energy through the implementation of the *Rural Electrification Master Plan (REMP)*; the promotion of *Renewable Energy Efficiency and Greenhouse Gas Abatement*; *Pacific Island Renewable Energy Project (PIREP)*; the *National Implementation Plan (NIP) for Persistent Organic Pollutants (POPs)*; the *Vanuatu Strategic Action Program for International Waters Project (IWP)*; Disaster Risk Reduction (DRR) and Disaster Management (DM) through the National Disaster Management Office (NDMO) with an associated National Disaster Plan. The project is particularly closely coordinated with the United Nations Development Programme (UNDP)-GEF regional project *Building Resilience to Climate Change* under the GEF-PAS.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



YEMEN

Integrated Coastal Zone Management in Yemen

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$4,950,000
Cofinancing	\$10,000,000
NAPA completion	April 2009
Inclusion in LDCF Work Program	June 2009
Expected CEO endorsement	May 2010
Expected implementation start and completion	September 2010–September 2016
GEF Agency	The World Bank
Other executing partners	Ministry of Fish Wealth; Environment Protection Authority (EPA), Ministry of Water and Environment

The coastal zone of Yemen holds a rich variety of natural habitats and species, and is a natural hub for development in terms of fisheries, coastal settlements, coastal infrastructure, tourism, and new development initiatives. If properly managed, these coastal and marine resources could become a major source of employment and income for Yemen's rural poor. Fisheries, for example, provide both employment and affordable food, especially in areas where cereal growth and livestock grazing are limited by severe lack of water and land erosion.

The vast majority of Yemen's poor live in rural areas. This segment of the population, particularly poor coastal communities, is most threatened by climate change variability. Predicted sea-level rise will increase coastal flooding and erosion, increase saltwater intrusion into surface and groundwater systems, raise

the cost of coastal protection, and lead to the loss of wetlands and other coastal ecosystems. Other projected climate variability for Yemen includes increased temperature, reduced annual rainfall, and increased frequency of high-intensity rainfall and storm surges. Extreme weather events, such as the October 2008 level-three tropical storm that inflicted major ecological and economic damage, are becoming more frequent in Yemen and reveal the extreme vulnerability of Yemen's coastal zone to climate change impacts.

Project Activities and Expected Impacts

It is critical that development in Yemen occur within a broader sustainable development policy framework and harmonize with climate considerations to make it climate resilient. The LDCF project focuses on coastal zone management, a key priority identified in Yemen's National Adaptation



Programme of Action (NAPA). By addressing urgent on-the-ground activities, the project seeks to reduce the vulnerability of Yemen's coastal and marine resources to climate change. Two pilot sites representing the major coastlines in Yemen, one along the Gulf of Aden and the other along the Red Sea, explore ways to increase resilience to climate change impacts through implementation of an Integrated Coastal Zone Management (ICZM) approach.

The project is made up of three interrelated components:

Component 1. Institutionalization of an ICMZ approach and climate change adaptation in selected governorates: A climate change gap analysis for ICZM is completed, and policy and institutional frameworks are strengthened through improved intersectoral coordination among national and local agencies for the management of coastal zones appropriate for climate-resilient development.

Component 2. Knowledge management through data collection and analysis through downscaled climate modeling, to inform climate-resilient development: The project aims to facilitate informed policy and decision making through the provision of value-added information and databases, including downscaled predictive regional and global climate change models. It ensures, through close ties with Component 1, that updated information is available for decision makers. An ICZM database is established, and climate change modeling, focusing on the covered coastal zones, is introduced to, and ultimately adopted by, local scientists.

Component 3. Piloting climate change adaptation into ICZM at two pilot sites: At the two pilot sites, Bir Ali-Burum, along the Gulf of Aden, and Kamaran-Luhaiyah, along the Red Sea, the project explores different types of optimum practices within the framework of ICZM.

In Bir Ali, economic activities include fishing, tourism, and mineral mining. It is located close to the port city of Al-Mukalla, which is covered by the Yemen Free Zones Initiative and is slated for tourism development. Given its relatively diverse economy, this site offers an

ideal opportunity to apply a coastal zoning approach, including balancing needs from different sectors. Bir Ali also presents an excellent site to explore value-added fishing practice and fishing waste processing, revising infrastructure construction codes to make new and reconstructed infrastructure flood and climate change proofed, as well as exploring retention of flood water by strengthening the water retention function of wetlands and other local practices in the area.

Kamaran-Luhaiyah represents a different type of coastal zone, in terms of both development and climate change adaptation. While the mangroves on Kamaran Island are intact and part of a protected area, the mangroves at Luhaiyah, on the mainland, are subject to ongoing development pressures. With rising sea temperatures and levels, Yemen will face potential losses of significant coastal ecosystems such as sea grasses, reefs, mangroves, and estuaries. Kamaran-Luhaiyah thus provides an opportunity for Yemen to explore a coastal management approach focusing more on biological and ecological development aspects, as well as nature-based adaptation measures.

Collectively, these two pilots showcase the value of climate-resilient-based ICZM along these vulnerable coastlines and serve as models for good practices and lessons learned to other parts of Yemen.

Synergies and Coordination

The LCDF project is coordinated with an International Development Association (IDA)-funded World Bank project on fisheries resource management and conservation. It also works cooperatively with the proposed Regional Red Sea project targeting coordination at the regional level. Additionally, the project links with European Union activities on fisheries information management.

This project also benefits from critical climate modeling work done through ongoing analytical work led by the World Bank, with support from the Netherlands, Norway, and Japan. A recent initiative of the multidonor South-South Experience Exchange Trust Fund called Yemen and China Knowledge Sharing on Systematic Management of Coastal and Marine Areas in Yemen is also expected to bring practical inputs to the project preparation.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org



ZAMBIA

Adaptation to the Effects of Drought and Climate Change in Agro-Ecological Zones 1 and 2 in Zambia

LEAST DEVELOPED COUNTRIES FUND	
LDCF grant	\$3,905,000
Cofinancing	\$7,100,000
NAPA completion	October 2007
Inclusion in LDCF Work Program	September 2008
Expected CEO endorsement	October 2009
Expected implementation start and completion	October 2009–October 2013
GEF Agency	United Nations Development Programme (UNDP)
Other executing partner	N/A

Zambia is already dealing with the early impacts of climate change. Since the late 1980s, there has been a tendency for the later onset and earlier withdrawal of rains, as well as more frequent droughts. In the last seven years of this decade, Zambia has had droughts in the rainy seasons of 2000–02 and 2004–05. Floods are becoming more widespread too: over half of Zambia's districts were affected in the last few years (2005–07), some for the first time in history. The impacts of these droughts and floods have been severe: crop failure, outbreaks of human and animal diseases, displacement of human populations, and destruction of property and infrastructure. In 2004–05 and 2006–07, the affected population sizes were 1.2 and 1.4 million people, respectively.

With very little infrastructure for water collection, Zambia is overwhelmingly dependent on rainfall. Water needs are met through boreholes and wells where available, or alternatively, rivers. Less than 5

percent of arable land is under irrigation. Climate change projections outlined in the National Adaptation Programme of Action (NAPA) point to an increase in temperature and a change in patterns of rainfall, leading to prolonged droughts and localized flooding. Experience shows that key crop varieties, such as maize, would not mature due to the shortening of the growing season in the southernmost part of the country, undermining food security in the region. Assessments of the economic costs of climate change on agriculture in Zambia have indicated that future climatic conditions in the southern regions will cause strong water deficits at critical periods of the cropping calendars, resulting in severe yield decreases for specific crops such as maize.

The NAPA has emphasized that, because of the shortening of the rainy season and higher seasonal temperatures, areas suitable for staple crops such as maize are likely to fall by more than 80 percent.



Climate change is superimposed on unsustainable land-use practices such as forest clearing for agriculture and charcoal production, which, combined with poor livestock management systems, have caused severe land degradation. Temperature increases are also likely to degrade the quality of rangeland for cattle, thereby leading to reduced productivity of cattle, which provides the main source of livelihood and draught power in many of the southernmost provinces.

Project Activities and Expected Impacts

This LDCF project supports climate-resilient water management and agricultural practices, primarily focused on the very vulnerable southern regions. The project's basic starting point is to improve the capacity to supply and use climate risk information for seasonal climate risk management. An early-warning system is already in place to communicate climate risk information to the Ministry of Agriculture, but has two key weaknesses: outreach to farmers, water managers, extension officers, and other relevant stakeholders, including packaging the information in an accessible format, and the links between the Ministry of Agriculture and the district authorities.

The project addresses each of these barriers and works to improve the capacity to conduct and apply climate risk assessments to planning processes through the following activities:

1. Working with the Meteorological Service, Ministry of Agriculture, and other relevant government ministries and research institutions to improve seasonal weather forecasts in order to reach a satisfactory level of predictive skill for application by decision makers, government planners, and farmers
2. Training farmers, agricultural planners, and water managers to use climate information in water and land management practices
3. Adapting early warning systems so that they communicate climate risk information effectively to user groups
4. Conducting an economic impact assessment of the adaptation value of using climate risk information to adapt agricultural planning. Building on this platform of improvement in the quality of climate information disseminated and packaged to relevant stakeholders, the project implements local adaptation pilots in the agriculture and water management sectors, including, among others, technologies to capture and store

rainfall, soil protection techniques, water conservation techniques, and test planting of climate-resilient varieties. The pilots demonstrate the cost-effectiveness of different adaptation options, and subsequently measure yields, income changes, transaction costs, and acceptability by farmers, with a view to making the case for planning, policy, and budgetary adjustments.

Additionally, the demonstration pilots are set up to test adaptation "hypotheses" agreed by stakeholders during the project preparation phase; for example, early-maturing crop varieties is a cost-effective adaptation; appropriate agricultural water management improves yields of traditional crop varieties; integrated land management seeking to avoid cultivation, deforestation, and construction along river banks is an effective adaptation measure against flooding; and keeping sufficient food stocks is an effective tool to mitigate the impacts of poor harvest years.

Using the outputs above, the final leg of the project focuses on constructing a case for adjustments to the most influential national strategies and policies. A central part of this effort is based on information on the economic value of adaptation investments. The project develops, therefore, a detailed proposal on the government regulatory and fiscal support needed to scale up adaptation interventions. National dialogues are then organized to debate the project findings. Building on the existing national efforts, the project contributes to building the capacity for documenting lessons learned and the establishment of a mechanism for replication, and initiates a policy dialogue for formulation and review of policy and legal frameworks for adaptation initiatives.

Synergies and Coordination

The project interventions are attached to, and seek synergy with, many existing agricultural sector programs already under implementation in Zambia that do not yet take into consideration the impacts of climate change on the success of their outcomes. This assures that the LDCF activities, while relatively limited in scope and scale, have a wide impact across the agriculture and water management sectors through learning, mainstreaming, and scaling up of successful pilot adaptation measures. Coordination and synergies are therefore being pursued with specific programs and projects currently being implemented in the following sectors: irrigation development, agricultural infrastructure, livestock development and productivity, agricultural technology development and dissemination, fertilizer support, and conservation tillage and moisture conservation.

For More Information

Global Environment Facility
1818 H Street NW
Washington DC 20433 USA

Tel: 202-473-0508
Fax: 202-522-3240

August 2009
www.theGEF.org

