

# EFFORTS OF THE LEAST DEVELOPED COUNTRIES IN IMPLEMENTING ADAPTATION PROJECTS

under the national adaptation programmes of action, national adaptation plans and related programmes through the financial mechanism of the Convention and the Paris Agreement



**United Nations**  
Framework Convention on  
Climate Change

**LEAST DEVELOPED  
COUNTRIES  
EXPERT GROUP**

Synthesis report in the context of the recognition of the adaptation efforts of developing country Parties (Article 7, para 14(a), of the Paris Agreement, and decision 11/CMA.1, para. 13)

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# TABLE OF CONTENTS

<b>ABBREVIATIONS AND ACRONYMS</b>	<b>5</b>
<b>1. EXECUTIVE SUMMARY</b>	<b>6</b>
<b>2. INTRODUCTION</b>	<b>8</b>
2.1 Mandate	8
2.2 Scope	8
2.3 Sources of information	9
<b>3. SUPPORT PROVISIONS FOR THE LEAST DEVELOPED COUNTRIES FOR ADAPTATION UNDER THE CONVENTION AND THE PARIS AGREEMENT</b>	<b>10</b>
3.1 Adaptation plans and policies	10
3.2 Funding	11
3.3 Technical support	13
<b>4. APPROACHES IN IMPLEMENTING ADAPTATION IN THE LEAST DEVELOPED COUNTRIES</b>	<b>15</b>
4.1 Response to specific hazards	15
4.1.1 Droughts	15
4.1.2 Floods	19
4.1.3 Sea level rise	22
4.2 Reducing vulnerability and building resilience in key economic systems	25
4.2.1 Agriculture and food security	25
4.2.2 Water security	29
4.2.3 Human health	31
4.2.4 Coastal zone resilience	34
4.2.5 Infrastructure	37
4.2.6 Resilience of natural ecosystems	39
4.3 Early warning systems and disaster risk management	45
4.4 Gender, youth, and social inclusion	48
4.5 Means of implementation	50
4.6 Monitoring and evaluation systems	52
<b>5. LESSONS LEARNED IN IMPLEMENTATING ADAPTATION PROJECTS</b>	<b>54</b>
<b>6. CONCLUSION</b>	<b>58</b>
<b>7. BIBLIOGRAPHY</b>	<b>60</b>
<b>8. ANNEX 1</b>	<b>62</b>





## ABBREVIATIONS AND ACRONYMS

<b>AC</b>	Adaptation Committee
<b>CMA</b>	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
<b>COP</b>	Conference of the Parties
<b>COVID-19</b>	Coronavirus disease 2019
<b>DRR</b>	Disaster risk reduction
<b>EWS</b>	early warning systems
<b>FAO</b>	Food and Agriculture Organization
<b>FFEWS</b>	famine and flood early warning system(s)
<b>GCF</b>	Green Climate Fund
<b>GEF</b>	Global Environment Facility
<b>GEF IEO</b>	GEF Independent Evaluation Office
<b>GHG</b>	Greenhouse gases
<b>GIS</b>	geographic information system
<b>GLOF</b>	glacial lake outburst flood
<b>GOTG</b>	the Government of the Gambia
<b>IPCC</b>	The Intergovernmental Panel on Climate Change
<b>LDC(s)</b>	least developed country/countries
<b>LDCF</b>	Least Developed Countries Fund
<b>LEG</b>	Least Developed Countries Expert Group
<b>MHEWS</b>	multi-hazard early warning system(s)
<b>NAP</b>	national adaptation plan
<b>NAPA</b>	national adaptation programmes of action
<b>ODA</b>	official development assistance
<b>PIF</b>	Project Implementation Form
<b>PIR</b>	Project Implementation Report
<b>SIDS</b>	Small island developing State(s)
<b>UNDRR</b>	United Nations Office for Disaster Risk Reduction
<b>UNEP</b>	United Nations Environment Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>UNSD</b>	United Nations Statistics Division
<b>WASH</b>	water, sanitation, and hygiene
<b>WHO</b>	World Health Organization
<b>WMO</b>	World Meteorological Organization

## 1. | EXECUTIVE SUMMARY

The LDCs are the world's most vulnerable countries to climate change, exhibiting poor human development indicators and low rates of economic growth, and economies that are critically pegged to climate-sensitive sectors. They are marked by high structural vulnerability to exogenous economic and environmental shocks and when hit, are among the least likely to recover. At the same time, the rate and magnitude of climate change impacts are rapidly evolving beyond those resulting from natural climate variability, as demonstrated by more frequent and severe events, such as rising sea levels, extreme temperatures, persistent droughts, and severe floods. These extreme weather and climate events exert long-term human, environmental, cultural, and economic losses and damages in the LDCs, that are not sufficiently prepared to absorb or avert climate and disaster shocks and recover from their adverse effects.



Nevertheless, many advances in climate change adaptation have been made in the LDCs over the past twenty years. Through the NAPAs, every LDC has implemented several adaptation projects with funding from the LDCF to address their urgent and immediate adaptation needs arising from climate change impacts. The projects typically fall within two broad categories of addressing climate hazards on the one hand and building resilience in key socio-economic sectors and systems against climate change impacts on the other. Key climate hazards addressed included droughts, floods, and sea level rise for which many countries implemented ecosystem and community-based adaptation actions such as low-cost water conservation and irrigation technologies, rehabilitation and monitoring of existing water infrastructures, restoration of wetland ecosystems, development of early warning systems, sustainable coastal zone protection, community-based training and awareness, and comprehensive vulnerability mapping. These actions were also applied in building the resilience of key systems and sectors of which among the prominent ones were agriculture and food security, water resources, early warning systems, infrastructure, forestry, natural ecosystems, coastal systems, human health and tourism. The projects also included strengthening gender considerations, youth and social inclusion, as well as enhancing overall capacity for adaptation planning, implementation, monitoring and evaluation.

Through the adaptation projects implemented by the LDCs, some achievements have been made in reducing vulnerability, building resilience, and enhancing adaptive capacity. Examples of these achievements include land and ecosystem restoration, enhanced local food production, improved access to water, cyclone and flood early warning systems, integrating climate change adaptation into sectoral policies and plans, strengthened capacity across different livelihood and economic disciplines, and applying a systems-thinking approach to achieve sustainable development. In addition, profitable income-generating and alternative livelihoods activities were established, consequently ensuring sustainability of the outcomes of the adaptation projects. There was also an observed increase in the number of projects performing gender analyses, as well as gender mainstreaming plans, and integrating gender in results frameworks. The projects also motivated the creation of subsequent projects to scale up adaptation. Key themes identified that are common and

critical across the LDCs and demonstrate the potential for replication and scale-up are adaptation in agriculture, water resources, human health, infrastructure, natural ecosystems, early warning systems, climate risk data and assessments.

Numerous lessons have emerged from the design and implementation of adaptation projects in the LDCs. For instance, factoring a country's socioeconomic and political context, and local knowledge in the project design was a major component that affected the effectiveness and sustainability of outcomes. Income-generating and alternative livelihood activities have significantly contributed towards sustainability of projects. Systems thinking between climate and socioeconomic priorities and goals increases sustainability. Given the limited human and institutional capacities to address complex technical issues in LDCs, integrating capacity development into the project design stage is a priority. In addition, effective horizontal and vertical coordination reduces transactional costs and synergizes implementation efforts across climate-sensitive sectors and at all levels of governance.

There were also challenges faced in project implementation that would help informing further efforts. For instance, fragile contexts adversely affect the timely delivery of project outputs, positive outcomes, and sustainability of interventions. While NAPAs were responsive to the urgent and immediate needs of the LDCs, they did not have the financial and programmatic framework to address future climate risks based on long-term planning horizons, thereby resulting in the LDCs largely implementing pilot projects and projects with limited geographical scope. Nonetheless, the LDCs have laid the foundation for continuing work in addressing and scaling up adaptation in their countries. The efforts continue to evolve and are transitioning towards medium and long-term adaptation that are tied to national development planning following the commencement of the process to formulate and implement NAPs since 2010.

This synthesis report provides evidence of the efforts of the LDCs in implementing adaptation over the past twenty years. It undertakes a systematic review of adaptation actions implemented by the LDCs by means of secondary research and critical analysis. It targets the projects financed under the LDCF, using all available project documents from the GEF website including PIFs, PIRs, and/or terminal evaluation reports for completed projects or programmes approved for implementation prior to 2016. It presents the approaches undertaken by the LDCs to address specific climate hazards and to build resilience in key economic systems. It identifies trends and key lessons learned to inform further implementation of adaptation in the LDCs and other vulnerable countries.

## 2. | INTRODUCTION

### 2.1. Mandate

Within the context of recognizing the adaptation efforts of developing country Parties (Article 7, para 14(a), of the Paris Agreement), the CMA, in its decision 11/CMA.1, requested the secretariat, under the guidance of the AC and the LEG and in collaboration with relevant stakeholders, to prepare synthesis reports every two years, starting in 2020, on specific adaptation themes, focusing on relevant lessons learned and good practices in developing country Parties. This synthesis report, the second in the series, is focused on the “Efforts of the least developed countries in implementing adaptation projects under the national adaptation programmes of action, national adaptation plans and related programmes through the financial mechanism of the Convention and the Paris Agreement”.

### 2.2. Scope

This report considers adaptation projects implemented by the LDCs based on their NAPAs (primarily) and other available instruments. These projects were predominantly funded through the LDCF. Notwithstanding their critical importance and contribution to adaptation achievements in the LDCs, the report does not include the consideration of projects implemented through other channels, such as domestic and bilateral resources. In drawing lessons, the report also provides linkages on the adaptation priorities contained in the NAPAs and the potential to further strengthen implementation approaches in subsequent adaptation actions.

This report is not meant to be exhaustive, but it rather highlights the achievements made by the LDCs in implementing adaptation over the course of the last 20 years. The data collection and analysis of adaptation projects implemented in the LDCs provides a general overview of and trends in key hazards and economic systems within the LDCs. For the purposes of analysing different types of hazards and their specific impacts and response needs, this report addresses them separately. Nevertheless, the importance of a multi-hazard approach cannot be stressed enough to tackle the complex interactions across different economic systems to reduce transaction costs and realize the co-benefits of coherence in an increasingly interconnected world.

While the analysis focuses on the projects implemented from the NAPAs, there are several instruments and programmes that were implemented in the LDCs that would contribute to the overall efforts. For instance, many of the LDCs were supported to prepare technology needs assessments which in turn helped articulate the adaptation technologies relevant to the implementation of the adaptation actions. Some of the LDCs also implemented adaptation actions that helped build capacity and scale up efforts with support from different programmes such as Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED), the European Union Global Climate Change Alliance (GCCA), and the Climate Investment Funds Pilot Programme for Climate Resilience (PPCR).



## 2.3. Sources of information

This report is based on information from all available project documents from the GEF website<sup>1</sup> including PIFs, PIRs, and/or terminal evaluation reports for completed projects or programmes approved for implementation prior to 2016. For the purpose of the analysis, all approved projects that had likely reached a project management life cycle of at least seven years were included to ensure a representative sample. The list of projects considered in the analysis is contained in annex 1.

Other relevant documentation to provide nuanced analysis were used, such as the *GEF Progress Report on the Least Developed Countries Fund and the Special Climate Change Fund* (GEF, 2021, 2022), the *GEF Strategic Country Cluster Evaluation of the Least Developed Countries* (GEO IEO, 2022), and the *Progress in the Process to Formulate and Implement National Adaptation Plans* (UNFCCC, 2022).

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1 | <https://www.thegef.org/projects-operations/database>.



### 3. SUPPORT PROVISIONS FOR THE LEAST DEVELOPED COUNTRIES FOR ADAPTATION UNDER THE CONVENTION AND THE PARIS AGREEMENT

#### 3.1. Adaptation plans and policies

The NAPAs were established to support LDCs in addressing the urgent and immediate adaptation needs to the impacts of climate change. The LDCF was initiated to finance the preparation and implementation of the NAPAs in view of the vulnerability of the LDCs. The NAPAs follow a multi-disciplinary process through which the LDCs identify priority climate adaptation actions that respond to their urgent and immediate needs. The NAPAs followed a flexible, community-driven, action-oriented, country-led process. As of March 31, 2021, 51 countries (of which five have since graduated from the LDC category) had accessed around USD 12.20 million in support of the preparation of their NAPAs (GEF, 2022). Climate-related hazards covered under the NAPAs include drought, floods, sea level rise, landslides, GLOF, land and forest degradation, tropical cyclones/typhoons/hurricanes, hailstorms, sea level rise, salinization, storm surges, wildfire, raising sea surface temperatures, shift of seasons, shifting precipitation patterns, heavy rainfall, heat waves, increasing temperatures, ocean acidification desertification, and loss of biodiversity. Priority sectors and areas addressed in the NAPAs comprised of agriculture and food security, water security, coastal zones, ecosystem services, forestry, fisheries, settlements, infrastructure, renewable energy, tourism, health, early warning, and disaster risk management.



All LDCs produced a NAPA and have implemented several of the priorities identified in them

The process to formulate and implement NAPs was established in 2010 to enable developing country Parties to identify medium- and long-term adaptation needs, and to develop and implement strategies and programmes to address those needs. The formulation and implementation of NAPs is the main instrument to ensure successful adaptation at the national and global levels. As of December 2022, a total of 42 developing countries, 17 of which are LDCs, had submitted their NAPs. Of the 154 developing country Parties, 139 had undertaken at least one activity related to the process to formulate and implement NAPs, 113 had submitted 127 proposals (42 of which were submitted by the LDCs) to access GCF financing under its Readiness and Preparatory Support Programme. Furthermore, 29 of the 42 funding proposals submitted by the LDCs, had been approved by September 2022, 24 of which were already receiving disbursement. All submitted NAPs covered a range of key systems in the sectors of agriculture, cities, settlements, infrastructure, land use and spatial planning, health, water resources, ecosystem services, forestry, fisheries, coastal zones, and DRR approaches. A few NAPs identified tourism, urban areas, mining, and industry among adaptation priorities. In effect, the range of technical support to formulate and implement NAPs continues to evolve as the number of developing country Parties that are submitting their NAPs increases along with progress across all activities (UNFCCC, 2022).





## 3.2. Funding

The LDCF was established by the COP in 2001 and is managed by the GEF. Initially mandated to finance the preparation and implementation of NAPAs as well as other components of the LDC work programme, it has been tasked, in 2011, to also provide resources to assist LDCs in activities to enable the formulation and implementation of NAPAs. The LDCF targets sectors that are critical to national development and livelihoods such as water, agriculture and food security, health, disaster risk management and prevention, and infrastructure. As of 31 December 2022, all the LDCs had successfully completed and submitted their NAPAs and had implemented one or more NAPA projects through the LDCF. The LDCF had financed over 310 projects and 53 enabling activities with approximately US 1.7 billion in grants. Furthermore, 61 medium- and full-sized projects in 48 LDCs, accounting for US 436 million, were approved in the seventh replenishment cycle of the GEF (July 2018 to June 2022).

The Adaptation Fund was established by the COP in 2001 to finance concrete adaptation projects and programmes in developing country Parties to the Kyoto Protocol and particularly vulnerable to the adverse effects of climate change. According to the Fund's strategic policies and guidelines, particularly vulnerable Parties include low-lying and other small island countries, countries with low-lying coastal, arid and semi-arid areas or areas liable to floods, drought and desertification, and developing countries with fragile mountainous ecosystems (Adaptation Fund, 2021a). Over the course

of the last two decades, the Adaptation Fund secured USD 923.5 million in financing for projects and programmes across an estimated 100 countries, 15 of which are SIDS and 30 LDCs (Adaptation Fund, 2021b). It has assisted around 36 million beneficiaries and enabled countries to access additional financing as well as project development support across accredited national implementing agencies.

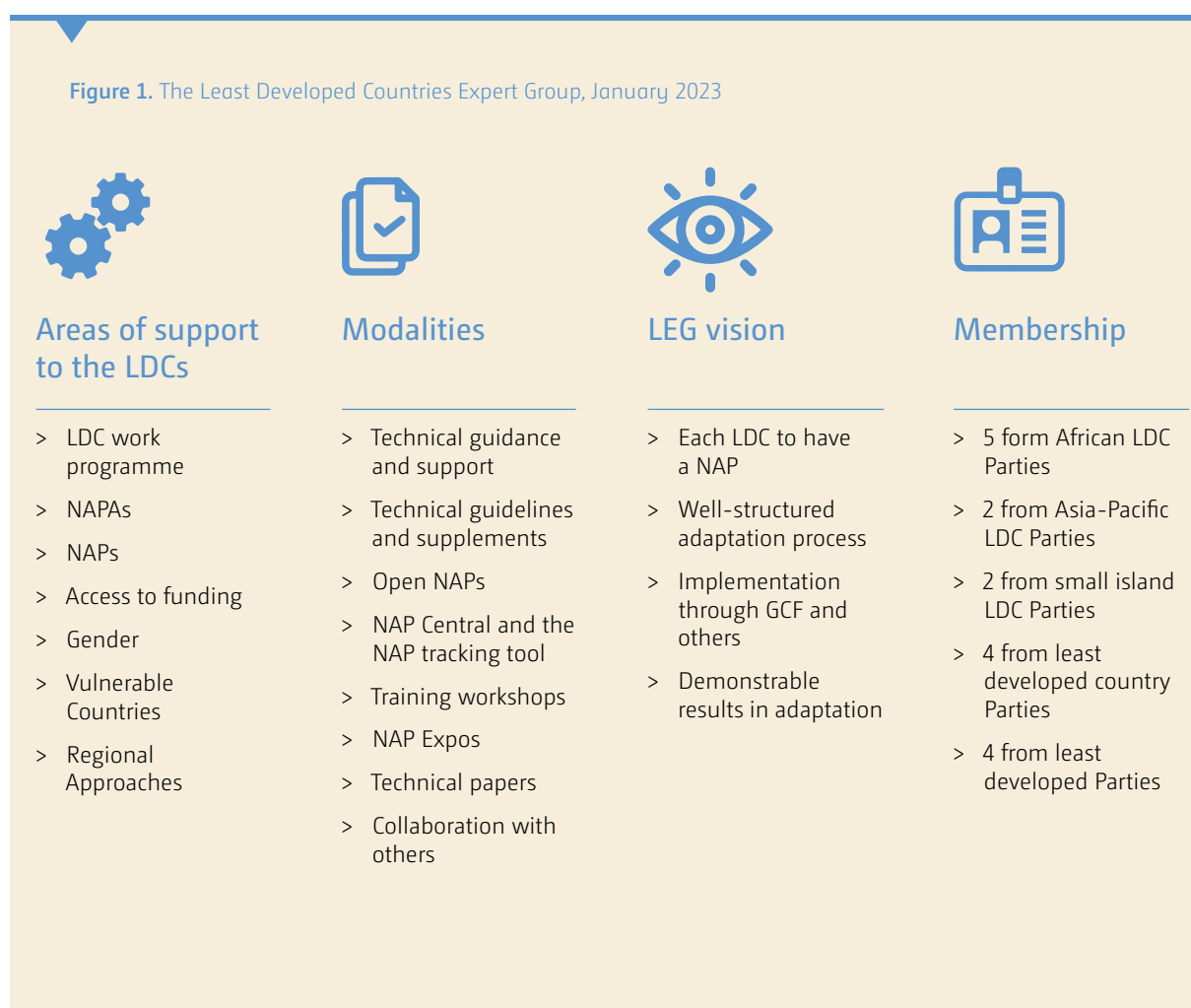
The GCF is the largest global fund dedicated to help fight climate change and to assist countries in moving towards low-emissions, climate resilient pathways. It was established in 2010 by the COP as an operating entity of the Financial Mechanism. The GCF is mandated to balance the allocation of its resources between adaptation and mitigation activities and to take into account the urgent and immediate needs of developing countries that are particularly vulnerable to the adverse effects of climate change, including LDCs, SIDS and African States, using minimum allocation floors for these countries, as appropriate. Subsequently, the Board of the GCF decided to aim for a 50:50 balance in allocating its resources between mitigation and adaptation over time and for a floor of 50 percent of the adaptation allocation for particularly vulnerable countries. As of May 2022, the GCF reported that nearly 70 percent of its adaptation investments went to LDCs, SIDS, and African States.



### 3.3. Technical support

The LEG was established in 2001 as part of the cluster of adaptation support to the LDCs. The group is currently mandated to provide technical guidance and support to the LDCs on the process to formulate and implement NAPs, the preparation and implementation of the NAPAs and the implementation of the LDC work programme. The LEG is also mandated to provide technical guidance and advice on accessing funding from the GCF for formulation and implementation of NAPs, and to support the LDCs on specific topics, including gender. The group is further mandated to engage a wide range of organizations in implementing its work programme. Over the years, the group has developed and implemented a wide range of tools and methods. These include technical guidelines, technical papers, training activities, workshops, expert meetings, NAP Expos, case studies, capturing and sharing of experiences, best practices and lessons learned, NAP Central, monitoring of progress, effectiveness and gaps, collaboration with other bodies, programmes and organizations, and promotion of coherence and synergy. As a result of the support of the LEG, the LDCs have made significant progress on adaptation, serving as pioneers of adaptation and implementation through the NAPAs.

Figure 1. The Least Developed Countries Expert Group, January 2023





The technical support provided by the LEG is complemented by the support provided by other constituted bodies, United Nations organizations, specialized agencies and other relevant organizations, as well as by bilateral and multilateral agencies, including through support programmes as per various mandates from the COP and the CMA. Based on the COP mandates, the LEG together with the GEF and its agencies worked closely with the LDCs to understand and create best ways to achieve success in implementing NAPAs. Additionally, together with relevant organizations, the LEG created the NAP technical working group to advance its work on technical guidance and support for NAPs and to help coordinate activities across all providers of support.



## 4. | APPROACHES IN IMPLEMENTING ADAPTATION IN THE LEAST DEVELOPED COUNTRIES

The adaptation actions implemented through the NAPA-LDCF projects follow two broad categories of (i) responding to specific climate hazards, and (ii) reducing vulnerability and building resilience against climate change impacts in key environmental and socio-economic sectors and systems. The range of climate hazards and impacts addressed in the adaptation projects include droughts, floods including GLOFs, landslides, land and forest degradation, tropical cyclones/typhoons/hurricanes, hailstorms, sea level rise, salinization, storm surges, wildfire, raising sea surface temperatures, shift of seasons, shifting precipitation patterns, heavy rainfall, heat waves, increasing temperatures, ocean acidification desertification, and loss of biodiversity. Among the key environmental and socio-economic sectors and systems, the LDCs implemented projects targeted at or containing significant components of climate proofing agriculture and food security, water security, human health, coastal zones, natural ecosystems and biodiversity. Other systems addressed include human settlements, renewable energy, tourism. Most importantly, many projects were focused exclusively or as components on early warning systems and disaster risk management.

### 4.1. Response to specific hazards

This involves addressing previously identified climate threats that are common and critical in the countries, enabling the exploitation of potential benefits and the moderation of potential costs. A review of the response to droughts, floods and sea-level rise is presented in the sub-sections below. An overview of these responses is further presented in table 1.

#### 4.1.1. Droughts

The direct impacts of droughts are a function of water scarcity and environmental, social, or economic variables, on account of the dependence of livelihoods and economic sectors on water (UNDRR, 2021). Droughts are most prevalent in Africa, claiming 40 percent of global events (UNDRR, 2020). And while droughts have always been part of the human experience, major droughts recorded over the past century spotlight the human cost of climate change and the equally harmful effects on natural ecosystems in many regions of the world. Droughts are linked to sweeping agricultural failures, loss of livestock, water shortages and outbreaks of epidemic diseases. It is well documented that the severity and frequency with which droughts will be experienced is expected to intensify due to climate change. Societal capacity to cope with droughts will be heavily determined by disaster and climate risk governance and access to fundamental tools and approaches to lower the cost of droughts.



**40%**  
of global events







Box 1 below provides examples of different adaptation actions in addressing droughts in the LDCs. Overall, risk assessments and sustainable development approaches need to be enhanced to recognize the underlying determinants of drought risk and the anticipatory action required to move towards a resilient economy, environment, and society.

#### BOX 1

### Examples of adaptation actions implemented by the LDCs in addressing droughts

#### ECOSYSTEM-BASED APPROACHES TO TACKLE DROUGHTS:

Rwanda's project of *Building Resilience of Communities Living in Degraded Forests, Savannas, and Wetlands of Rwanda through an Ecosystem-based Adaptation Approach*<sup>2</sup> followed an ecosystem-based approach to restore wetlands, forests, and savannas with the view to increase the resilience of local communities to floods, droughts, and landslides. In particular, the proposed ecosystem-based approach interventions covered the selection of plant species that are resilient to droughts and floods, as well as those that have stabilizing effects on the soil. The goal was to reduce soil erosion, minimize siltation of water sources, and ease the impacts of droughts on local communities. Overall, 866 households implemented soil conservation practices through radical terraces and agroforestry leading to cultivations on terraces increasing their crop productivity four-fold. A total of 428 hectares of wetlands and lakes, 538 hectares of savannah and 29 hectares of forest were restored. Educational resources and training manuals on ecosystem-based approach were developed as well. To maximize the upscaling of the interventions, the project trained national, local-level authorities, and local communities at intervention sites on the use of Ecosystem-based adaptation; and insured the provision of guiding documents to mainstream ecosystem-based adaptation into policies, plans and strategies in Rwanda.

#### ECOSYSTEM-BASED APPROACHES TO STRENGTHEN NATURAL RESILIENCE AND COMMUNITY LIVELIHOODS:

In Djibouti, poor soil fertility coupled with low water scarcity and salinity, precipitates low yields. The *Implementing Adaptation Technologies in Fragile Ecosystems of Djibouti's Central Plains*<sup>3</sup> project focused on protective measures against water-related hazards including droughts, which included completing water distribution systems in several cities and settlements, providing a hydrological model of current and projected water resources availability, restoring vegetable cover of 7.5 hectares in Acacia woodlands in Hanlé, and restoring 4.2 hectares of mangroves in central coastal zones. In three restoration sites, more than 80 percent of the villagers were involved in the reforestation, replantation, and associated awareness raising activities. These interventions fortified the natural resilience in target areas and contributed towards improved community livelihoods. The benefits of those activities directly witnessed by the surrounding communities including windbreaks and sand protection are providing strong incentive for the communities to protect and continue the restoration activity. Residents of the vulnerable community of Tadjourah say the new mangroves have also boosted the local economy. As reported by the implementing agency, UNEP, the success of the project has led to the approval of a much larger, almost \$10 million project in Djibouti's Tadjourah and Dikhil regions, which aims to further expand flood defense infrastructure (UNEP, 2021).

#### INTEGRATED APPROACHES – CLIMATE RISK INFORMATION, CAPACITY DEVELOPMENT, ADAPTIVE AGRICULTURE PRACTICES, LIVELIHOOD DIVERSIFICATION:

In Lao People's Democratic Republic, importance is placed on curtailing food insecurity by strengthening the knowledge base through analysis of agricultural land-use planning in drought-prone areas and developing alternative land use plans based on climate-risk scenarios. Its project on *Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts*<sup>4</sup> further looked at integrating climate risk projections into a comprehensive national information system for drought related hazards and vulnerabilities. In particular, the project looked at enhancing the capacity of sector planners and agricultural producers to understand and address climate change related risks and opportunities for local food production, as well as promote diversified and adaptive agricultural practices at the community-level.

2 | <https://www.thegef.org/projects-operations/projects/5194>.

3 | <https://www.thegef.org/projects-operations/projects/5021>.

4 | <https://www.thegef.org/projects-operations/projects/4034>.



#### TECHNOLOGY INNOVATIONS IN ADAPTATION:

In Mali, the myriad effects of climate change such as irregular rainfall patterns, high temperatures, long dry periods, flash floods and droughts have made agricultural production increasingly challenging. Through its project on *Strengthening the Resilience of Women Producer Groups and Vulnerable Communities in Mali*<sup>5</sup>, the country prioritized innovative approaches and climate resilient technologies such as the development of a multipurpose farm that integrates water and soil conservation and supports the diffusion of drought-adapted crops to ensure sustainable livelihoods. Overall, the project led to the improvement of the living conditions of most of the vulnerable producers, 51 percent of whom are women, due to the availability of climate change-resilient production means and systems, in addition to ensuring water access and storage for vulnerable farmers in the 10 targeted communes. The project's emphasis on identifying its positive results towards climate change adaptation and women empowerment was apparent, thereby enabling their scaling-up beyond the project lifetime.

Increasing infrastructure resilience against droughts, floods, erosion, and landslides: In Timor-Leste, *Strengthening the Resilience of Small-Scale Rural Infrastructure and Local Government Systems to Climatic Variability and Risk*<sup>6</sup> looked at physical investments to reduce climate risks. Specifically, it highlighted resilience of small-scale rural infrastructure against droughts, floods, erosion, and landslides. This was achieved through interventions in water supply systems, rural access roads and bridges, reservoirs and irrigation systems, stabilizing riverbanks/flood protection. The impacts of climate change in the country affected infrastructure through increased risks associated with more frequent and severe droughts and floods, and more fundamental shifts in the hydrological regime undermining the ecosystem services that provide a natural buffer.

### 4.1.2. Floods

Floods usually occur when excess water submerges normally dry ground, and are often caused by heavy rainfall, swift snowmelt or a storm surge from a tropical cyclone or tsunami (UNDRR, 2021). Flood disasters levy catastrophic costs to human health and wellbeing, the economy, and natural ecosystems. In the past two decades, approximately 1.65 billion people have been affected by floods (Browder, et al., 2021). Floods are the most common type of event with an average of 163 events per year. The economic costs have been confounding, and the social costs are exceedingly high as the poor and marginalized are unduly affected, being 'the hardest hit and the slowest to recover'. Overall, floods have exhibited the greatest impact in Asia. Forty-one percent of all flood events between 2000 and 2019 occurred on the Asian continent and with 1.5 billion people affected, accounting for 93 percent of people affected by floods globally (UNDRR, 2020). Notwithstanding the extreme nature of storms, there is an observable global shift in climate zones, and watersheds are fluctuating imposing huge threats to hydrology across regions (Browder, et al., 2021).



163

events per year

5 | <https://www.thegef.org/projects-operations/projects/5192>.

6 | <https://www.thegef.org/projects-operations/projects/4696>.







The LDCs have made great leaps in their efforts to better manage flood risks. **BOX 2** below provides examples of adaptation actions in addressing floods in the LDCs through the NAPA-LDCF projects.

#### BOX 2

### Examples of adaptation actions implemented by the LDCs in addressing floods

#### **PARTICIPATORY PLANNING AND COMMUNITY-BASED ADAPTATION:**

In Bangladesh, the *Integrating Community-based Adaptation into Afforestation and Reforestation Programmes*<sup>7</sup> project underlined the importance of disaster preparedness and risk reduction measures such as flood-resistant agricultural plots, protection of aquaculture, and freshwater supply infrastructure. It further highlighted the ways afforestation and reforestation programmes offer an innovative outreach mechanism that provides vulnerable communities with access to early warning systems and complementary support mechanisms that reduce risks from extreme weather events. To this effect, 7,305 households were provided with climate resilient livelihood support related to climate resilient agriculture, fisheries, and livestock options. The project also achieved 450 hectares mangrove enrichment plantation. Equipment and essential training were provided to cyclone preparedness programme volunteers trained for climate risks and disaster preparedness.

#### **ENHANCING ADAPTIVE CAPACITY AGAINST FLOODS:**

Bhutan is one of the most disaster-prone countries in the Asia-Pacific region with climate change expected to heighten the intensity and frequency of hazards. In recent decades, variations in monsoon rain patterns, particularly heavy rainfall in short intervals, coupled with a geologically young and unstable Himalayan terrain, has triggered several flash floods and landslides. Bhutan's project on *Addressing the Risk of Climate-induced Disasters through Enhanced National and Local Capacity for Effective Actions*<sup>8</sup> implemented risk reduction from climate-induced floods and landslides in the Pasakhectares economic and industrial hub focusing on riverbank protection, enhanced community resilience, as well as training and development of flood buffer zones. The project facilitated and strengthened alignment of climate interventions with district priorities in disaster management and institutional development, facilitated collection of large volumes of data, and built the capacity of local authorities and government systems.

#### **STRENGTHENING RESILIENCE AND BUILDING ADAPTIVE CAPACITY TO GLACIAL OUTBURST FLOODS:**

In Nepal, the effects of increased climate variability are demonstrated by frequent, intense, and variable rainfall. This trend compounded by a fragile topography, deforestation, and eroded soils has led to landslides and flash flooding. The *Community Based Flood and Glacial Lake Outburst Risk Reduction project*<sup>9</sup> in Nepal strengthened connectivity of GLOF monitoring and early warning systems, provided flood preparedness and GLOF risk mitigation training, and community-based flood risk management. The project achieved key milestones towards building adaptive capacity to GLOFs, including the lowering of a glacial lake through construction of an artificial open channel, river course stabilization sediment trap measures, flood proofing drainage systems, creation of evaluation centers, training, and demonstration actions.

#### **INTEGRATED WATERSHED MANAGEMENT:**

Rwanda's unique topography, exposure to extreme climate events, and poorly designed catchment management and agricultural practices, has rendered the ecosystem and people of the Gishwati and its associated Nile-Congo crest watersheds one of the most vulnerable in the country. Its project on *Reducing Vulnerability to Climate Change by Establishing Early Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in Flood Prone Areas*<sup>10</sup> was designed to reduce floods and droughts and their interrelated climate impacts. The project put in place a modern and fully functional early warning system to deliver climate information and early warnings, facilitated developed of land-use plans in the project areas, rehabilitated at least 1,373 hectares of degraded land through tree planting, agro-forestry and establishment of graded and radical terraces, and extended climate resilient training to village leaders, disaster management committees, communities and farmers.

7 | <https://www.thegef.org/projects-operations/projects/4700>

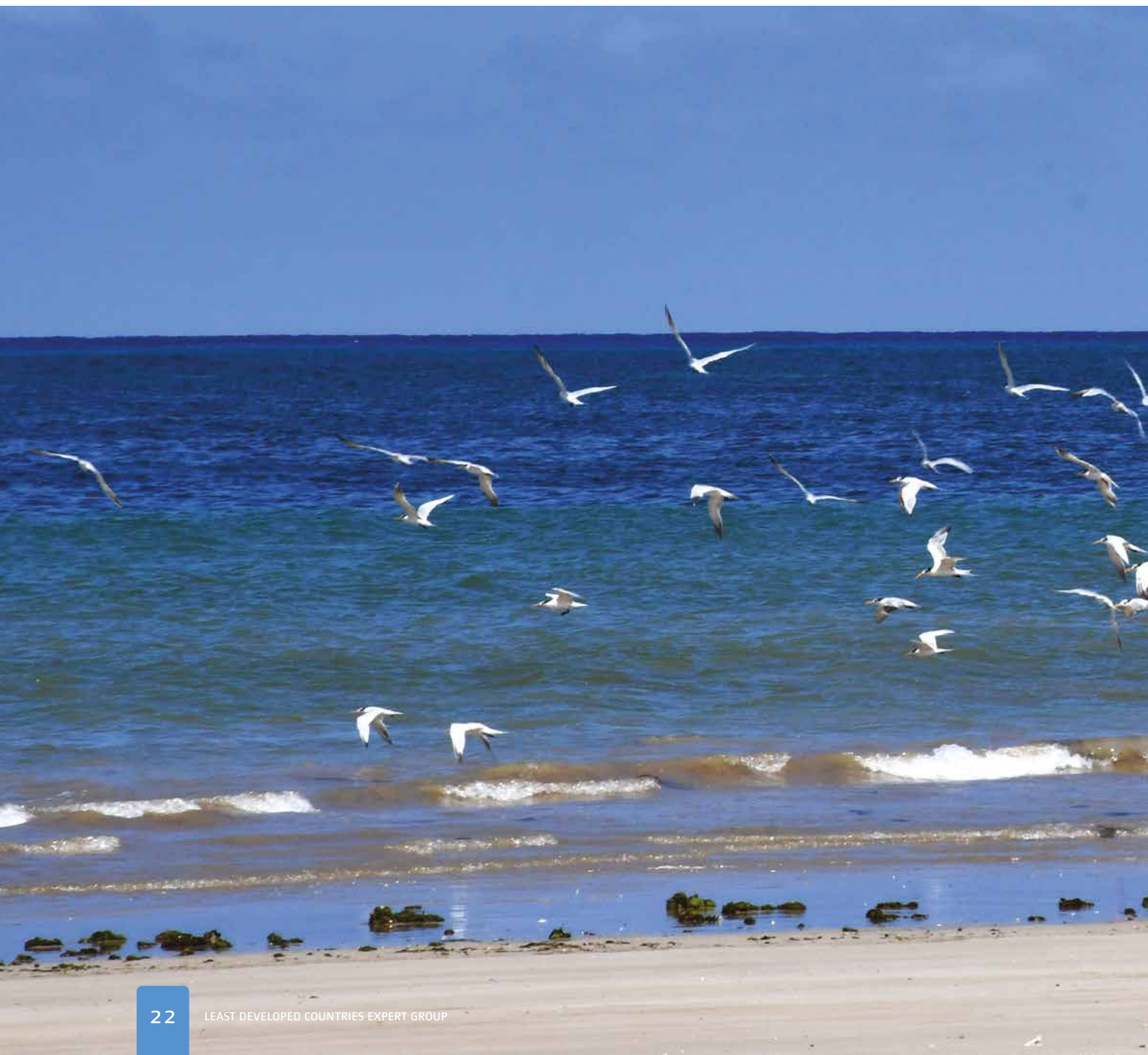
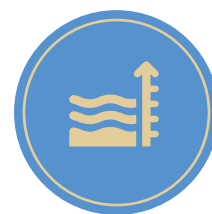
8 | <https://www.thegef.org/projects-operations/projects/4976>

9 | <https://www.thegef.org/projects-operations/projects/4551>

10 | <https://www.thegef.org/projects-operations/projects/3838>

### 4.1.3. Sea level rise

Global mean sea level is rising and accelerating with high certainty, and human impact is likely the main driver since at least 1971 (IPCC, 2022). According to the IPCC's Sixth Assessment Report (AR6), heating of the climate system has caused global mean sea level rise through ice loss on land and thermal expansion from ocean warming. Additionally, IPCC research indicates that it is highly probable that due to relative sea level rise, extreme sea level events that previously occurred once every 100 years are projected to strike at least yearly at more than half of all tide gauge locations by 2100 (IPCC, 2022).





**BOX 3** below provides examples of different adaptation actions in addressing sea level rise in the LDCs.

BOX 3

### Examples of adaptation actions implemented by the LDCs in addressing sea level rise

#### ESTABLISHING EARLY WARNING SYSTEMS FOR COASTAL COMMUNITIES:

Establishing early warning systems for coastal communities: São Tome and Príncipe's relatively small size and remoteness juxtaposed against its exposure to natural hazards and its limited capacity to respond to extreme weather events render it highly vulnerable. It is impacted by increased saltwater intrusion caused by sea level rise, increased water scarcity due to variable temperature and precipitation patterns, and a lack of protective coastal infrastructure. *Adaptation to Climate Change*<sup>11</sup> in São Tome and Príncipe dealt with the increased resilience of coastal communities against sea level rise and extreme weather events through the establishment of a coastal early warning system and the institution of coastal protection measures in support of vulnerable communities. The project resulted in the dissemination of timely forecasts to fishermen and coastal communities, thereby lowering the average number of lives lost from 4.8 per year to 1 per year. In the project's four pilot communities, there was evidence of strengthened adaptive capacity, as community risk committees were actively engaged and there was a relatively lower impact from storm surges and flooding. After the success of the Adaptation to Climate Change Project, support for eight additional coastal communities was increased through the West Africa Coastal Area Resilient Investment Project (WACA-ResIP).

#### STRENGTHENING NATURAL RESILIENCE TO SECURE COMMUNITY LIVELIHOODS:

Faced with storm surges, sea level rise and increased salinization that degrade freshwater supplies and disrupt the livelihoods of coastal communities, Cambodia implemented local interventions to increase ecosystem resilience. The *Vulnerability Assessment and Adaptation Programme for Climate Change in the Coastal Zone of Cambodia*<sup>12</sup> project was focused on increasing the resilience of natural ecosystems, such as mangrove forests, along the coast and reduce the vulnerability of coastal communities to climate change impacts and risks. As part of its intervention, the project deployed local communities to maintain coastal flood control measures, while reducing pressures on mangrove systems through sustainable harvesting and management. One of the biggest successes of the project was the production of District specific Coastal Vulnerability and Climate Adaptation Plans and from this, the successful implementation of pilot projects in the four targeted provinces, coupled with the highly successful mangrove rehabilitation interventions. The project also provided a platform for mainstreaming climate change policy into national and local development plans, thus ensuring long-term coastal adaptation in Cambodia.

#### CLIMATE RISK INFORMATION FOR PLANNING:

The Democratic Republic of Congo's project on *Resilience of Muanda's communities from coastal erosion*<sup>13</sup> emphasized investment in coastal defense and monitoring. It created a community-based early warning system to increase preparedness, risk prevention, and response capacities. The project also developed coastal risk profiles based on community-level data and the employment of geographical information systems techniques that would demonstrate the area of land impacted by coastal erosion or storm surge inundation. The coastal risk profiles include coastal zones projected to be affected by sea level rise based on three different scenarios until the year 2100. The early warning systems were implemented for the five coastal communities. The project further implemented coastal protection measures pending provision of additional funding.

11 | <https://www.thegef.org/projects-operations/projects/4018>.

12 | <https://www.thegef.org/projects-operations/projects/3890>.

13 | <https://www.thegef.org/projects-operations/projects/5280>.



**Table 1.** Climate change adaptation actions implemented by the LDCs in response to droughts, floods and sea level rise



Drought	Floods	Sea level rise
<ul style="list-style-type: none"> <li>• Climate resilient cropping practices in drought-prone watershed</li> <li>• Diffusion of drought-adapted crops (e.g., drought-resistant, and early maturing seeds) and drought-resistant livestock</li> <li>• Integrated agro-silvo-pastoral systems</li> <li>• Rainfall capture, storage, and adaptive irrigation management in drought-prone areas</li> <li>• Low-cost water conservation/irrigation technologies</li> <li>• Drought preparedness and mitigation plans</li> <li>• Rapid drought impact assessment</li> <li>• Integration of climate risk projections into a comprehensive national database</li> <li>• Land use management practices adjusted for anticipated climate change risks</li> <li>• Restoration of wetland and savanna ecosystems</li> <li>• Rangeland management and rehabilitation (e.g., natural retention of surface water, slope stabilization, groundwater infiltration)</li> <li>• Drought forecasting and early warning systems</li> <li>• Micro-credit products designed and offered through financial service providers</li> <li>• Drought index defined by the Livelihood, Early Assessment and Protection (LEAP) software to help establish trigger for insurance pay-outs</li> </ul>	<ul style="list-style-type: none"> <li>• Protective measures against floods in cities and settlements (e.g., tree planting around water collection points; tree preservation)</li> <li>• Protective measures against floods in rural areas (e.g., flood-resistant agricultural plots; protection of aquaculture and freshwater supply infrastructure; safe haven for livestock)</li> <li>• Watershed management</li> <li>• Use of hydrological models, risk mapping, GIS, and preventative forecasts</li> <li>• Rehabilitation and monitoring of existing water infrastructures or building of new ones e.g., (micro-catchment, reservoirs, terraces, check dams, dikes, boreholes)</li> <li>• Water conservation e.g., investments in water harvesting infrastructure</li> <li>• Flood preparedness and mitigation plans</li> <li>• Restoration of wetland ecosystems</li> <li>• Flood-proofing of communal water supply, storage facilities and other basic rural infrastructure</li> <li>• Establishment of nurseries for wetland restoration and agroforestry</li> <li>• Drainage improvement</li> <li>• Community-based training/awareness raising on flood preparedness and GLOF risk mitigation</li> <li>• Monitoring of conditions to respond to flooding and glacial lake</li> <li>• Outburst flooding (GLOF)</li> <li>• Development of early warning systems</li> <li>• Establishment and training of Disaster Management Institutions at all levels</li> <li>• Integration of information from hazard assessments and mapping of floods into Disaster Management Plans</li> </ul>	<ul style="list-style-type: none"> <li>• Coastal early warning system</li> <li>• Comprehensive vulnerability mapping and geomorphology study</li> <li>• Saline resistant fodder crops</li> <li>• Population retreat/resettlement (last resort option in consultation with coastal communities)</li> <li>• Safety at sea training and equipment (e.g., radar reflectors and live vests) for artisanal fishermen.</li> <li>• Sustainable coastal zone protection investments</li> <li>• Construction of fleet protection shelters</li> <li>• Reinforcement of Capacity of Civil Protection Agencies</li> <li>• Implementation of contingency plans and simulation exercises by coast guard</li> <li>• Physical protection of designated buildings and public infrastructure</li> <li>• Community awareness and participation in improved coastal zone management</li> </ul>

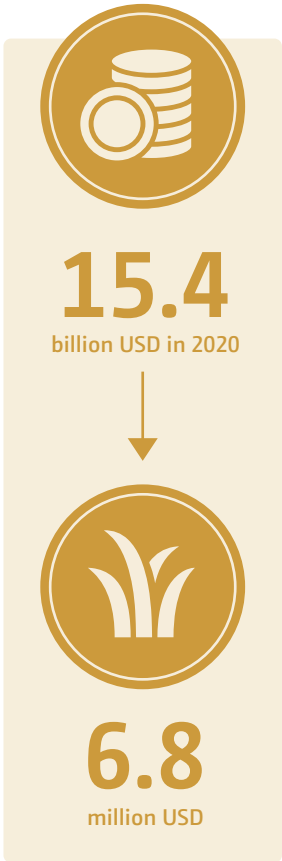
## 4.2. Reducing vulnerability and building resilience in key economic systems

A second overarching category of actions in implementing adaptation is reducing vulnerability in key economic sectors and systems. The actions are in the main climate sensitive sectors and areas that are commonly captured by the LDCs. Most of the actions cut across multiple sectors/systems. For the purposes of analysing diverse economic systems and the sector specific dimensions of climate change, this report addresses them separately. A review of the key economic systems is presented in the sub-sections below. Table 2 provides an overview of adaptation actions implemented by the LDCs to enhance the adaptive capacity and resilience of key economic systems.

### 4.2.1. Agriculture and food security

Climate change is not only a threat to global food security, but also puts at risk countries' ability to eradicate poverty and achieve sustainable development. It influences agricultural productivity by changing rainfall patterns, causing drought, flooding, and shifting the geographic distribution of pests and diseases (FAO, 2022). The increased frequency and intensity of climate hazards are adversely impacting agricultural communities and global food systems on which they depend (Wiebe, 2019). Data by the UNSD indicates that direct economic losses attributed to disasters totalled USD 15.4 billion in 2020, of which USD 6.8 billion accounted for the agricultural sector (FAO, 2022).

Actions for adapting agriculture and food systems in the projects implemented by the LDCs included adaptive agriculture and land management techniques, agrometeorological and decision support information systems, climate proofing of food crops storage, adapting infrastructure against climate induced erosion, water conservation practices such as rainwater harvesting, improved irrigation techniques, improved soil and crop management practices, climate resilient seed varieties, and climate resilient alternative livelihoods.









**BOX 4** below provides examples of adaptation actions applied by the LDCs in adapting agriculture to climate change.

BOX 4

### Examples of adaptation actions implemented to adapting agriculture and food systems by the LDCs

#### INTEGRATED APPROACHES – AGRICULTURE AND WATER RESILIENCE:

Moderate to severe food insecurity at the global level has been on the steady rise. In fact, the latest data for 2021 suggests that the prevalence of moderate or severe food insecurity has remained relatively unchanged compared to 2020, whereas severe food insecurity has soared, offering more evidence of worsening situations largely for those already dealing with insurmountable hardships (FAO, IFAD, UNICEF, WFP and WHO, 2022). *Implementing NAPA priority interventions to build resilience in the agriculture and water sectors to the adverse impacts of climate change in Sudan*<sup>14</sup> aimed to narrow this gap by increasing the resilience of food production systems and food insecure communities through innovative practices. Such practices included rainwater harvesting, improved irrigation techniques, climate-resilient cropping and grazing systems, livelihood diversification, reseeding of the rangeland with heat-resistant varieties of grass and legume species, and introduction of new crop systems and practices more appropriate in changing climatic conditions. The project reached a large number of people in diverse socio-economic and ecological conditions to improved lives and food security. New technologies, practices and approaches were introduced and generally adopted in all the project target areas through packages of forestry, traditional agricultural crops, new horticultural crops, water management and harvesting, livestock management, sustainable energy, and training.

#### INTEGRATED CLIMATE RISK AND DISASTER MANAGEMENT IN AGRICULTURE:

Reliance on rainfed agriculture in Ethiopia, coupled with a growing population and a notable decline in the per capita availability of natural resources is impacting the country's sustainable development. *Promoting Autonomous Adaptation at the community level in Ethiopia*<sup>15</sup> was implemented to reduce vulnerability and build resilience through the development of integrated climate change and disaster risk management plans at local and regional levels for key sectors including agriculture. In particular, the project implemented capacity building of development agents for coordinating financing and managing climate risk-reducing investments, facilitated the adoption of innovative and indigenous adaptation technologies, and helped improve the capacity for community-based climate change adaptation. Based on the successes of this project, a new project on 'Upscaling Community-Based Adaptation in Ethiopia' was initiated.

#### INTEGRATED APPROACHES – AGRICULTURE AND WATER RESILIENCE:

In its project on *Strengthening Resilience and Adaptive Capacity to Climate Change in Guinea-Bissau's Agrarian and Water Sectors*<sup>16</sup>, Guinea-Bissau incorporated climate risk and adaptation measures into relevant policies and plans for the water and agrarian sectors and enhanced the capacity of decision makers. In order to enhance Guinea-Bissau's resilience and adaptation capacity, a national multi-sectoral committee was created to advise on adaptation practices. In addition, innovative practices were introduced, such as efficient water use in crop production systems, introduction of climate resilient food production methods, small-ruminant breeding, and water resource management at the local level.

#### CLIMATE-RESILIENT AGROFORESTRY AND NATURAL REGENERATION PRACTICES:

While significant global progress on sustainable forest management has been achieved, the world's forest loss remains high with a decline of 100 million hectares over the course of last two decades (FAO, 2022). At the country level, Zambia's indigenous forests are under extreme pressure, with the country's rate of deforestation well above the global average. Urbanization is a key driver of climate change in a country which claims one of the highest urbanization rates in Africa. As a result, ecosystem services that the forests provide, such as

14 | <https://www.thegef.org/projects-operations/projects/3430>.

15 | <https://www.thegef.org/projects-operations/projects/4222>.

16 | <https://www.thegef.org/projects-operations/projects/4019>.

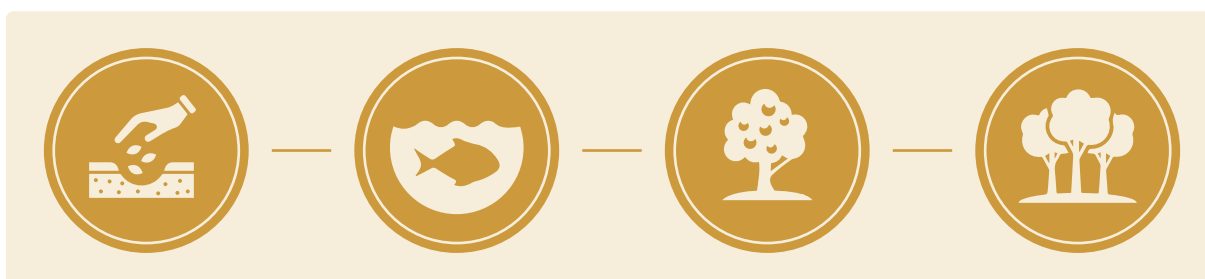
regulating the climate and enhancing sustainable livelihoods, are under threat. According to the latest issue on The State of Food Security and Nutrition in the World 2022, the magnification of the main drivers of recent food insecurity and malnutrition trends such as conflict, climate extremes and economic shocks, coupled with the high cost of nutritious foods and mounting inequalities will continue to hamper food security and nutrition (FAO, IFAD, UNICEF, WFP and WHO, 2022). The project on *Promoting climate resilient community-based regeneration of indigenous forests in Zambia's Central Province*<sup>17</sup> was implemented to enhance the capacity of foresters and communities to implement climate-resilient agroforestry and natural regeneration practices. In the Central Province through the project, the indigenous forests were preserved and are providing support for sustainable livelihoods and ecosystems, for which 22,176 community members participated in community-based regeneration of indigenous forests. A further 15,858 community members were trained in alternative livelihoods and sustainable land management skills. There was a noticeable transformation in the technical and institutional capacity of foresters and communities in Central Province to implement appropriate climate-resilient agroforestry and natural regeneration practices in designated zones as well.

#### INTEGRATION OF CLIMATE RISK INTO AGRICULTURAL PLANNING:

*Adapting Agriculture Production in Togo (ADAPT)*<sup>18</sup> was implemented to lessen the impact of climate change on vulnerable rural communities and on natural resources critical for sustaining agricultural production and ensuring food security. It worked to improve the understanding and monitoring capacity of climate change impacts on agricultural systems, and systematically gathered agrometeorological data to inform risk decisions. Although the results of the project were unsatisfactory, it nevertheless succeeded in promoting the use of organic products for crops (manure and treatments) which has positive impacts on the productivity and quality of production, and conducted a reforestation campaign in the classified areas managed by the State and on community lands.

#### STRENGTHENING COMMUNITY RESILIENCE:

Meanwhile in Malawi, much of the population comprise resource-poor rural communities, largely engaged in subsistence rain-fed agriculture. In fact, many are food insecure year-round. The *Climate Adaptation for Rural Livelihoods and Agriculture (CARLA)*<sup>19</sup> project implemented integrated adaptation strategies and interventions to improve agricultural production and rural livelihoods. At its core, the project focused on community-based adaptation activities, vulnerability assessments, and district and national-level capacity building. However, frequent changes in the staffing of fiduciary staff limited progress in implementation of the project activities. The project also experienced challenges in monitoring and evaluation was also unsatisfactory due to the lack of consistency on the staffing. Despite this, 200 hectares of land was developed for irrigation, 15 fishponds were constructed, 1048 hectares of land area was conserved, 288 hectares of land area was cultivated with drought tolerant crops namely sorghum, millet, cassava and sweet potatoes, 6,294 fruit tree seedlings were propagated, and 939,925 trees were planted. A key lesson learned was that capacity building for local leadership and implementing staff will guarantee sustainability of project benefits.



17 | <https://www.thegef.org/projects-operations/projects/5435>.

18 | <https://www.thegef.org/projects-operations/projects/4570>.

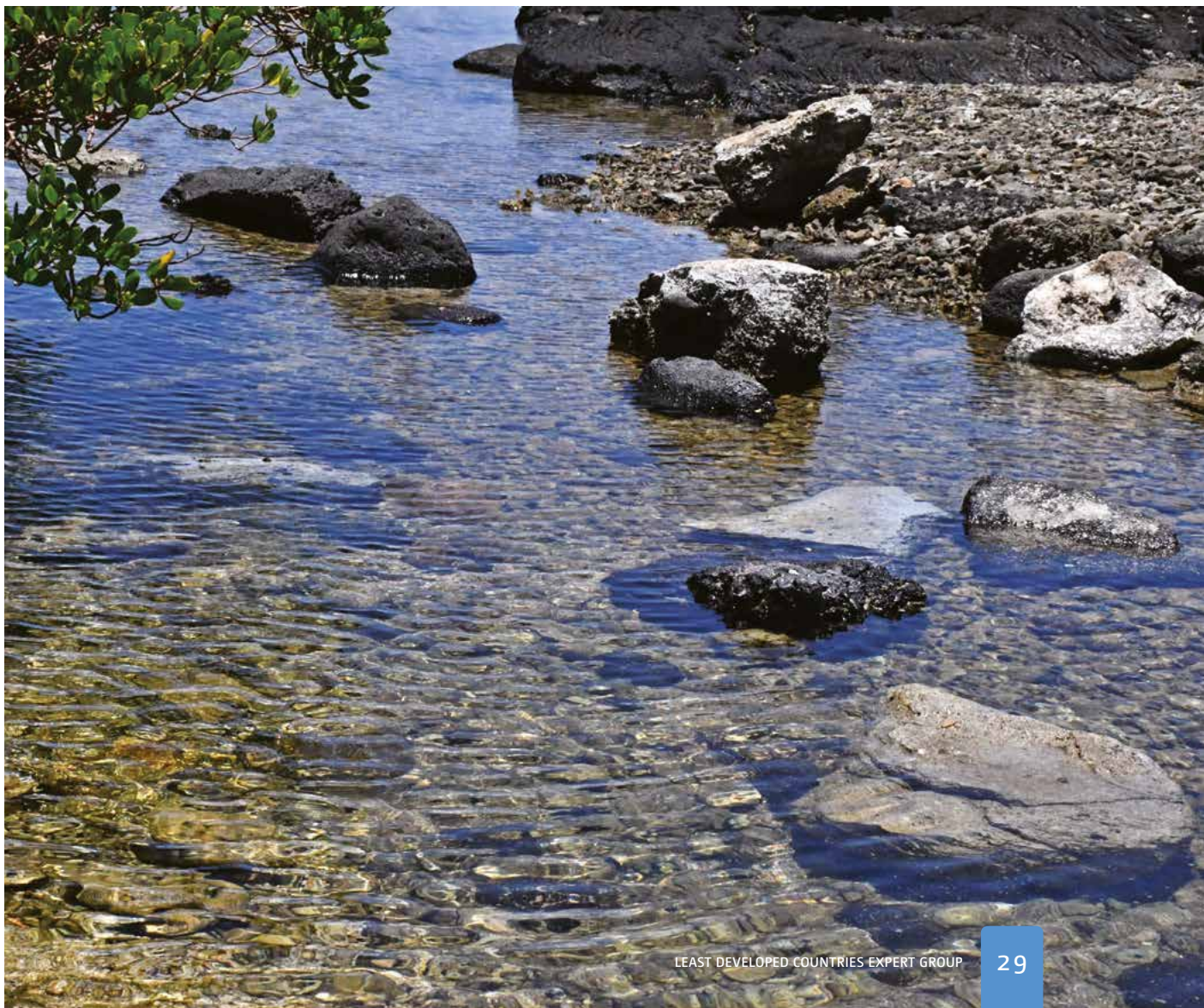
19 | <https://www.thegef.org/projects-operations/projects/3302>.

## 4.2.2. Water security

In principle, climate change impacts include severe water-related crises which are underpinned by worsening floods, sea level rise, glacial retreat, wildfires, and droughts (UN Water, n.d.). According to UN-Water, extreme weather events are fuelling water scarcity and making water availability increasingly unpredictable. Such impacts on the water cycle threaten sustainable development, natural ecosystems, and communities' access to water and sanitation. Sustainable water management assists communities to adapt to climate change by building resilience and protecting health (Murray, et al., 2003).



Adaptation actions for ensuring water security against climate change impacts included climate resilient and adaptive watershed management, which involved small-scale water infrastructure, climate resilient micro-water harvesting, water conservation techniques, watershed management, small-scale water saving technologies and distribution systems, restoration of degraded watersheds, and rehabilitation of existing and new water structures (reservoirs, terraces, check dams, boreholes, gullies).





**BOX 5** below provides examples of adaptation actions implemented by the LDCs in ensuring water security in the face of climate change.

#### BOX 5

### Examples of adaptation actions implemented by the LDCs for ensuring water security against climate change impacts

#### CLIMATE-SMART WATER MANAGEMENT:

A quarter of the global population are living in countries under water stress, almost half the global population face inadequate access to water at least one month per year. Meanwhile, water-related hazards have surged in frequency in the last 20 years (WMO, 2021). At a more granular level, Djibouti's project of *Supporting Rural Community Adaptation to Climate Change in Mountain Regions of Djibouti*<sup>20</sup> focused on climate-smart water management. It prioritized the rehabilitation and monitoring of existing and new water structures, promoted watershed management through alignment of livelihoods with tree retention, and ensured increased resilience to hydrological climate risks. Overall, 83 percent of the targeted households have their livelihoods enhanced due to water mobilization and reforestation through improved and new water infrastructure. In addition, 14 micro-dams, 16 cisterns, 28 semi-underground sills, 31 wells, and two bank fortifications with rock-filled wire work were constructed.

#### ADAPTIVE WATER MANAGEMENT INTERVENTIONS:

As the only source of water in the Grand Comore, saline water intrusion of coastal boreholes is a climate health risk. When rainwater flows into rivers and poor waste management persists, low water quality and diminishing water supply adversely affect the livelihoods and well-being of the population. Innovative financing and technology transfer for water resource management is crucial to support governments in fulfilling their water and climate targets. With its project of *Adapting Water Resource Management in Comoros to Increase Capacity to Cope with Climate Change*<sup>21</sup>, Comoros worked towards transferring relevant technologies to improve water access and quality, and strengthen the institutional capacity needed to assess and monitor fluctuations in water availability. The project supported the integration of climate change information into water resources management policies and plans. In particular, the project piloted technologies to improve water access and quality that mitigate climate change risks piloted through soil conservation measures, water harvesting, remedial work on existing boreholes. Training to community members to manage adaptive water interventions was also undertaken.

#### INTEGRATED WATER RESOURCES MANAGEMENT:

The *Solomon Islands Water Sector Adaptation Project (SIWSAP)*<sup>22</sup> supported planning in the context of integrated water resources management. It facilitated strategic investments in water and sanitation infrastructure, developed vulnerability assessments of water resources and directed the restoration of ecosystems that protect critical water resources. As a result, all climate change vulnerability assessments and water sector climate adaptation response plans were developed and implemented. All water scheme interventions were adopted including rainwater harvesting, hand dug well improvements and desalination/ultra-filtration installations.

#### RAINWATER HARVESTING TO ENSURE WATER SECURITY:

Surveying, protecting, and sustainably using groundwater is vital to adapting and thriving in a changing climate. According to the 2008 State of the Environment report, water is Afghanistan's most critical natural resource and integral to the health and well-being of the Afghan people. In fact, water-harvesting and water conservation techniques could enhance rainfed kilocalorie production by up to 24 percent and by more than 40 percent when combined with irrigation development (FAO, 2020). In the project *Strengthening the Resilience of Rural Livelihood Options for Afghan Communities in Panjshir, Balkh, Uruzgan and Herat Provinces to Manage Climate Change-induced Disaster Risks*<sup>23</sup>, the introduction of micro-water harvesting techniques helped diversify rural livelihood

20 | <https://www.thegef.org/projects-operations/projects/5332>.

21 | <https://www.thegef.org/projects-operations/projects/3857>.

22 | <https://www.thegef.org/projects-operations/projects/4725>.

23 | <https://www.thegef.org/projects-operations/projects/5202>.

opportunities for vulnerable Afghan communities. The project benefited 71,140 households through livelihood sub-projects, such as a greenhouse farming, 12 infrastructure sub-projects including canal rehabilitation and flood protection wall construction. The project improved the climate adaptation toolkit to include a broader adaptation package and help field staff identify adaptation measures based on the local context. In total, 166 interventions were made, which include 144 greenhouses, eight raisin houses and 14 underground cold storage facilities were constructed.

#### MICRO-WATERSHED MANAGEMENT AND CLIMATE RESILIENT AGRICULTURE PRACTICES:

Aside from agricultural production, issues with water access and water pollution are visible along the food supply chain, impacting food security, nutrition, and health (FAO, 2020). Improved water management approaches when combined with agronomic practices will be an important factor in moderating water risks and boosting agricultural yields for improved food security and nutrition. Cambodia's project on *Strengthening the Adaptive Capacity and Resilience of Rural Communities Using Micro Watershed Approaches to Climate Change and Variability to Attain Sustainable Food Security*<sup>24</sup> aimed at ensuring food security through integrated micro watershed management and climate resilient agriculture practices. Overall, the increase of food secure households' proportion went up from nine to 16 percent in addition to several climate change adaptation related workshops were facilitated. 10,519 hectares of degraded forests reserves were placed under improved protection, restoration, and climate change adaptation management plans.

### 4.2.3. Human health

The influence of climate change on health is clear and engendered in several ways. Climate change causes non-communicable diseases such as pulmonary and cardiovascular diseases, including hypertension brought on by heat stress, and mental health issues. It can trigger a host of food-, water-, and vector-borne illnesses such as malaria, diarrheal diseases, nutrient-related conditions, and even death (Romanello, et al., 2022). It is anticipated that frequent extreme weather events, such as heatwaves, storms and floods, as well as the disruption of food systems, will continue to exacerbate such maladies. Indeed, climate change impacts not only undermine the social determinants of health and wellbeing, but also disproportionately affect the most vulnerable including women and children, persons with disabilities, Indigenous Peoples, the elderly and infirm, migrants, refugees, and internally displaced people (WHO, 2021).



Health adaptation measures included adaptive interventions and investment in health infrastructure such as the construction of primary healthcare centers and community washrooms, community awareness of the health impacts of climate change and other soft measures related to the development of national health surveillance plans and enhanced capacity of the health sector to anticipate and respond to climate-related diseases.

<sup>24</sup> | <https://www.thegef.org/projects-operations/projects/4434>.

BOX 6 below provides examples of adaptation actions implemented by the LDCs in health adaptation to climate change.

BOX 6

## Examples of actions implemented by the LDCs in health adaptation to climate change in the LDCs NAPA-LDCF projects

### PARTICIPATORY PLANNING AND COMMUNITY-BASED ADAPTATION:

Reducing risk of water-borne diseases: In many ways, Madagascar's project on *Enabling climate resilience in the agriculture sector in the southwest region*<sup>25</sup> was implemented to secure and improve rural farmers' livelihoods through water management and health interventions that ensure that water-borne diseases do not threaten rural wellbeing. The impact of climate change on water availability is expected to alter the prevalence of water-borne diseases, such as malaria and diarrheal disease. In response, the project improved health outcomes through the construction of primary healthcare centers and community washrooms, and by spearheading a campaign to encourage behavioral change to control the spread of water-related diseases. Additional benefits included raising awareness and build capacity for the rural population to manage water and health aspects considering projected climate change impacts.

### WATER AND SANITATION:

According to Uganda's Ministry of Health, 75 percent of the disease burden is deemed preventable through improved hygiene and sanitation, vaccination, good nutrition, and other preventive measures. The project on *Building resilience to climate change through the water and sanitation sector in flood- and drought-prone regions of Uganda*<sup>26</sup> was aimed at improving health status and reducing water-borne diseases in flood-prone peri-urban areas. It built awareness of communities on the health impacts of climate change, specifically on water, sanitation and health that would otherwise impede public health and economic development outcomes. The project also increased access to climate-resilient sanitation in flood-prone peri-urban areas through the installation of appropriate sanitation facilities.

### WATER-MANAGEMENT PRACTICES AGAINST WATERBORNE DISEASES:

Cambodia's project on *Promoting Climate-Resilient Water Management and Agricultural Practices*<sup>27</sup> demonstrated resilient irrigation, freshwater management, and farming options. The project led to the restoration and building of small-scale irrigation schemes, solar and windmill pumps, and community ponds. As a result, these interventions led to improved health benefits from waterborne diseases through clean water use.

### RESILIENCE OF WATER RESOURCES TO IMPROVE SANITATION:

A key objective of the *Solomon Island's Water Sector Adaptation Project (SIWSAP)*<sup>28</sup> was to improve the resilience of water resources to the impacts of climate change in order to improve health, sanitation, quality of life, and sustain livelihoods in targeted vulnerable areas. Through ensuring a resilient water supply in at least 6 sites across 6 Provinces, more people had access to proper sanitation facilities, potentially reducing prevalence of disease.

25 | <https://www.thegef.org/projects-operations/projects/5233>.

26 | <https://www.thegef.org/projects-operations/projects/5204>.

27 | <https://www.thegef.org/projects-operations/projects/3404>.

28 | <https://www.thegef.org/projects-operations/projects/4725>.





#### 4.2.4. Coastal zone resilience

More than 600 million people (around 10 percent of the world's population) live in coastal areas that are less than 10 meters above sea level, thus being vulnerable to sea level rise, coastal erosion, ocean acidification and storm surges (United Nations, 2017). Coastal zone management offers varied options (physical, technological, financial, human, and/or institutional) to respond to climate risks, yet no single response strategy can eliminate the economic costs of climate change (Nicholls, et al., 2007). Admittedly, tropical SIDS are among the most vulnerable due to the impacts of climate change and extreme weather events. They experience increased saltwater intrusion caused by sea level rise, water scarcity owing to variations in temperature and precipitation patterns, and inadequate coastal protection infrastructure.



Adaptation actions to building resilience in coastal zones in the LDCs included community based and ecosystem-based approaches, climate proofing for coastal protection infrastructure, restoration of degraded shores, conservation and management of marine ecosystems, conservation of natural coastal defences and buffering systems, diversified climate resilient marine-based coastal livelihoods, early warning system and sea-level rise impact monitoring systems.





**BOX 7** below provides examples of adaptation actions implemented by the LDCs in coastal zones resilience to climate change.

BOX 7

## Approaches to building resilience in coastal zones in the LDCs

### FRESHWATER RESOURCES AND COASTAL INFRASTRUCTURE RESILIENCE:

With atolls situated a mere two meters above sea-level, Kiribati is markedly exposed to climate variability and extreme weather events. Against the backdrop of highly diverse and productive marine and coastal ecosystems, the resource-rich island nation is plagued by degradation of coastal zones and coral reefs, depletion of fisheries and freshwater sources, and a loss of vegetation and biodiversity. To improve the resilience to the impacts of climate change on coastal infrastructure, Kiribati aimed to increase coastal resilience through investments in long-term shoreline protection in priority, high wave-energy sites on South Tarawa in its project *Increasing resilience to climate variability and hazards*<sup>29</sup>. As such, three seawalls measuring 370 linear meters were completed on South Tarawa. Shoreline mangrove plantings of 35,000 seedlings along 46 segments of coastline measuring 1.005 linear km were also completed by communities in nine outer Islands. It was noted that this project is consistent with the Kiribati Joint Implementation Plan for Climate Change and Disaster Risk Management (2014-2023), the goal of which is to increase resilience through sustainable climate change adaptation and disaster risk reduction using a ‘whole of country’ approach. In addition, based on lessons learned from past water and sanitation sector-wide approaches in Kiribati, the project design recognized the need for day-to-day community engagement across all components. The project also acknowledged the sensitive policy issues pertaining to land and asset ownership, which would have to be addressed to ensure the sustainability of the project.

29 | <https://www.thegef.org/projects-operations/projects/4068> .





### CAPACITY BUILDING IN COASTAL COMMUNITIES:

Sea level rise significantly impacts the Mozambiquan coastline. Intense and frequent tropical cyclones and storm surges heighten existing risks. The *Adaptation in the coastal zones of Mozambique*<sup>30</sup> project was implemented to develop the capacity of communities living in the coastal zone to better manage climate risks including by integrating coastal climate risks into key decision-making processes across all levels. The project successfully trained various district, provincial government officials and community members in geographical information systems mapping and early warning systems. The project supported the development of maps and platforms on climate change risk management for the three project areas, which were not yet integrated into the national network system at the time of the terminal evaluation. The project underperformed in terms of knowledge management, learning and monitoring and evaluation. One key lesson learned was to select more accessible and logically less impaired sites for demonstration project.

### COASTAL COMMUNITY RESILIENCE:

In Tanzania, a project on *Developing Core Capacity to Address Adaptation to Climate Change in Productive Coastal Zones*<sup>31</sup> applied participatory coastal vulnerability assessment, together with methods to reduce coastal zone vulnerability to climate change. It considered the need to broaden stakeholder engagement and spearhead integrated approaches to coastal zone and river basin management. As a result of the project, coastal communities became better protected from sea level rise through grey infrastructure (seawalls) and green infrastructure (mangroves). The project also improved the capacity at the government and community levels to engage on climate adaptation issues. Stakeholder engagement improved community ownership of project investments that will contribute to maintenance and sustainability.

### COMMUNITY-BASED ADAPTATION:

In Tuvalu, sea level rise is a direct threat to the lives and livelihoods of coastal areas, where 90 percent of the population reside. Tuvalu consists of 'widely scattered, low-lying islands and at its widest point, it only spans about 200 meters (UNDP, 2021). Rising surface ocean temperature affects the integrity of marine resources, resulting in coral bleaching, which contributes to the loss of marine habitats and causes the fish population to shift towards the poles. Tuvalu's project on *Effective and Responsive Island-level Governance to Secure and Diversify Climate Resilient Marine-based Coastal Livelihoods and Enhance Climate Hazard Response Capacity*<sup>32</sup> was implemented to build the resilience of the population. The project contributed to greater access to financing for community-based climate change adaptation actions, as well as greater resilience of marine-based coastal livelihoods, and developed capacities of island communities to respond to climate-induced hydro-meteorological risks. The project was aligned with the national strategy for sustainable development for Tuvalu, which resulted in good engagement and participation of government departments and stakeholders. This played a key role in the implementation of respective activities under each outcome and contributed to an early institutionalization of results. However, implementing a project in a small island with dispersed outer islands comes with high costs, which needs to be considered.

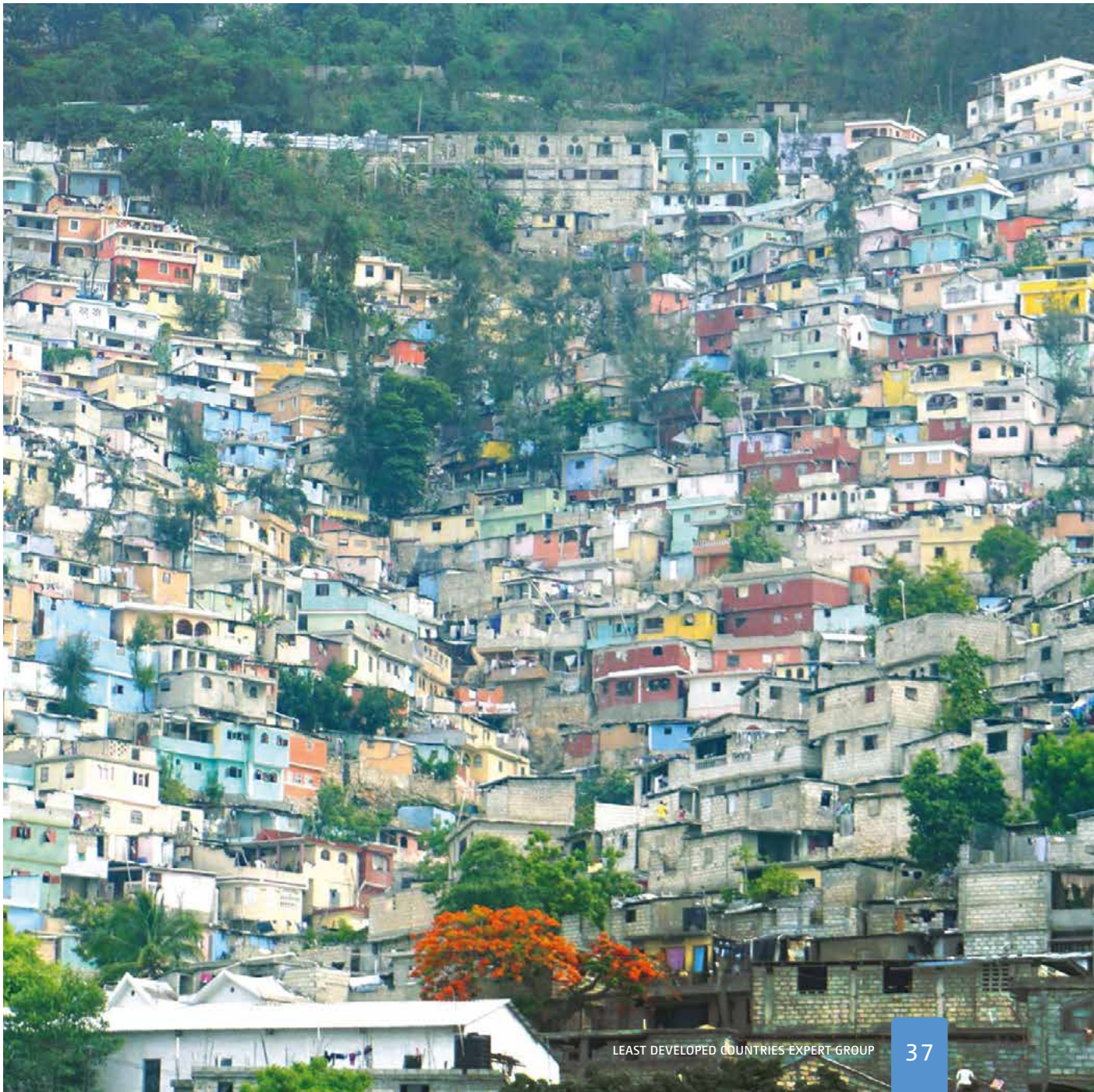
30 | <https://www.thegef.org/projects-operations/projects/4276>.

31 | <https://www.thegef.org/projects-operations/projects/4141>.

32 | <https://www.thegef.org/projects-operations/projects/4714>.

## 4.2.5. Infrastructure

Climate-related shocks and stressors have destabilized infrastructure networks and their capacity to operate and deliver critical services to communities (Thacker, et al., 2021). Adaptation actions for building infrastructure resilience to climate change were integrative and community-based approaches, which included low-cost community infrastructure against climate induced erosion (e.g., terracing, rainwater control, wind breaks), flood-resistant infrastructure, transfer of technologies for climate and environmental monitoring infrastructure, infrastructure risk assessments, and enhanced management capacities of small scale agropastoral infrastructure.





**BOX 8** below provides examples of adaptation actions implemented by the LDCs in building infrastructure resilience to climate change.

#### BOX 8

### Examples of adaptation actions implemented by the LDCs for building infrastructure resilience to climate change

#### INCREASING INFRASTRUCTURE RESILIENCE AGAINST EXTREME WEATHER EVENTS:

In Timor-Leste, the impacts of climate change in the country affected infrastructure through increased risks associated with more frequent and severe droughts and floods, and more fundamental shifts in the hydrological regime undermining the ecosystem services that provide a natural buffer. Hence, its project on *Strengthening the Resilience of Small-Scale Rural Infrastructure and Local Government Systems to Climatic Variability and Risk*<sup>33</sup> looked at physical investments to reduce climate risks. Specifically, it was focused on resilience of small-scale rural infrastructure against droughts, floods, erosion, and landslides. This was achieved through interventions in water supply systems, rural access roads and bridges, reservoirs and irrigation systems, stabilizing riverbanks/flood protection. The project resulted in the construction of 20 climate resilient rural infrastructure projects benefiting over 100,000 people, and 10 Civil Society Organizations implementing soil-bioengineering approaches to strengthen existing rural infrastructure. Similar to its other project on *Upscaling Climate-Proofing in the Transport Sector in Timor-Leste: Sector Wide Approaches*<sup>34</sup>, the project aimed to reduce the vulnerability of road infrastructure by introducing physical measures to counter climate change variability and extreme events, in addition to conducting risk and vulnerability assessments. Specifically, several roads were rehabilitated, widened into international standards with Asphalt Concrete Pavement (ACP) surface course in addition to improving drainage structures to accommodate the larger quantities of runoff. As such, the project introduced bio-engineering activities, succeeded in re-vegetating unstable slopes, and applied vegetated erosion control blankets, which consist of natural fibers able to retain soil and sediments.

#### INFRASTRUCTURE RESILIENCE AGAINST FLOODS:

Climate adaptive infrastructure at its most basic level constitutes the building block for climate resilient, sustainable development. In Benin, low rates of agricultural development coupled with geographically isolated ranges, which offer high agricultural potential, add to existing development constraints in key climate sensitive sectors. *Flood Control and Climate Resilience of Agriculture Infrastructures in Oueme Valley*<sup>35</sup> was implemented to improve and secure agricultural outputs by ensuring the resilience of agricultural infrastructure. The project emphasized flood protection infrastructure as well as climate proofing of food crops storage and other agriculture related infrastructure with the view to ensure food security and agricultural growth. Under this project, flooding risk mapping and climate resilient agriculture infrastructures, such as dikes, were promoted along with flood resistant grain and food crops storage systems. A key lesson learned was to primarily adopt simple management techniques that are manageable by the beneficiaries.

#### EARLY WARNING AND DISASTER RISK MANAGEMENT TO PROTECT INFRASTRUCTURE FROM CLIMATE CHANGE IMPACTS:

Burundi, like many countries, has faced the destructive effects of sea level rise, which has given way to saltwater intrusion, inundation of water sources and spurred the coastal erosion of beaches. Such events have accelerated the salinization of shallow water wells and contaminated the domestic water supply. In response, the project *Community Disaster Risk Management in Burundi*<sup>36</sup> on integrated coastal zone and river basin management was implemented to restore sea level rise protective infrastructure in the country. Agroforestry and forestry interventions were implemented. 1,500 households were trained on erosion control measures through the implementation of water basin terracing techniques, in addition to 267 stakeholders trained on early warning system operations. The project installed several hydrometeorological stations. 755,739 agroforestry and forestry trees were produced and planted on 730 hectares of land, 586 km of erosion control vegetated ditches were installed in Mumirwa, Bugesera and Imbo, and 6,000 m<sup>3</sup> of gabions were installed to stabilize the Ntahangwa riverbank.

33 | <https://www.thegef.org/projects-operations/projects/4696>.

34 | <https://www.thegef.org/projects-operations/projects/5773>.

35 | <https://www.thegef.org/projects-operations/projects/5232>.

36 | <https://www.thegef.org/projects-operations/projects/4990>.



#### CLIMATE-RESILIENT AGROPASTORAL INFRASTRUCTURE:

At the crossroads of North and Central Africa, the impact of floods on rural infrastructure in Chad is exerting economic and environmental damage. As the standing infrastructure is underdeveloped, much can be done to improve its resilience in the face of future uncertainties and climate shocks. As part of Chad's project on *Enhancing the resilience of the agricultural ecosystems*<sup>37</sup>, the expansion of management capacities of small-scale agropastoral infrastructure was undertaken. Furthermore, the development of flood-resistant infrastructure added value for agricultural activities and productions. As a result, 10 hectares of market gardening sites was equipped with boreholes; five productive boreholes were equipped with solar dewatering system (photovoltaic), four seed storages were equipped with a kit of small agricultural equipment (cart, plough, western hoe, seeder and sprayer), 9,623 hectares of degraded land was restored, and 200 hectares was revegetated.

#### WATER HARVESTING AND INFRASTRUCTURE RESILIENCE:

In Somalia, a range of investments in medium and small-scale water infrastructure, flood-control infrastructure, and watershed management techniques were developed to enhance ecosystem resilience of critical watersheds, rangelands, and forested areas. Its project on *Enhancing Climate Resilience of the Vulnerable Communities and Ecosystems in Somalia*<sup>38</sup> climate actions were aimed at the development of resilient infrastructure technologies such as improvement of planning processes to reflect integrated and adaptive strategies. Among its outcomes, the project developed new models of water management infrastructure and facilitated construction of 151 water harvesting infrastructures and 778 ecosystem-based structures, benefiting more than 108,440 households, including 56,388 women headed households. The project brought considerable improvements on the ground for local communities, included and empowered women and vulnerable women, created a foundation for long term solutions, and increased the demand to scale-up adaptation interventions.

### 4.2.6. Resilience of natural ecosystems

Healthy ecosystems, rich in biodiversity, generate highly valuable resources within diverse biomes. These include forests, which in their natural unaltered state possess the ability to host biodiverse species and critical habitats essential for ecosystem resilience. Additionally, tropical forests when preserved have the potential to sequester carbon.



Adaptation actions for building ecosystems resilience included climate-resilient agroforestry and natural regeneration practices, participatory management of protective ecosystems and climate-sensitive natural resources, in addition to climate smart ecosystem rehabilitation and management practices, promotion of sustainable natural resource use and introduction of alternative livelihoods, integrated map-based assessment of climate-related hazards, vulnerabilities, and climate-sensitive natural resources.

<sup>37</sup> | <https://www.thegef.org/projects-operations/projects/5376>.

<sup>38</sup> | <https://www.thegef.org/projects-operations/projects/5592>.

**BOX 9** below provides examples of adaptation actions implemented by the LDCs in building ecosystems resilience to climate change.

BOX 9

## Examples of adaptation actions implemented by the LDCs for building ecosystems resilience to climate change

### RESILIENCE IN NATURAL RESOURCES MANAGEMENT SECTORS:

Nestled amid a sprawling plateau in West Africa, Burkina Faso manages its natural resources through the restoration of wetlands and natural pastures. Its project on *Adapting Natural Resource Dependent Livelihoods to Climate induced Risks in Selected Landscapes in Burkina Faso: the Boucle du Mouhoun Forest Corridor and the Mare d'Oursi Wetlands Basin*<sup>39</sup> was implemented to build the resilience of natural sectors. As a result of the project, knowledge and understanding of climate variability and change-induced risks in the project targeted areas through use of the customized geo-based agroecological and hydrological information systems was increased. In addition, the integration of climate adaptive management of agroecological and hydrological systems into key sectoral planning and investment frameworks with focus on local and regional levels was improved.

### IMPROVED ECOSYSTEM RESILIENCE TO REDUCE LIVELIHOODS VULNERABILITY:

Lesotho's project on *Reducing vulnerability from climate change in the Foothills, Lowlands and the lower Senqu River Basin*<sup>40</sup> was implemented to mainstream climate risk considerations in the Land Rehabilitation Programme of Lesotho for improved ecosystem resilience and reduced vulnerability of livelihoods to climate shocks. As a result of the project, improvements were observed through capacity building of technical staff and communities on climate driven vulnerability and the utilization of land use planning and management to reduce risk, inclusion of a considerable land area under rehabilitation and management practices, and support to mainstream climate change into national strategic development policies.

### INTEGRATED COASTAL ZONE MANAGEMENT:

Madagascar's project on *Adapting Coastal Zone Management to Climate Change in Madagascar Considering Ecosystem and Livelihoods*<sup>41</sup> was implemented to reduce vulnerability of the coastal zone through institutional capacity building and pilot measures. Overall, technical support and equipment was provided to farmers to implement climate-smart agriculture (CSA) in four regions, two community-based resilient livelihoods initiatives were implemented by each region (eight in total), which include but are not limited to: local product processing and valorization; aviculture improvement; compost production and establishment of a community market, establishment of a fish farm; honey certification and commercialization. In addition, the mangrove restoration target of 350 hectares was met (with 372,5 ha rehabilitated, with a survival rate of above 80%).

39 | <https://www.thegef.org/projects-operations/projects/4971>

40 | <https://www.thegef.org/projects-operations/projects/5075>

41 | <https://www.thegef.org/projects-operations/projects/4568>








**Table 2.** Climate change adaptation actions implemented by the LDCs in key economic systems

 Agriculture and food security	 Water security	 Human health <sup>42</sup>
<ul style="list-style-type: none"> <li>• Climate proofing of food crops storage and other agriculture related infrastructure</li> <li>• Adaptive agriculture and land management techniques</li> <li>• Agro-meteorological and decision support information (e.g., satellite monitoring data); climate change forecasts; early warnings</li> <li>• Climate resilient agro-sylvo-pastoral technologies; innovative and indigenous adaptation technologies; cultivation technologies</li> <li>• Low-cost community infrastructure against climate induced erosion (e.g., terracing, rainwater control, wind breaks and other forms of erosion control)</li> <li>• Climate-proofed water management systems</li> <li>• Water conservation practices (e.g., rainwater harvesting); improved irrigation techniques</li> <li>• Improved soil and crop management practices (e.g., climate resilient seed varieties)</li> <li>• Climate resilient alternative livelihoods (i.e., aquaculture, livestock, and agriculture products); diversification of protected crop production; integrated livestock cropping systems</li> <li>• Engagement of seed-multipliers and women's groups in adapted seeds production</li> <li>• Integration of disaster risk management and adaptation practices into agriculture and food policies</li> <li>• Agricultural biodiversity</li> <li>• Flood-resistant agricultural plots</li> </ul>	<ul style="list-style-type: none"> <li>• Small-scale water infrastructure (e.g., small-scale storage reservoirs); climate resilient micro-water harvesting; water conservation techniques</li> <li>• Watershed management; water governance; integrated water resources management</li> <li>• River-bank protection/ flood protection; flood-resistant infrastructure; protection of freshwater supply infrastructure; flood-proofing of communal water supply and storage facilities</li> <li>• Construction of water supply systems; small-scale water saving technologies and distribution systems; low-cost water treatment technologies</li> <li>• Flood preparedness and GLOF risk mitigation</li> <li>• Hydrological model and preventative forecast of water resources availability; hydrometric monitoring tools in watersheds</li> <li>• Restoration of degraded watersheds</li> <li>• Rehabilitation and monitoring of existing and new water structures (reservoirs, terraces, check dams, boreholes, gulleys)</li> <li>• Techniques for efficient water use in crop production systems</li> <li>• Artificial groundwater recharge methods</li> <li>• National strategy for water resources management</li> <li>• Community-based awareness raising on water-use and irrigation management</li> <li>• Integration of climate change considerations into water policies</li> </ul>	<ul style="list-style-type: none"> <li>• Control of water-related diseases/ climate sensitive diseases; vector control</li> <li>• Community awareness of the health impacts of climate change (including water and sanitation)</li> <li>• Epidemics early warning systems: enhanced capacity of the health sector to anticipate and respond to climate-related diseases</li> <li>• Coordination with the Ministry of Health to integrate climate change adaptation and mitigation in health sector policies (including WASH priorities)</li> <li>• Development and implementation of a national health surveillance plan</li> <li>• Surveillance of environmental hazards and climate-sensitive diseases; prevention and management</li> <li>• Promotion of nutrition security for healthier livelihoods</li> </ul>

<sup>42</sup> | Given the limited number of projects that have integrated health considerations into their adaptation planning processes, most of the climate adaptation options in human health are extrapolated from the LDC's NAPA and NAP priority areas.

**Table 2.** Climate change adaptation actions implemented by the LDCs in key economic systems

 Coastal zone resilience	 Infrastructure	 Resilience of natural ecosystems
<ul style="list-style-type: none"> <li>• Measures to respond to coastal flooding and erosion (e.g., mangrove rehabilitation)</li> <li>• Climate proofing for coastal protection infrastructure; resilient sea-level rise protective infrastructure</li> <li>• Restoration of degraded shores</li> <li>• Conservation and management of marine ecosystems; conservation of natural coastal defenses and buffering systems</li> <li>• Diversified climate resilient marine-based coastal livelihoods</li> <li>• Early warning system; island disaster response plans and communication protocols; investment in coastal defense and monitoring; sea-level rise impact monitoring system; hydrometric monitoring tools</li> <li>• Coastal development policies and strategies incorporate climate risk management</li> <li>• Integrated coastal zone management</li> <li>• Participatory coastal vulnerability assessment</li> <li>• Evaluation of coastal management systems</li> <li>• Coastal and land use policies</li> <li>• Technologies for resilient protection and rehabilitation of coastal productive assets</li> <li>• Financial provisions in national budgets for coastal zone management</li> </ul>	<ul style="list-style-type: none"> <li>• Infrastructure risk assessments</li> <li>• Climate-resilient small-scale water infrastructure</li> <li>• Transfer of technologies for climate and environmental monitoring infrastructure; adaptation technologies to protect infrastructure</li> <li>• Enhanced management capacities of small scale agro-pastoral infrastructure</li> <li>• Flood-resistant infrastructure; flood protection infrastructure</li> <li>• Low-cost community infrastructure against climate induced erosion (e.g., terracing, rainwater control, wind breaks)</li> <li>• Maintenance of small-scale rural infrastructure; improved resilience of existing water supply storage and distribution infrastructure</li> <li>• Climate monitoring infrastructure (e.g., EWS) Climate risk management infrastructure</li> <li>• Investment in medium and small-scale water infrastructure; flood-control infrastructure</li> <li>• Ecosystem based adaptation to reduce vulnerability of infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Integrated natural resource management</li> <li>• Participatory management of protective ecosystems and climate-sensitive natural resources</li> <li>• Customized geo-based agro-ecological and hydrological information system</li> <li>• Reduction of livestock overstocking in wetland areas during the dry season</li> <li>• Integrated map-based assessment of climate-related hazards, vulnerabilities, and climate-sensitive natural resources</li> <li>• Climate smart ecosystem rehabilitation and management practices</li> <li>• Promotion of sustainable natural resource use and introduction of alternative livelihoods</li> <li>• Institutional and local capacity building for sustainable management of natural resources</li> <li>• Adaptive landscape</li> <li>• management planning</li> <li>• Climate-resilient agro-forestry and natural regeneration practices</li> </ul>







### 4.3. Early warning systems and disaster risk management

Most LDCs have prioritized and implemented efforts to develop, strengthen, or expand their early warning systems against climate-related events, with almost 70 percent of the LDCs prioritizing their early warning capabilities and 65 percent highlighting the provision of climate risk data and assessments. As for disaster risk reduction, 37 percent of the LDCs have aimed to strengthen their disaster risk management systems. Furthermore, 45 percent of the LDCs have revealed plans to integrate climate change adaptation into national policies. **BOX 10** below provides examples of adaptation actions applied by the LDCs in strengthening or expanding their EWS.



37%

of the LDCs have aimed to strengthen their disaster risk management systems

BOX 10

#### Approaches to strengthening and expanding EWS against climate hazards

##### CAPACITY BUILDING AND SOFT MEASURES:

Through its project on *Promoting climate-resilient development and enhanced adaptive capacity to withstand disaster risks in Angola's Cuvelai River Basin*<sup>43</sup>, Angola enhanced the capacity of hydro-meteorological services, civil authorities, and environmental institutions by establishing a comprehensive Famine and Flood Early Warning System (FFEWS). The project established several training programs for government officers and meteorologist technicians to capture relevant information from the ground and prepare thematic maps that contribute to reduce and manage disasters and climate change threats. The project also supported the training of community extension officers on climate resilient farming methods, seeds collection for research and improvement, creation of community-based organizations related to disaster risk reduction and water resources management, and the rehabilitation of water wells.

##### METEOROLOGY AND HYDROLOGY INFRASTRUCTURE:

In *Strengthening Climate Information and Early Warning Systems in Cambodia to Support Climate Resilient Development and Adaptation to Climate Change*<sup>44</sup>, the project focused on making climate information accessible, timely, and relevant such that it enhances planning and early warning systems. To do so, meteorology and hydrology infrastructure and software was installed, which enabled contextually adapted monitoring of extreme weather events and advancement of meteorological and hydrological forecasting. In particular, 24 meteorological stations, 24 hydrological stations, and 5 are hydrological stations for ground water were installed. The project therefore led to strengthened institutional capacity to operate and maintain EWS and climate information infrastructure. The project further underscored that engagement with development agencies to collaborate and build synergy would achieve the project results in a more cost-effective manner. Seeing as a focus was on sub-national planning for transboundary communication in the region, the project underscored how a country-level project could contribute to the existing regional transboundary EWS mechanism.

<sup>43</sup> | <https://www.thegef.org/projects-operations/projects/5177>.

<sup>44</sup> | <https://www.thegef.org/projects-operations/projects/5318>.

#### CLIMATE RISK REDUCTION AND INTEGRATED COASTAL ZONE MANAGEMENT:

In Guinea, *Increased Resilience and Adaptation to Adverse Impacts of Climate Change in Guinea's Vulnerable Coastal Zones*<sup>45</sup> project implemented climate risk reduction measures among coastal communities, particularly the development of an early warning system to support coastal zone management. As a result, a system to disseminate climate change relevant agrometeorological advice to critical coastal stakeholders was initiated. Appropriate coastal management systems aimed at reducing risks from rising sea levels were also identified, evaluated, and developed for four vulnerable sites in the coastal area and in critical rice-growing plains. Similarly, in response to surges in coastal hazards, Haiti implemented a project on *Strengthening adaptive capacities to address climate change threats on sustainable development strategies for coastal communities in Haiti*<sup>46</sup>, to tackle the integration of climate risk into local disaster preparedness strategies. The project installed meteorological equipment and supported the training of meteorologists. The project worked to create different types of knowledge and communication platforms that could be interpreted by a wide range of stakeholders.

#### ESTABLISHMENT OF MONITORING SYSTEMS:

Equally, the project on *Enhancing Resilience of vulnerable coastal areas to climate change risks in Liberia*<sup>47</sup> emphasizes the development of an early warning system for informing national planners and coastal communities on climate change-related coastal risks. The project emphasized the development of an early warning system for informing national planners and coastal communities on climate change-related coastal risks. The project led to the establishment of a system for monitoring the maintenance of coastal protection measures as well as the establishment and training of a county coastal protection. As such, the capacity in Monserrado County to plan and respond to climate change was strengthened.

#### CAPACITY BUILDING AND INTEGRATION OF CLIMATE INFORMATION INTO DEVELOPMENT PLANS:

Indeed, hydrometeorological monitoring and early warning systems provide the scientific basis for identifying climate-related vulnerabilities at the local level and for informing resilience actions (UN-SPIDER, n.d.). The Gambia is dedicated to upgrading the infrastructure of existing meteorological and hydrological networks to ensure the optimal performance of early warning systems. With the second phase of the *GOTG/GEF/UNEP LDCF NAPA Early Warning Project*<sup>48</sup>, the critical mass of human resources and the capacity required to ensure the operability of EWS was prioritized. The integration of climate information into development plans was further emphasized to provide effective use of hydro-meteorological and environmental information. Support to the Gambia National Meteorological Services led to the elaboration of a 10-year recruitment and retention plan to upgrade skills and capacity of hydro met services. The project also completed the rehabilitation of 2 hydro met stations, 5 conventional stations, and fencing of automatic stations. Targeted climate products were also produced, including monthly bulletins, seasonal forecasts, crop-climate models, and food security bulletins. This information improved the dissemination and uptake of early warning and climate risk information across targeted communities.

The IPCC AR6 WG-II report highlights the range of adaptation options available such as disaster risk management, early warning systems, climate services and risk sharing that have general relevance across sectors and deliver exponential benefits to other adaptation options when integrated (IPCC, 2022). Overall, significant effort has been directed towards the establishment and deployment of climate information early warning systems, which respond to the urgency to translate early warnings into anticipatory action to reduce the impact of climate change and extreme weather events. Such risk informed early action grounded in LDCs would prompt the release of contingency funds for

45 | <https://www.thegef.org/projects-operations/projects/3703>.

46 | <https://www.thegef.org/projects-operations/projects/3733>.

47 | <https://www.thegef.org/projects-operations/projects/3885>.

48 | <https://www.thegef.org/projects-operations/projects/5071>.

emergencies to initiate activities with the goal of reaching the most vulnerable (UNDRR, 2022). For instance, UNDP supports climate information and early warning system projects in 11 African nations (Benin, Burkina Faso, Liberia, Sierra Leone, Sao Tome and Principe, Ethiopia, the Gambia, Uganda, Tanzania, Malawi and Zambia) through its Programme on Climate Information for Resilient Development in Africa (CIRDA) with USD 50 million from the GEF’s LDCF. The programme has enabled vulnerable countries strengthen national climate information systems as well as to benefit from regional coordination through this platform of knowledge management. A focal area of the programme is providing capacity building on meteorological, climate and hydrological observing and forecasting systems, disaster risk management, viable communication systems/processes for disseminating alerts, and the use of alternative cost-effective technologies (UNDP, 2020).

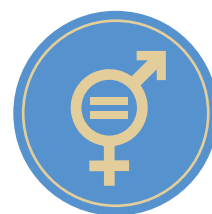
Of late, multi-hazard early warning systems (MHEWS) have been reinforced at the international level. Through the implementation of the Early Warnings for All Action Plan, support would be directed to the most vulnerable as a priority. The UN Global Early Warning Initiative for the Implementation of Climate Adaptation provides an important policy direction to continue to strengthen early warning systems across the world, which will also benefit the LDCs (WMO, 2022).





## 4.4. Gender, youth, and social inclusion

The GEF Independent Evaluation Office programme evaluation of the LDCF found that gender mainstreaming ratings have improved over time across the LDCF portfolio, and that the use of gender analysis during project design is widespread (GEO IEO, 2022). This is partly attributed to the implementation of the GEF's gender equality policy, which requires all projects to include gender analysis before their approval for implementation. It is also important to note that LDCs applied gender as one of the primary criteria in the ranking and appraisal of the priorities identified in their NAPAs. **BOX 11** below provides examples of approaches taken by LDCs to promote inclusivity and gender mainstreaming in their funded projects.



### BOX 11

#### Approaches taken by LDCs to strengthen gender-sensitivity and promote gender mainstreaming in funded projects

##### COMMUNITY-LED INITIATIVES:

São Tome and Príncipe's project on *Enhancing capacities of rural communities to pursue climate resilient livelihood options in the Sao Tome and Principe districts of Caué, Me-Zochi, Principe, Lemba, Cantagalo, and Lobata (CMPLCL)*<sup>49</sup> was implemented to strengthen the resilience of rural community livelihood options in response to climate change. The project engaged community members (both women and men) throughout the decision-making processes, resulting in incorporation of community-led initiatives, that were implemented with the strong participation of the communities, thus ensuring effectiveness and ownership in the long-term. Although the project's design was over ambitious, several interventions such as food processing centers and solar dryers were designed to benefit women and increase in their incomes. It is foreseen that the impacts will continue beyond the project lifetime to see incremental and stronger engagement of community members in the design and implementation of adaptation projects.

##### COMMUNITY-LED INTEGRATED ADAPTATION INTERVENTIONS:

The project *Promoting autonomous adaptation at the community level in Ethiopia*<sup>50</sup> was implemented with the consideration of the importance of community resourcefulness that limits dependence on state funds as communities tailor adaptation technologies and approaches to their specific needs. The communities were engaged by the project to be equal partners as well as learners to test and apply techniques for adding adaptation value to agriculture production. As such, the project engaged 5,043 farmers (2,674 men, 2,369 women). Both men and women farmers changed their agriculture production techniques from the traditional rain-fed subsistence farming practices. About 46% men and 31% women farmers were covered by the crop insurance mechanism based on variability of rainfall between sowing and harvest seasons, and about 42.88% women and 58.64% men farmers effectively used early warning climate information to prepare for the sowing and harvest seasons. The project strengthened the Woreda and Kebele administrations adaptive capacity to reform and regulates the institutional process for planning adaptation actions. Based on the integrated adaptation approach, the project also synthesized lessons learned and envisioned to scale up immediate and short-term adaptation measures linked to long term development actions and goals. The piloted results of the adaptation actions are

49 | <https://www.thegef.org/projects-operations/projects/5184>

50 | <https://www.thegef.org/projects-operations/projects/4222>.

envisioned to be scaled-up in about 150 Woredas in Ethiopia. Moreover, the project demonstrated the capability to convince key stakeholders at the Federal and Woreda institutional level to join and meet a significant demand for adaptation, for the most vulnerable communities.

#### **CAPACITY DEVELOPMENT TRAININGS ON COMMUNITY ADAPTION:**

Nepal increased the *Resilience of communities to climate change through restoration of degraded forests and rangelands*<sup>51</sup>. Its capacity development trainings on community adaption to climate change targeted a wide range of stakeholders, such as local authorities and committees that employ a gender-sensitive approach. By and large, the representation of women and youth at the training workshops and management committees are targeted as a priority. In particular, a national gender action plan was developed, based on which gender responsive activities were implemented, and an average 57% women were found to be engaged in project interventions.

#### **WOMEN EMPOWERMENT THROUGH COMMUNITY-BASED INTERVENTIONS:**

Similar experience exists in many of the LDCs, whereby projects implemented contained a range of activities led by or engaging communities. Such activities include – targeted training activities mostly for women and girls, promotion of income generating activities from agriculture. For example, Congo's *project Improving women's and children's resiliency and capacity to adapt to climate change in the Democratic Republic of the Congo*<sup>52</sup> was a community-based project focusing on the needs of women and children in four provinces with the goal to improve the capacities of rural workers and households to reduce vulnerability of communities to climate change. As a result, 2,014 households including (1,395 female heads of household and 619 male heads of household) adopted resilient means of subsistence in 25 villages, through a variety of income-generating activities and use of seeds/cuttings of resilient varieties. In addition, 25 cooperatives made up of women's groups, young peoples' groups and producers were created in pilot villages and they were involved in diversification activities to consolidate their small businesses through training on rural entrepreneurship, financing, commerce, and access to local financial services.

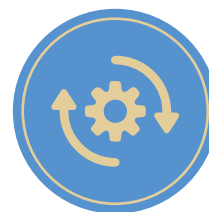
The process to formulate and implement NAPs offers greater opportunities for the LDCs to further strengthen gender-sensitivity and multi-stakeholder engagement in their overall adaptation planning and implementation. The LEG together with the AC and the NAP Global Network developed a toolkit to support to countries to pursue a gender-responsive process to formulate and implement NAPs, to help government actors, other national stakeholders, and development partners supporting adaptation planning and implementation (NAP Global Network & UNFCCC, 2019). Indeed, an analysis of the 39 NAPs submitted by the developing countries as at 31 October 2022 found that 33 of those had identified gender equality and considerations either as a cross-cutting issue, as an objective, as a guiding principle, or as a priority sector in their documents. This provides a valuable foundation and will help guide implementation efforts in the same account.

51 | <https://www.thegef.org/projects-operations/projects/5203>.

52 | <https://www.thegef.org/projects-operations/projects/5226>.

## 4.5. Means of implementation

To sustain the resilience of climate systems, resilience financing needs to be considered at the outset of investment and financing decisions, consistent with a pathway towards climate-resilient development. The mobilization of increased flows of climate adaptation finance by donors, and support for the improvement of national capacities and institutional strengthening would go a long way in generating resource-efficient inclusive economies. 24 percent of the LDCs outlined climate finance and risk insurance plans in their projects. Sudan, for example, systematically spotlighted institutional and technical capacity development for climate observation, forecasting, and EWS together with the deployment of weather index-based insurance and financial services provision. Such actions would increase the adaptive capacity of rural livelihoods through microcredit and microinsurance services, all under the auspices of Sudan's climate risk finance project.<sup>53</sup>



Continuous capacity development is also a critical component to underpin effective actions. 72 percent of the LDCs highlighted capacity building as a priority in their projects. Bangladesh's *National Adaptation Programme of Action*<sup>54</sup> similarly highlighted capacity building as a priority to facilitate the integration of climate change in development planning, infrastructure projects, as well as in land and water management projects. While, the Central African Republic's project on *Agricultural Production and Food Security*<sup>55</sup> emphasized climate resilient technologies and builds awareness and capacity to facilitate the integration of climate change risks and adaptation into agricultural strategies.

43 percent of the LDCs highlighted technology transfer as a priority in their projects, and 61% also stressed the importance of knowledge transfer. Sierra Leone's project featured the transfer of technologies, such as infrastructure for climate and environmental monitoring. It further underscored national capacity development to gather forecasts and integrate data into existing development plans and disaster management systems.<sup>56</sup> In Benin, focus was placed on the demonstration, deployment, and transfer of relevant adaptation technologies in targeted areas, including the capacity building of farmers associations to deliver agricultural extension activities and advisory support services to farmers.<sup>57</sup>

Almost half of the LDCs revealed plans to integrate climate change adaptation into sectoral policies and plans, underscoring a systems-thinking approach to achieve sustainable development. However, gaps in intersectoral and governance-level coordination of climate adaptation priorities and actions in the LDCs were apparent. As such, effective horizontal and vertical coordination synergizes

<sup>53</sup> | <https://www.thegef.org/projects-operations/projects/4958>.

<sup>54</sup> | <https://www.thegef.org/projects-operations/projects/2026>.

<sup>55</sup> | <https://www.thegef.org/projects-operations/projects/4318>.

<sup>56</sup> | <https://www.thegef.org/projects-operations/projects/4993>.

<sup>57</sup> | <https://www.thegef.org/projects-operations/projects/5002>.



implementation efforts across climate-sensitive sectors and at all levels of governance. Several countries sought to integrate climate change adaptation into development planning and prioritize climate change adaptation markers in national budgeting processes.

By prioritizing policy coherence and achieving adaptation options with a positive environment-socioeconomic nexus, the likelihood of sustaining environmental benefits of project outputs is much higher as well. Markings of sustainable projects under this set of actions include integrated programming and the transfer of cost-effective and appropriate technologies.



## 4.6. Monitoring and evaluation systems

Monitoring and evaluation systems are integral to enabling informed decision-making. At a basic level, monitoring and evaluation systems can identify bottlenecks in implementation and thereby the recalibration of programme- and project-level performance measures and results. Certainly, the capacity of monitoring systems to promote accountability of results and support continuous learning and improvement, fosters the achievement of results in a timely and effective manner (UNESCAP, n.d.).



*Mainstreaming Ecosystem-based Approaches to Climate-resilient Rural Livelihoods*<sup>58</sup> in Senegal brought attention to its information management systems, including the monitoring of vegetative stages and water availability, and the carrying capacity of dry rangelands and flood plains. From an operational lens, it underscored the establishment of a project monitoring system that provides systematic information on progress in meeting project outputs and outcomes, and the production of timely biannual progress reports and evaluations.

Equally, Niger's project on *Integrating climate resilience into agricultural and pastoral production for food security*<sup>59</sup> shared its monitoring capacity to track data on progress in achieving project targets in addition to the preparation of the mid-term and final evaluations. Furthermore, the project played a catalytic role in assisting in the transfer of lessons learned from other GEF-funded projects in Niger and from neighbouring countries such as Burkina Faso, Benin, and Mali.

With respect to knowledge, data management and monitoring and evaluation, the project in Mauritania<sup>60</sup> ensured that lessons learned, and associated knowledge products were produced and disseminated, and that monitoring, and evaluation reports were generated. It also sought to improve the dissemination of approaches, measures, and practices to enhance resilience to climate change.

The establishment of robust monitoring and evaluation systems in the LDCs is a well-documented challenge. Local and national capacity development combined with sustained support from international donors is critical to generate benefits including good governance and evidence-based policy making. Several LDCs sought to establish project monitoring systems that provide systematic information on progress in meeting project outputs and outcomes, and the production of timely biannual progress reports and evaluations.

58 | <https://www.thegef.org/projects-operations/projects/5503>.

59 | <https://www.thegef.org/projects-operations/projects/4702>.

60 | <https://www.thegef.org/projects-operations/projects/5190>.







## 5. | LESSONS LEARNED IN IMPLEMENTATING ADAPTATION PROJECTS

To achieve impact at scale and the likelihood of broader adoption of successful projects, quality project design at the planning stages of an intervention is essential. The identification of lessons learned illuminates both the positive experiences and challenges of the LDCs in the implementation of adaptation projects. Emerging practices from the design and implementation of adaptation projects from the NAPAs include the following:

- ▶ Common sustainability features of the projects included mainstreaming, replication, scaling up, sustaining, and market change (GEO IEO, 2022). Additional determinants were integrated programming, clear governance structures, availability of follow-on funding, identification of relevant approaches to long-term adaptation planning (e.g., adaptation pathways method, ecosystem-based adaptation, community-based adaptation, risk-based approach, programmatic approach, or livelihood diversification), and the transfer of cost-effective and appropriate technologies;

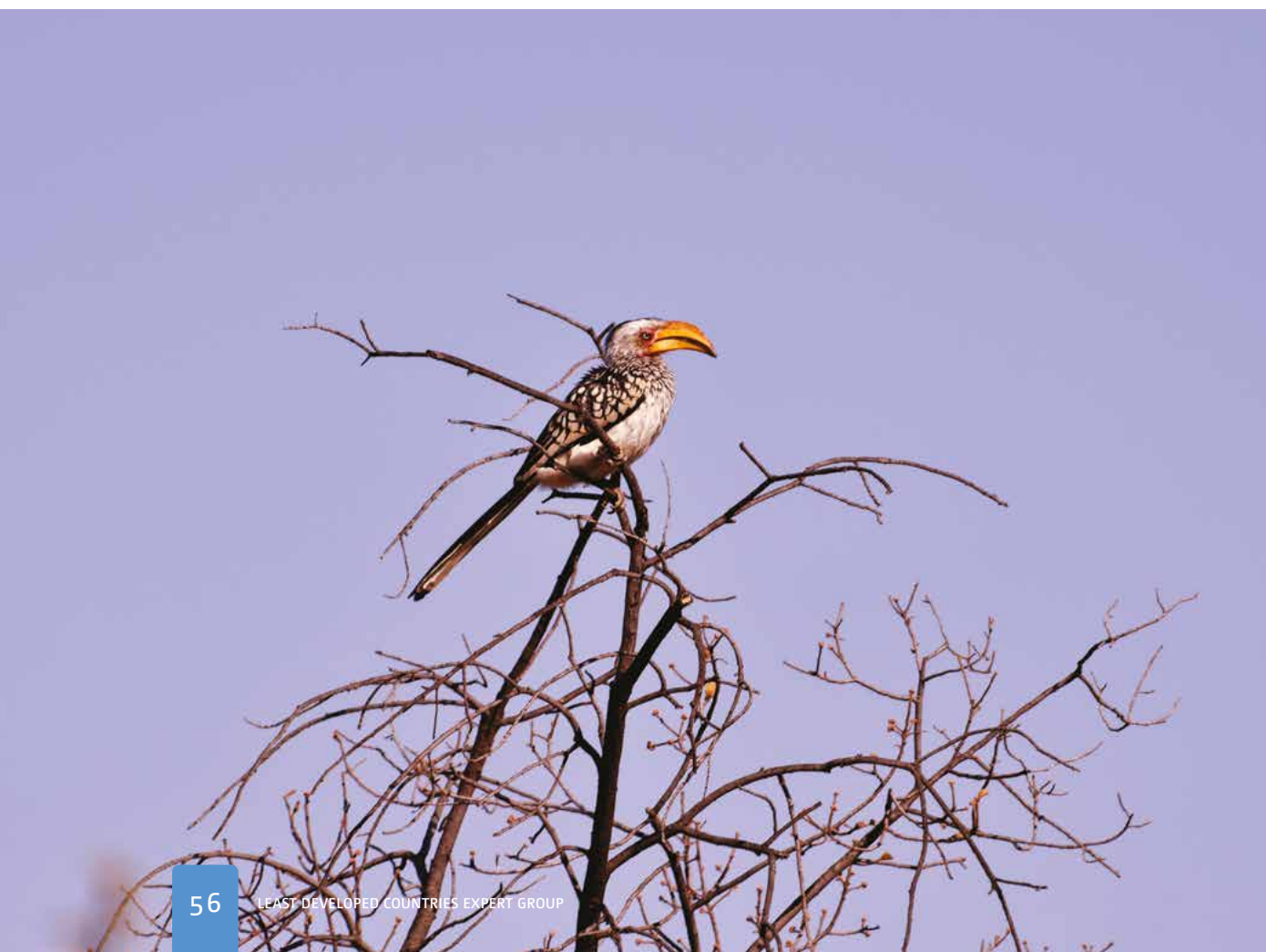


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- ▶ The NAPAs were grounded on key principles that include a participatory process, involvement of stakeholders (particularly local communities), multidisciplinary approach, a complementary approach, building upon existing plans and programmes, including national action plans under the United Nations Convention to Combat Desertification, national biodiversity strategies and action plans under the Convention on Biological Diversity, and national sectoral policies, and the links to sustainable development. These are the key elements on other emerging approaches such as locally led adaptation, which hold greater potential to improve effectiveness of adaptation actions;
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- ▶ By prioritizing policy coherence and achieving adaptation options with a positive environment social and economic nexus, the likelihood of sustaining environmental benefits of project outputs became much higher. However, further work is needed in deepening the understanding and approaches to facilitate coherence and synergy across different issues;
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- ▶ The implementing agencies of the LDCF were encouraged to conduct gender analysis to understand women's and men's different activities and responsibilities, and their access to resources and decision-making. Consequently, the project results frameworks for the LDCF included sex-disaggregated indicators, and gender was integrated into all results frameworks and operational guidance as appropriate. Overall, this helped to create an increase in the number of projects performing gender analyses, as well as gender mainstreaming plans;





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- ▶ Project design is a major component that affects the effectiveness and sustainability of outcomes and should factor in a country's socioeconomic and political context, and local knowledge. This helped ensure sustainability;
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- ▶ In many LDCs profitable income-generating activities and alternative livelihood activities significantly contributed towards sustainability of projects. Indeed, financial resources fall among the four dimensions of sustainability (financial, institutional, environmental, and political) despite ranking low across the LDCs for obvious resource constraints. Detailing financial arrangements in project design that deliver sustained benefits long after project completion therefore remains essential in the LDCs;
- 
- ▶ While projects in the LDCs tend to exhibit lower ratings compared to other developed/developing countries, newly completed projects (from 2005 onwards) in the LDCs have higher ratings than those completed in early years (i.e., 2007-2014), thereby showing an improvement in project quality over time;
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- ▶ Given the limited human and institutional capacities to address complex technical issues in the LDCs, integrating adaptation across different levels and systems can increase impact. Notwithstanding the gaps in intersectoral and governance-level coordination, some countries were continuously implementing activities to facilitate the integration of climate change adaptation into development planning and prioritize climate change adaptation markers in national budgeting processes.
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Evaluation findings also shows that long-term sustainability of achievements remains a challenge in the LDCs, which may be attributed to context and project related factors. Examining the areas where LDCs faced challenges during project implementation can also shed light for future efforts. Below are a few cross-cutting challenges encountered by the LDCs in implementing their projects:

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- ▶ The process of accessing funding for adaptation remains a key challenge for the LDCs. Further support can be deployed to the LDCs in need of special technical assistance (GEO IEO, 2022);

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  - ▶ In several instances, fragile contexts have adversely affected the timely delivery of project outputs, positive outcomes, and sustainability of interventions in the LDCs. State-level insecurity and the rise of fragile situations significantly interrupted project implementation;

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  - ▶ Funding for NAPAs did not have the programmatic framework to address future climate risks based on long-term planning horizons. This has resulted in the LDCs largely implementing pilot projects and projects with limited geographical and temporal scope;

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  - ▶ Despite targeted investment, institutional frameworks in some LDCs remain incomplete or fragmented. Institutional support to the LDCs is mainly focused on assisting countries develop their environmental policy, legal, and regulatory frameworks.
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The GEF IEO provides a selection of projects that could be replicated or scaled up based on post-completion sustainability ratings for field-verified climate change projects in the LDCs. Key themes identified that are common and critical across the LDCs and demonstrate the potential for replication and scale-up are early warning systems, climate risk data and assessments, agriculture, water resources, sustainable land management as well as natural resources and ecosystem management.



## 6. | CONCLUSION

The following key recommendations for designing future adaptation projects in the LDCs provide specific actions that may be undertaken in response to challenges and shortcomings outlined by the LDCs.

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- ▶ **STRENGTHEN PROJECT DESIGN TO ENHANCE SUSTAINABILITY OF OUTCOMES:** Although the path towards ensuring sustainability is a gradual process, a well-designed project should incorporate financial and institutional measures and actions that promote the continued delivery of outcomes beyond the life of the project. Furthermore, special focus on financial sustainability should be provided to projects and programs in African LDCs (Nwamarah, et al., 2018).
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- ▶ **PURSUE FOLLOW-ON FINANCING ARRANGEMENTS:** GCF support will allow the LDCs to plan and attract more funding for resilient futures by bolstering their adaptation planning processes. During the process to formulate the NAP through the GCF Readiness Programme, developing country Parties may also avail themselves of the resources to prepare project concepts and conduct the requisite baseline surveys or feasibility studies to strengthen their planning processes.
- 
- ▶ **BOLSTER THE SYSTEMIC PROCESSES OF INSTITUTIONS TO EFFECTIVELY MANAGE CLIMATE FUNDS:** While the importance of financial sustainability has been sufficiently emphasized, the ways in which climate funds are managed is of equal importance. Improvements to the institutional capacities and mechanisms of national governments and scientific institutions to absorb and effectively manage large climate funds is crucial.
- 
- ▶ **ENHANCE POLICY COHERENCE AND GOVERNANCE-LEVEL COORDINATION:** Effective horizontal and vertical coordination reduces transactional costs and synergizes implementation efforts across climate-sensitive sectors and at all levels of governance. Moreover, directing valuable resources towards high-impacts areas that offer co-benefits and advance the mobilization of private finance will directly promote the effectiveness of adaptation interventions across LDCs and reduce vulnerability in the long-run.
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- ▶ **DERIVE CO-BENEFITS OF THE GEF PARTNERSHIP FOR THE LDCS THAT ALSO INCLUDE SIDS:** There is need to enhance dialogue with governments and other key stakeholders in the LDCs that are also SIDS, centered on their collective thematic and regional competencies that can be strengthened when combined.
- 
- ▶ **UTILIZE AVAILABLE CLIMATE POLICIES AND PLANS AS A LAUNCH PAD FOR NAPs:** Existing national climate policies serve as a solid basis for initiating the process to formulate and implement NAPs. The NAP process is iterative in that it demonstrates the capacity to adjust, integrate, and develop climate adaptation interventions that are currently underway.

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- ▶ **ENSURE COMPREHENSIVE RISK MANAGEMENT ACROSS ALL KEY SECTORS:** Common hazards identified in the NAPs were floods, drought, rising temperature, sea level rise, and an increasing incidence of vector- and waterborne diseases. However, few projects addressed the health impacts of climate change despite frequent references to health and well-being in both the NAPAs and NAPs. At the national and regional level, government and donors would greatly benefit from diversifying investments in the environmental sector to tackle threats to sustainability.

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  - ▶ **INCREASE INCOME STREAMS AND IMPROVE SOCIAL SUPPORT MEASURES THROUGH LIVELIHOOD DIVERSIFICATION ACTIVITIES:** Profitable income-generating activities underpinned by livelihoods and economic diversification strategies are critical for ensuring sustainability of outcomes across the LDCs.

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  - ▶ **STRENGTHEN CAPACITY BUILDING PROCESSES AND STAKEHOLDER ENGAGEMENT TO ENHANCE ADAPTATION IMPLEMENTATION:** Capacity development or readiness for implementation is a critical feature of sustainable climate adaptation interventions in the LDCs. The sustainability of projects has been most effective when interventions support institutional and human capacity development and promote livelihood activities grounded on community-based approaches.





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## Annex 1. List of LDCF funded NAPA projects considered in the analysis

Country	Region	Project Title	GEF Project ID	LDCF Grant (US \$ million)	Co-financing (US \$ million)	Web-link
<b>Afghanistan</b>	<b>Asia</b>	Strengthening the Resilience of Rural Livelihood Options for Afghan Communities in Panjshir, Balkh, Uruzgan and Herat Provinces to Manage Climate Change-induced Disaster Risks	5202	9,000,000	103,000,000	<a href="https://www.thegef.org/projects-operations/projects/5202">https://www.thegef.org/projects-operations/projects/5202</a>
<b>Angola</b>	<b>Africa</b>	Promoting Climate-resilient Development and Enhanced Adaptive Capacity to Withstand Disaster Risks in Angola's Cuvelai River Basin	5177	8,200,000	46,473,004	<a href="https://www.thegef.org/projects-operations/projects/5177">https://www.thegef.org/projects-operations/projects/5177</a>
<b>Bangladesh</b>	<b>Asia</b>	Integrating Community-based Adaptation into Afforestation and Reforestation Programmes in Bangladesh	4700	5,650,000	47,000,000	<a href="https://www.thegef.org/projects-operations/projects/4700">https://www.thegef.org/projects-operations/projects/4700</a>
<b>Bangladesh</b>	<b>Asia</b>	Community Based Adaptation to Climate Change through Coastal Afforestation	3287	3,300,000	7,100,000	<a href="https://www.thegef.org/projects-operations/projects/3287">https://www.thegef.org/projects-operations/projects/3287</a>
<b>Benin</b>	<b>Africa</b>	Flood Control and Climate Resilience of Agriculture Infrastructures in Oueme Valley	5232	7,200,000	67,639,000	<a href="https://www.thegef.org/projects-operations/projects/5232">https://www.thegef.org/projects-operations/projects/5232</a>
<b>Benin</b>	<b>Africa</b>	Strengthening Climate Information and Early Warning Systems in Western and Central Africa for Climate Resilient Development and Adaptation to Climate Change	5002	4,000,000	14,511,549	<a href="https://www.thegef.org/projects-operations/projects/5002">https://www.thegef.org/projects-operations/projects/5002</a>
<b>Benin</b>	<b>Africa</b>	Integrated Adaptation Programme to Combat the Effects of Climate Change on Agricultural Production and Food Security	3704	3,410,000	7,879,900	<a href="https://www.thegef.org/projects-operations/projects/3704">https://www.thegef.org/projects-operations/projects/3704</a>
<b>Bhutan</b>	<b>Asia</b>	Addressing the Risk of Climate-induced Disasters through Enhanced National and Local Capacity for Effective Actions	4976	11,491,200	54,539,829	<a href="https://www.thegef.org/projects-operations/projects/4976">https://www.thegef.org/projects-operations/projects/4976</a>
<b>Bhutan</b>	<b>Asia</b>	Reducing Climate Change-induced Risks and Vulnerabilities from Glacial Lake Outbursts in the Punakha-Wangdi and Chamkhar Valleys	3219	3,445,050	4,036,224	<a href="https://www.thegef.org/projects-operations/projects/3219">https://www.thegef.org/projects-operations/projects/3219</a>
<b>Burkina Faso</b>	<b>Africa</b>	Integrating Climate Resilience into Agricultural and Pastoral Production for Food Security in Vulnerable Rural Areas Through the Farmers Field School Approach.	5014	3,810,000	19,435,000	<a href="https://www.thegef.org/projects-operations/projects/5014">https://www.thegef.org/projects-operations/projects/5014</a>
<b>Burkina Faso</b>	<b>Africa</b>	Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change - Burkina Faso	5003	4,000,000	61,090,525	<a href="https://www.thegef.org/projects-operations/projects/5003">https://www.thegef.org/projects-operations/projects/5003</a>
<b>Burkina Faso</b>	<b>Africa</b>	Adapting Natural Resource Dependent Livelihoods to Climate induced Risks in Selected Landscapes in Burkina Faso: the Boucle du Mouhoun Forest Corridor and the Mare d'Oursi Wetlands Basin	4971	7,000,000	30,672,541	<a href="https://www.thegef.org/projects-operations/projects/4971">https://www.thegef.org/projects-operations/projects/4971</a>
<b>Burkina Faso</b>	<b>Africa</b>	Strengthening Adaptation Capacities and Reducing the Vulnerability to Climate Change in Burkina Faso	3684	2,900,000	20,094,595	<a href="https://www.thegef.org/projects-operations/projects/3684">https://www.thegef.org/projects-operations/projects/3684</a>
<b>Burundi</b>	<b>Africa</b>	Community Disaster Risk Management in Burundi	4990	8,715,000	27,000,000	<a href="https://www.thegef.org/projects-operations/projects/4990">https://www.thegef.org/projects-operations/projects/4990</a>
<b>Burundi</b>	<b>Africa</b>	Enhancing Climate Risk Management and Adaptation in Burundi (ECRAMB)	3701	3,080,000	15,660,000	<a href="https://www.thegef.org/projects-operations/projects/3701">https://www.thegef.org/projects-operations/projects/3701</a>
<b>Cambodia</b>	<b>Asia</b>	Reducing the Vulnerability of Cambodian Rural Livelihoods through Enhanced sub-national Climate Change Planning and Execution of Priority Actions	5419	4,567,500	15,860,000	<a href="https://www.thegef.org/projects-operations/projects/5419">https://www.thegef.org/projects-operations/projects/5419</a>
<b>Cambodia</b>	<b>Asia</b>	Strengthening Climate Information and Early Warning Systems in Cambodia to Support Climate Resilient Development and Adaptation to Climate Change	5318	4,910,285	21,884,540	<a href="https://www.thegef.org/projects-operations/projects/5318">https://www.thegef.org/projects-operations/projects/5318</a>
<b>Cambodia</b>	<b>Asia</b>	Strengthening the Adaptive Capacity and Resilience of Rural Communities Using Micro Watershed Approaches to Climate Change and Variability to Attain Sustainable Food Security	4434	5,174,364	25,728,477	<a href="https://www.thegef.org/projects-operations/projects/4434">https://www.thegef.org/projects-operations/projects/4434</a>
<b>Cambodia</b>	<b>Asia</b>	Vulnerability Assessment and Adaptation Programme for Climate Change in the Coastal Zone of Cambodia Considering Livelihood Improvement and Ecosystems	3890	1,635,000	4,195,000	<a href="https://www.thegef.org/projects-operations/projects/3890">https://www.thegef.org/projects-operations/projects/3890</a>
<b>Cambodia</b>	<b>Asia</b>	Promoting Climate-Resilient Water Management and Agricultural Practices	3404	1,850,000	2,240,350	<a href="https://www.thegef.org/projects-operations/projects/3404">https://www.thegef.org/projects-operations/projects/3404</a>

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Country	Region	Project Title	GEF Project ID	LDCF Grant (US \$ million)	Co-financing (US \$ million)	Web-link
Central African Republic	Africa	Reducing Rural and Urban Vulnerability to Climate Change by the Provision of Water Supply	5504	7,140,000	21,469,000	<a href="https://www.thegef.org/projects-operations/projects/5504">https://www.thegef.org/projects-operations/projects/5504</a>
Central African Republic	Africa	Integrated Adaptation Programme to Combat the Effects of Climate Change on Agricultural Production and Food Security in CAR	4318	2,780,000	41,990,000	<a href="https://www.thegef.org/projects-operations/projects/4318">https://www.thegef.org/projects-operations/projects/4318</a>
Central African Republic	Africa	National Adaptation Plan of Action for the Central African Republic	2425	200,000		<a href="https://www.thegef.org/projects-operations/projects/2425">https://www.thegef.org/projects-operations/projects/2425</a>
Chad	Africa	Enhancing the Resilience of the Agricultural Ecosystems	5376	7,305,936	24,500,000	<a href="https://www.thegef.org/projects-operations/projects/5376">https://www.thegef.org/projects-operations/projects/5376</a>
Comoros	Africa	Enhancing Adaptive Capacity and Resilience to Climate Change in the Agriculture Sector in Comoros	4974	8,990,890	38,309,621	<a href="https://www.thegef.org/projects-operations/projects/4974">https://www.thegef.org/projects-operations/projects/4974</a>
Comoros	Africa	Adapting Water Resource Management in Comoros to Increase Capacity to Cope with Climate Change	3857	3,740,000	9,316,318	<a href="https://www.thegef.org/projects-operations/projects/3857">https://www.thegef.org/projects-operations/projects/3857</a>
Democratic Republic of the Congo	Africa	Resilience of Muanda's Communities from Coastal Erosion, Democratic Republic of Congo	5280	5,355,000	11,500,000	<a href="https://www.thegef.org/projects-operations/projects/5280">https://www.thegef.org/projects-operations/projects/5280</a>
Democratic Republic of the Congo	Africa	Improving Women and Children's Resilience and Capacity to Adapt to Climate Change in the Democratic Republic of the Congo.	5226	4,725,000	15,500,000	<a href="https://www.thegef.org/projects-operations/projects/5226">https://www.thegef.org/projects-operations/projects/5226</a>
Democratic Republic of the Congo	Africa	Building the Capacity of the Agriculture Sector in DR Congo to Plan for and Respond to the Additional Threats Posed by Climate Change on Food Production and Security	3718	3,000,000	4,050,000	<a href="https://www.thegef.org/projects-operations/projects/3718">https://www.thegef.org/projects-operations/projects/3718</a>
Djibouti	Africa	Supporting Rural Community Adaptation to Climate Change in Mountain Regions of Djibouti	5332	5,379,452	28,630,000	<a href="https://www.thegef.org/projects-operations/projects/5332">https://www.thegef.org/projects-operations/projects/5332</a>
Djibouti	Africa	Implementing Adaptation Technologies in Fragile Ecosystems of Djibouti's Central Plains	5021	7,360,000	14,170,000	<a href="https://www.thegef.org/projects-operations/projects/5021">https://www.thegef.org/projects-operations/projects/5021</a>
Djibouti	Africa	Implementing NAPA Priority Interventions to Build Resilience in the most Vulnerable Coastal Zones in Djibouti	3408	2,070,000	2,405,000	<a href="https://www.thegef.org/projects-operations/projects/3408">https://www.thegef.org/projects-operations/projects/3408</a>
Ethiopia	Africa	Strengthening Climate Information and Early Warning Systems to Support Climate Resilient Development and Adaptation to Climate Change	4992	4,900,000	33,336,410	<a href="https://www.thegef.org/projects-operations/projects/4992">https://www.thegef.org/projects-operations/projects/4992</a>
Ethiopia	Africa	Promoting Autonomous Adaptation at the community level in Ethiopia	4222	5,307,885	24,721,020	<a href="https://www.thegef.org/projects-operations/projects/4222">https://www.thegef.org/projects-operations/projects/4222</a>
Gambia	Africa	Strengthening Climate Services and Early Warning Systems in the Gambia for Climate Resilient Development and Adaptation to Climate Change – 2nd Phase of the GOTG/GEF/UNEP LDCF NAPA Early Warning Project	5071	8,000,000	21,510,000	<a href="https://www.thegef.org/projects-operations/projects/5071">https://www.thegef.org/projects-operations/projects/5071</a>
Guinea	Africa	Increased Resilience and Adaptation to Adverse Impacts of Climate Change in Guinea's Vulnerable Coastal Zones	3703	2,970,000	162,885,000	<a href="https://www.thegef.org/projects-operations/projects/3703">https://www.thegef.org/projects-operations/projects/3703</a>
Guinea Bissau	Africa	Strengthening Resilience and Adaptive Capacity to Climate Change in Guinea-Bissau's Agrarian and Water Sectors	4019	4,000,000	19,954,431	<a href="https://www.thegef.org/projects-operations/projects/4019">https://www.thegef.org/projects-operations/projects/4019</a>
Haiti	Caribbean	Strengthening Climate Resilience and Reducing Disaster Risk in Agriculture to Improve Food Security in Haiti Post Earthquake	4447	2,727,000	9,329,724	<a href="https://www.thegef.org/projects-operations/projects/4447">https://www.thegef.org/projects-operations/projects/4447</a>
Haiti	Caribbean	Strengthening Adaptive Capacities to Address Climate Change Threats on Sustainable Development Strategies for Coastal Communities in Haiti	3733	3,500,000	9,780,000	<a href="https://www.thegef.org/projects-operations/projects/3733">https://www.thegef.org/projects-operations/projects/3733</a>
Kiribati	Oceania	Enhancing National Food Security in the Context of Global Climate Change	5414	4,446,210	7,140,000	<a href="https://www.thegef.org/projects-operations/projects/5414">https://www.thegef.org/projects-operations/projects/5414</a>
Kiribati	Oceania	Increasing Resilience to Climate Variability and Hazards	4068	3,000,000	7,800,000	<a href="https://www.thegef.org/projects-operations/projects/4068">https://www.thegef.org/projects-operations/projects/4068</a>
Lao People's Democratic Republic	Asia	Climate Adaptation in Wetlands Areas (CAWA)	5489	4,717,579	15,367,380	<a href="https://www.thegef.org/projects-operations/projects/5489">https://www.thegef.org/projects-operations/projects/5489</a>



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Country	Region	Project Title	GEF Project ID	LDCF Grant (US \$ million)	Co-financing (US \$ million)	Web-link
Lao People's Democratic Republic	Asia	Effective Governance for Small Scale Rural Infrastructure and Disaster Preparedness in a Changing Climate	4554	4,700,000	30,872,896	<a href="https://www.thegef.org/projects-operations/projects/4554">https://www.thegef.org/projects-operations/projects/4554</a>
Lao People's Democratic Republic	Asia	Improving the Resilience of the Agriculture Sector in Lao PDR to Climate Change Impacts	4034	4,445,450	7,718,548	<a href="https://www.thegef.org/projects-operations/projects/4034">https://www.thegef.org/projects-operations/projects/4034</a>
Lesotho	Africa	Strengthening Capacity for Climate Change Adaptation through Support to Integrated Watershed Management Programme in Lesotho	5124	3,592,694	8,437,000	<a href="https://www.thegef.org/projects-operations/projects/5124">https://www.thegef.org/projects-operations/projects/5124</a>
Lesotho	Africa	Reducing Vulnerability from Climate Change in the Foothills, Lowlands and the Lower Senqu River Basin	5075	8,398,172	27,600,000	<a href="https://www.thegef.org/projects-operations/projects/5075">https://www.thegef.org/projects-operations/projects/5075</a>
Lesotho	Africa	Adaptation of Small-scale Agriculture (LASAP)	4453	4,330,000	21,146,000	<a href="https://www.thegef.org/projects-operations/projects/4453">https://www.thegef.org/projects-operations/projects/4453</a>
Lesotho	Africa	Improvement of Early Warning System to Reduce Impacts of Climate Change and Capacity Building to Integrate Climate Change into Development Plans	3841	1,735,000	2,721,500	<a href="https://www.thegef.org/projects-operations/projects/3841">https://www.thegef.org/projects-operations/projects/3841</a>
Liberia	Africa	Strengthening Liberia's Capability to Provide Climate Information and Services to Enhance Climate Resilient Development and Adaptation to Climate Change	4950	6,730,000	11,859,700	<a href="https://www.thegef.org/projects-operations/projects/4950">https://www.thegef.org/projects-operations/projects/4950</a>
Liberia	Africa	Enhancing Resilience to Climate Change by Mainstreaming Adaption Concerns into Agricultural Sector Development in Liberia	4268	2,381,400	6,345,122	<a href="https://www.thegef.org/projects-operations/projects/4268">https://www.thegef.org/projects-operations/projects/4268</a>
Liberia	Africa	Enhancing Resilience of Vulnerable Coastal Areas to Climate Change Risks	3885	4,900,000	4,653,420	<a href="https://www.thegef.org/projects-operations/projects/3885">https://www.thegef.org/projects-operations/projects/3885</a>
Madagascar	Africa	Enabling Climate Resilience in the Agriculture Sector in the Southwest Region of Madagascar	5233	6,272,000	37,200,000	<a href="https://www.thegef.org/projects-operations/projects/5233">https://www.thegef.org/projects-operations/projects/5233</a>
Madagascar	Africa	Adapting Coastal Zone Management to Climate Change in Madagascar Considering Ecosystem and Livelihoods	4568	5,337,500	12,050,000	<a href="https://www.thegef.org/projects-operations/projects/4568">https://www.thegef.org/projects-operations/projects/4568</a>
Malawi	Africa	Implementing Urgent Adaptation Priorities Through Strengthened Decentralized and National Development Plans.	5015	4,500,000	6,561,341	<a href="https://www.thegef.org/projects-operations/projects/5015">https://www.thegef.org/projects-operations/projects/5015</a>
Malawi	Africa	Strengthening Climate Information and Early Warning Systems in Malawi to Support Climate Resilient Development and Adaptation to Climate Change	4994	4,000,000	11,294,907	<a href="https://www.thegef.org/projects-operations/projects/4994">https://www.thegef.org/projects-operations/projects/4994</a>
Malawi	Africa	Climate Proofing Local Development Gains in Rural and Urban Areas of Machinga and Mangochi Districts	4797	5,318,200	36,000,000	<a href="https://www.thegef.org/projects-operations/projects/4797">https://www.thegef.org/projects-operations/projects/4797</a>
Malawi	Africa	Climate Adaptation for Rural Livelihoods and Agriculture (CARLA)	3302	3,000,000	6,288,000	<a href="https://www.thegef.org/projects-operations/projects/3302">https://www.thegef.org/projects-operations/projects/3302</a>
Mali	Africa	Strengthening the Resilience of Women Producer Group's and Vulnerable Communities in Mali	5192	5,460,000	16,500,000	<a href="https://www.thegef.org/projects-operations/projects/5192">https://www.thegef.org/projects-operations/projects/5192</a>
Mali	Africa	Strengthening Resilience to Climate Change through Integrated Agricultural and Pastoral Management in the Sahelian zone in the Framework of the Sustainable Land Management Approach	4822	2,172,727	14,247,259	<a href="https://www.thegef.org/projects-operations/projects/4822">https://www.thegef.org/projects-operations/projects/4822</a>
Mali	Africa	Integrating Climate Resilience into Agricultural Production for Food Security in Rural Areas	3979	2,106,818	4,500,000	<a href="https://www.thegef.org/projects-operations/projects/3979">https://www.thegef.org/projects-operations/projects/3979</a>
Mali	Africa	Enhancing Adaptive Capacity and Resilience to Climate Change in the Agriculture Sector in Mali	3776	2,340,000	8,477,300	<a href="https://www.thegef.org/projects-operations/projects/3776">https://www.thegef.org/projects-operations/projects/3776</a>
Mauritania	Africa	Improving Climate Resilience of Water Sector Investments with Appropriate Climate Adaptive Activities for Pastoral and Forestry Resources in Southern Mauritania	5190	6,350,000	14,580,000	<a href="https://www.thegef.org/projects-operations/projects/5190">https://www.thegef.org/projects-operations/projects/5190</a>
Mauritania	Africa	Support to the Adaptation of Vulnerable Agricultural Production Systems	3893	3,500,000	10,473,000	<a href="https://www.thegef.org/projects-operations/projects/3893">https://www.thegef.org/projects-operations/projects/3893</a>

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Country	Region	Project Title	GEF Project ID	LDCF Grant (US \$ million)	Co-financing (US \$ million)	Web-link
Mozambique	Africa	Strengthening Capacities of Agricultural Producers to Cope with Climate Change for Increased Food Security through the Farmers Field School Approach	5433	9,000,000	27,344,657	<a href="https://www.thegef.org/projects-operations/projects/5433">https://www.thegef.org/projects-operations/projects/5433</a>
Mozambique	Africa	Adaptation in the Coastal Zones of Mozambique	4276	4,433,000	9,677,000	<a href="https://www.thegef.org/projects-operations/projects/4276">https://www.thegef.org/projects-operations/projects/4276</a>
Nepal	Asia	Catalysing Ecosystem Restoration for Climate Resilient Natural Capital and Rural Livelihoods in Degraded Forests and Rangelands of Nepal	5203	5,246,475	11,039,000	<a href="https://www.thegef.org/projects-operations/projects/5203">https://www.thegef.org/projects-operations/projects/5203</a>
Nepal	Asia	Reducing Vulnerability and Increasing Adaptive Capacity to Respond to Impacts of Climate Change and Variability for Sustainable Livelihoods in Agriculture Sector in Nepal	5111	2,689,498	12,990,000	<a href="https://www.thegef.org/projects-operations/projects/5111">https://www.thegef.org/projects-operations/projects/5111</a> <a href="https://www.thegef.org/projects-operations/projects/4551">https://www.thegef.org/projects-operations/projects/4551</a>
Nepal	Asia	Community Based Flood and Glacial Lake Outburst Risk Reduction	4551	6,300,000	20,352,510	<a href="https://www.thegef.org/projects-operations/projects/4551">https://www.thegef.org/projects-operations/projects/4551</a>
Niger	Africa	Disaster Risk Management and Urban Development Project	5436	6,649,315	100,000,000	<a href="https://www.thegef.org/projects-operations/projects/5436">https://www.thegef.org/projects-operations/projects/5436</a>
Niger	Africa	Integrating Climate Resilience into Agricultural and Pastoral Production for Food Security in Vulnerable Rural Areas through the Farmers Field School Approach	4702	3,800,000	13,958,871	<a href="https://www.thegef.org/projects-operations/projects/4702">https://www.thegef.org/projects-operations/projects/4702</a>
Niger	Africa	Scaling up Community-Based Adaptation (CBA) in Niger	4701	3,750,000	15,626,000	<a href="https://www.thegef.org/projects-operations/projects/4701">https://www.thegef.org/projects-operations/projects/4701</a>
Niger	Africa	Implementing NAPA Priority Interventions to Build Resilience and Adaptive Capacity of the Agriculture Sector to Climate Change	3916	3,500,000	10,950,000	<a href="https://www.thegef.org/projects-operations/projects/3916">https://www.thegef.org/projects-operations/projects/3916</a>
Rwanda	Africa	Building Resilience of Communities Living in Degraded Forests, Savannahs and Wetlands of Rwanda Through an Ecosystem Management Approach	5194	5,500,000	9,244,000	<a href="https://www.thegef.org/projects-operations/projects/5194">https://www.thegef.org/projects-operations/projects/5194</a>
Rwanda	Africa	Reducing Vulnerability to Climate Change by Establishing Early Warning and Disaster Preparedness Systems and Support for Integrated Watershed Management in Flood Prone Areas	3838	3,486,000	12,427,000	<a href="https://www.thegef.org/projects-operations/projects/3838">https://www.thegef.org/projects-operations/projects/3838</a>
Sao Tome and Principe	Africa	Enhancing Capacities of Rural Communities to Pursue Climate Resilient Livelihood Options in the Sao Tome and Principe Districts of Caué, Me-Zochi, Principe, Lemba, Cantagalo, and Lobata (CMPLCL)	5184	4,000,000	16,276,281	<a href="https://www.thegef.org/projects-operations/projects/5184">https://www.thegef.org/projects-operations/projects/5184</a>
Sao Tome and Principe	Africa	Strengthening Climate Information and Early Warning Systems in Sao Tome and Principe for Climate Resilient Development and Adaptation to Climate Change	5004	4,000,000	40,295,000	<a href="https://www.thegef.org/projects-operations/projects/5004">https://www.thegef.org/projects-operations/projects/5004</a>
Sao Tome and Principe	Africa	Strengthening the Adaptive Capacity of Most Vulnerable Sao Tomean's Livestock-keeping Households	4274	1,985,000	6,200,000	<a href="https://www.thegef.org/projects-operations/projects/4274">https://www.thegef.org/projects-operations/projects/4274</a>
Sao Tome and Principe	Africa	Sao Tome and Principe Adaptation to Climate Change	4018	4,147,800	13,173,600	<a href="https://www.thegef.org/projects-operations/projects/4018">https://www.thegef.org/projects-operations/projects/4018</a>
Senegal	Africa	Strengthening Land & Ecosystem Management Under Conditions of Climate Change in the Niayes and Casamance regions- Republic of Senegal	5566	4,100,000	13,200,000	<a href="https://www.thegef.org/projects-operations/projects/5566">https://www.thegef.org/projects-operations/projects/5566</a>
Senegal	Africa	Mainstreaming Ecosystem-based Approaches to Climate-resilient Rural Livelihoods in Vulnerable Rural Areas through the Farmer Field School Methodology	5503	6,228,995	24,607,385	<a href="https://www.thegef.org/projects-operations/projects/5503">https://www.thegef.org/projects-operations/projects/5503</a>
Senegal	Africa	Climate Change adaptation project in the areas of watershed management and water retention	4234	5,000,000	10,175,000	<a href="https://www.thegef.org/projects-operations/projects/4234">https://www.thegef.org/projects-operations/projects/4234</a>
Sierra Leone	Africa	Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change	5006	4,000,000	20,347,310	<a href="https://www.thegef.org/projects-operations/projects/4993">https://www.thegef.org/projects-operations/projects/4993</a>
Sierra Leone	Africa	Building Adaptive Capacity to Catalyze Active Public and Private Sector Participation to Manage the Exposure and Sensitivity of Water Supply Services to Climate Change in Sierra Leone	4599	2,940,000	10,150,000	<a href="https://www.thegef.org/projects-operations/projects/4599">https://www.thegef.org/projects-operations/projects/4599</a>



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Sierra Leone	Africa	Integrating Adaptation to Climate Change into Agricultural Production and Food Security in Sierra Leone	3716	2,644,800	8,626,000	<a href="https://www.thegef.org/projects-operations/projects/3716">https://www.thegef.org/projects-operations/projects/3716</a>
Solomon Islands	Oceania	Community Resilience to Climate and Disaster Risk in Solomon Islands Project	5581	7,300,000	7,330,000	<a href="https://www.thegef.org/projects-operations/projects/5581">https://www.thegef.org/projects-operations/projects/5581</a>
Solomon Islands	Oceania	Solomon Islands Water Sector Adaptation Project (SIWSAP)	4725	6,850,000	43,622,462	<a href="https://www.thegef.org/projects-operations/projects/4725">https://www.thegef.org/projects-operations/projects/4725</a>
Somalia	Africa	Enhancing Climate Resilience of the Vulnerable Communities and Ecosystems in Somalia	5592	8,000,000	64,820,000	<a href="https://www.thegef.org/projects-operations/projects/5592">https://www.thegef.org/projects-operations/projects/5592</a>
Sudan	Africa	Livestock and Rangeland Resilience Program	5651	8,526,000	32,349,000	<a href="https://www.thegef.org/projects-operations/projects/5651">https://www.thegef.org/projects-operations/projects/5651</a>
Sudan	Africa	Climate Risk Finance for Sustainable and Climate Resilient Rainfed Farming and Pastoral Systems	4958	5,700,000	18,800,000	<a href="https://www.thegef.org/projects-operations/projects/4958">https://www.thegef.org/projects-operations/projects/4958</a>
Sudan	Africa	Implementing NAPA Priority Interventions to Build Resilience in the Agriculture and Water Sectors to the Adverse Impacts of Climate Change	3430	3,300,000	3,500,000	<a href="https://www.thegef.org/projects-operations/projects/3430">https://www.thegef.org/projects-operations/projects/3430</a>
Timor Leste	Asia	Upscaling Climate-Proofing in the Transport Sector in Timor-Leste: Sector Wide Approaches	5773	4,560,000	118,750,000	<a href="https://www.thegef.org/projects-operations/projects/5773">https://www.thegef.org/projects-operations/projects/5773</a>
Timor Leste	Asia	Strengthening Community Resilience to Climate-induced Disasters in the Dili to Ainaro Road Development Corridor, Timor Leste	5056	5,250,000	37,366,780	<a href="https://www.thegef.org/projects-operations/projects/4696">https://www.thegef.org/projects-operations/projects/4696</a>
Timor Leste	Asia	Strengthening the Resilience of Small Scale Rural Infrastructure and Local Government Systems to Climatic Variability and Risk	4696	4,600,000	52,265,399	<a href="https://www.thegef.org/projects-operations/projects/4696">https://www.thegef.org/projects-operations/projects/4696</a>
Togo	Africa	Adapting Agriculture Production in Togo (ADAPT)	4570	5,354,546	11,219,000	<a href="https://www.thegef.org/projects-operations/projects/4570">https://www.thegef.org/projects-operations/projects/4570</a>
Tuvalu	Oceania	Effective and Responsive Island-level Governance to Secure and Diversify Climate Resilient Marine-based Coastal Livelihoods and Enhance Climate Hazard Response Capacity	4714	4,200,000	19,838,880	<a href="https://www.thegef.org/projects-operations/projects/4714">https://www.thegef.org/projects-operations/projects/4714</a>
Tuvalu	Oceania	Increasing Resilience of Coastal Areas and Community Settlements to Climate Change	3694	3,300,000	4,500,000	<a href="https://www.thegef.org/projects-operations/projects/3694">https://www.thegef.org/projects-operations/projects/3694</a>
Uganda	Africa	Reducing Vulnerability of Banana Producing Communities to Climate Change Through Banana Value Added Activities - Enhancing Food Security And Employment Generation	5603	2,820,000	7,065,502	<a href="https://www.thegef.org/projects-operations/projects/5603">https://www.thegef.org/projects-operations/projects/5603</a>
Uganda	Africa	Building Resilience to Climate Change in the Water and Sanitation Sector	5204	8,370,000	38,000,000	<a href="https://www.thegef.org/projects-operations/projects/5204">https://www.thegef.org/projects-operations/projects/5204</a>
Uganda	Africa	Strengthening Climate Information and Early Warning Systems in Africa to Support Climate Resilient Development and Adaptation to Climate Change	4993	4,000,000	26,270,000	<a href="https://www.thegef.org/projects-operations/projects/4993">https://www.thegef.org/projects-operations/projects/4993</a>
United Republic of Tanzania	Africa	Strengthening Climate Information and Early Warning Systems in Tanzania to Support Climate Resilient Development and Adaptation to Climate Change	4991	4,000,000	23,165,000	<a href="https://www.thegef.org/projects-operations/projects/4991">https://www.thegef.org/projects-operations/projects/4991</a>
United Republic of Tanzania	Africa	Developing Core Capacity to Address Adaptation to Climate Change in Productive Coastal Zones	4141	3,356,300	67,828,498	<a href="https://www.thegef.org/projects-operations/projects/4141">https://www.thegef.org/projects-operations/projects/4141</a>
Zambia	Africa	Promoting Climate Resilient Community-based Regeneration of Indigenous Forests in Zambia's Central Province	5435	3,885,000	29,030,090	<a href="https://www.thegef.org/projects-operations/projects/5435">https://www.thegef.org/projects-operations/projects/5435</a>
Zambia	Africa	Strengthening Climate Information and Early Warning Systems in Eastern and Southern Africa for Climate Resilient Development and Adaptation to Climate Change - Zambia	4995	4,000,000	12,563,907	<a href="https://www.thegef.org/projects-operations/projects/4995">https://www.thegef.org/projects-operations/projects/4995</a>
Zambia	Africa	Adaptation to the effects of drought and climate change in Agro-ecological Zone 1 and 2 in Zambia	3689	3,795,000	9,804,000	<a href="https://www.thegef.org/projects-operations/projects/3689">https://www.thegef.org/projects-operations/projects/3689</a>









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