



United Nations Development Programme

Country: Liberia

PROJECT DOCUMENT

Project Title: Strengthening Liberia's capability to provide climate information and services to enhance climate resilient development and adaptation to climate change.

UNDAF Outcome(s):

Outcome 2.1: Natural Resource and Food Security: Improved sustainable natural resource utilization and food security.

Expected CP Outcome(s):

Output 2.1.4) Utilization of Natural Resources (land, water and forest) improved; and Output 4.4.4) By 2016, National Disaster Risk Reduction (DRR) policy implemented and supported by a commission/agency with clearly defined mandates.

Executing Entity/Implementing Partner:

Environmental Protection Agency (EPA).

Implementing Entity/Responsible Partners:

Ministry of Transport (MoT) Meteorology Department; Ministry of Lands, Mines and Energy (MLME) Hydrological Services; Ministry of Internal Affairs (MIA) National Disaster Relief Commission (NDRC); Ministry of Agriculture (MoA); Liberia Maritime Authority (LMA); National Ports Authority (NPA); Ministry of Health (MoH) and Ministry of Planning and Economic Affairs (MoPEA).

Brief Description

Fourteen years of civil war and decades of low investment in infrastructure have severely disrupted the meteorological and hydrological services in Liberia. This has resulted in a limited capacity to monitor, forecast, archive, analyse and communicate meteorological and hydrological data and climate change information. As a result of the limited knowledge of current climate variability in Liberia, there is a lack of planning for future climate change impacts. These changes will have a particularly negative impact on rural Liberian communities, the majority of whom are small-scale farmers and are highly dependent on natural resource-based livelihoods. To increase Liberia's capacity to adapt to the impacts of climate change, it will be necessary to generate appropriate climate information to monitor and predict slow-onset climate hazards such as sea level rise and increased temperatures, as well as rapid-onset hazards such as coastal surges and river floods, including flash-floods. This information needs to be disseminated to end-users through an Early Warning System (EWS).

To realise the long-term development planning benefits of a streamlined, customized and consolidated EWS informed by accurate climate information, this Least Developed Country Fund (LDCF)-financed project will take a two-pronged approach by: i) extending the geographic distribution of meteorological monitoring stations at a national level; and ii) establishing communication channels for the dissemination of climate information and early warnings, which will be tested in 2 target districts. The following three outcomes will be delivered through this Government of Liberia (GoL) led initiative:

- Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.
- Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making; and
- Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.

To achieve these outcomes LDCF financing will be used to overcome key barriers including: i) inadequate network of weather monitoring infrastructure; ii) limited knowledge and capacity to effectively predict future climate events; iii) limited co-ordination of hydro-meteorology activities; iv) no systematic forecasting of climate hazards and analysis of risks meaning no timely dissemination of warnings and climate information; and v) no environmental databases for assessing the risks posed by climate variability and change. This LDCF-financed project, which builds on several ongoing baseline development initiatives, will be implemented by the Environmental Protection Agency (EPA), in collaboration with the Ministry of Transport (MoT), and is expected to be completed by the third quarter of 2017.

Programme Period:	2013-2017	Total resources required:	US\$ 18,589,700
Atlas Award ID:	00074351	Total allocated resources:	US\$ 18,589,700
Project ID:	00086796	• Regular (GEF/LDCF)	US\$6,730,000
PIMS #	4858	• Other:	
Start date:	September 2013	o Government	US\$ 5,965,428
End Date	September 2017	o Other	US\$ 5,694,272
Management Arrangements	NIM	o UNDP (Cash)	US\$ 200,000
PAC Meeting Date	7 August 2013		

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year

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LIST OF ACRONYMS

ACMAD	African Centre of Meteorological Applications for Development
AMESD	African Monitoring of the Environment for Sustainable Development
AWS	Automatic weather station
BCPR	Bureau for Crisis Prevention and Recovery
CARI	Central Agricultural Research Institute
CCA	Climate Change Adaptation
CIMO	Communication on Instruments and Methods of Observation
CO	Country Office
COP	Conference of Parties
DPCs	Direct Project Costs
DRR	Disaster Risk Reduction
DPS	Direct Project Services
EPA	Environmental Protection Agency
EPR	Emergency Preparedness and Response
ERC	Evaluation Resource Center
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
EWS	Early warning system
FA	Focal Area
FAO	UN Food and Agriculture Organisation
FAPS	Food and Agriculture Policy and Strategy
FDA	Forestry Development Authority
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEO	Group on Earth Observations
GFCS	Global Framework Climate Services
GoL	Government of Liberia
GPRS	General packet radio service
GTS	Global Telecommunication System
IP	Implementing Partner
ICT	Information Communication Technology
IPCC	Intergovernmental Panel on Climate Change
IWRM	Integrated Water Resources Management
LRRRC	Liberia Refugee, Repatriation and Resettlement Commission
LOA	Letter of Agreement
LDCF	Least Developed Country Fund
LMA	Liberia Maritime Agency
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal
MIA	Ministry of Internal Affairs
MLME	Ministry of Lands Mines and Energy
MoA	Ministry of Agriculture
MoH	Ministry of Health
MoPEA	Ministry of Planning and Economic Affairs
MoT	Ministry of Transport

MoU	Memorandum of Understanding
NAPA	National Adaptation Action Plan
NMC	National Meteorological Centre
NCCS	National Climate Change Secretariat
NCCSC	National Climate Change Steering Committee
NDMC	National Disaster Management Commission
MNDMCS	National Disaster Management Secretariat
NDMTC	National Disaster Management Technical Committee
NDRC	National Disaster Relief Commission
NDRMP	National Disaster Risk Management Policy
NFSNS	National Food Security and Nutrition Strategy
NGO	Non-Governmental Organisation
NHMS	National Hydro-Meteorological Services
NMA	National Meteorological Agency
NPA	National Ports Authority
NRDP	National Reconstruction Development Plan
NVE	Norwegian Water Resources and Energy Directorate
PMC	Project Management Cost
PRSP	Poverty Reduction Strategy Paper
PUMA	Preparation for the Use of Meteosat in Africa
RP	Responsible Partners
RIA	Roberts International Airport
SADIS	Satellite Distribution System
SCCF	Special Climate Change Fund
SLR	Sea Level Rise
SMS	Short message service
SOP	Standard Operating Procedures
SBAA	Standard Basic Assistance Agreement
UNDAF	United Nations Development Action Framework
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UPS	Universal Power Supply
WFP	World Food Programme
WMO	World Meteorological Organisation

1. SITUATION ANALYSIS

1. Fourteen years of civil war and decades of low investment in infrastructure have left the Liberian hydro-meteorological services with a limited capacity to monitor, forecast, archive, analyse and communicate information on water resources and climate – including the impact of extreme climate events and disasters. This situation undermines efforts across a range of sectors to understand, quantify and plan for historical and current climate fluctuations, as well as to develop tools to help plan for adaptation to future climate changes. This is particularly important given that the main economic sectors in Liberia – agriculture, fisheries, forestry and energy – are highly vulnerable to climate variability and change. As a result of the lack of available meteorological data in Liberia, little is known on how the climate is already changing within the country, nor how it may be expected to change in the future. Whilst physical data is largely lacking, perceived changes have been noted including an increase in: i) temperature; ii) erratic rainfall patterns; iii) floods; and iv) crop failures.

2. Climate change models for the Guinea Coast region are strongly divergent and fail to reproduce realistic inter-annual and inter-decadal simulations. However, the following climate changes are anticipated for Liberia¹:

- In urban and coastal Liberia, mean annual temperature is expected to increase at a rate of approximately 0.18 °C per decade and is projected to increase by 2-4°C by 2100, relative to mean annual temperature in 1960.
- Annually, projections indicate that ‘hot’ days will occur on 24-65% of days by the 2060s, and 29-65% of days by the 2090s².
- Hot nights are projected to occur on 37-89% of nights by the 2060s and 49-97% of nights by the 2090s, relative to 1990-1999 records.
- Projections of mean annual rainfall averaged over the country from different models show a wide range of changes in precipitation for Liberia, but tend towards overall increases, particularly for the periods July-September and October-December. Rainfall during these periods is expected to increase by up to 23% and 32%, respectively, by the 2090’s.
- An increase in frequency and intensity of extreme weather events such as droughts, floods and severe storms.

3. The anticipated climate change impacts to different sectors are described below. In line with the National Adaptation Action Plan (NAPA), the proposed project will provide targeted support particularly to the agriculture sector. However, the proposed interventions will benefit other sectors such as forestry, health and coastal management.

4. *Agriculture*: The agricultural sector contributes over 66% to Liberia’s GDP. Over 90% of subsistence farmers depend on rain-fed agriculture and are vulnerable to anticipated changes in rainfall. Anticipated impacts are described below.

- Recent changes in rainfall patterns³ have made it increasingly difficult to identify the optimal time to plant crops, which hampers crop planning. Climate change is likely to exacerbate this problem.
- Increasingly unpredictable onset and duration of seasonal rainfall aggravate pest and disease problems, thereby limiting the productivity of traditional crops.
- Many strategies to cope with crop failures which rely on traditional knowledge of local weather are increasingly ineffective as a result of climate change.
- The northwest and central regions have experienced lower cereal crop yields because of plant diseases, agricultural pests, soil degradation and lack of water for irrigation.

¹ Source: UNDP Climate Change Country Profiles (http://country_profiles.geog.ox.ac.uk)

² Hot days, or hot nights, are those exceeding the 90th percentile of temperature range recorded for that region and season.

³ Hot nights have increased by 15.7% between 1960 and 2003 and mean annual rainfall has on average decreased since 1960 (http://country_profiles.geog.ox.ac.uk/). It is noteworthy that many aspects of climate change, particularly changes in extremes, could not be calculated as a result of the lack of weather data. Consequently these figures only provide an overview of changes in regions where data was available.

5. *Forestry*: The natural forests of Liberia cover 4.8 million hectares, and managed plantations a further 10,000 ha. Knowledge of the current climate, suitable areas for plantations and how climate change is affecting this suitable area is limited by the sparse observational network. As forests take several years to mature, long-term (multi-year to multi-decadal) projections are useful for long-term planning. However, the availability of fine resolution climate projections for Liberia is limited by both the observational network and local-regional capacity to generate such projections. Anticipated impacts on forestry are likely to include.

- slower tree growth and death of certain tree species, as a result of reduced sunlight intensity caused by longer rainy seasons; and
- impeded tree growth and reduced timber quality, as a result of increased incidence of pests (e.g. pine caterpillar) and diseases because of increased temperatures.

6. *Coastal management and fisheries*: Over 20,000 Liberians are reliant on some form of fishing activity as a livelihood. Fish represents the main source of animal protein in the typical Liberian diet. Global forecasts for wind, waves and temperature are poor indicators for the climate of Liberia's coastline and there is a need to develop locally applicable forecasts. Anticipated impacts on coastal management and fisheries resulting from the absence of local forecasts are likely to include:

- limited understanding of the vulnerability of fisheries to climate change impacts as a result of limited data on water temperatures, rainfall, river outflow and coastal ocean dynamics;
- adverse effects on populations of certain fish species as a result of increasing water temperature and changing rainfall patterns; and
- increasing logistical difficulties and potential hazards experienced by small and large vessels in Liberia's territorial waters as a result of the absence of accurate wind and wave forecasts for the coastal zones.

7. *Public Health*: Changes in rainfall and temperature patterns are expected to result in an increased incidence of water-borne diseases e.g. cholera, dysentery, giardiasis, amebiasis, typhoid fever and malaria. The predictability of disease outbreaks depend on several climatic and non-climatic factors. Cholera can be predicted using remote sensing imagery to detect zooplankton blooms, and malaria – in areas where its occurrence is seasonal – can be predicted through monitoring of rainfall and temperature. The introduction of climate forecasts and increased satellite and climate observation capabilities will benefit the state of public health in Liberia by providing forewarning of where and when disease outbreaks are likely to occur. Anticipated impacts of climate change on Liberia's public health sector are likely to include:

- increasing incidence and extended spatial occurrence of malaria as a result of increasing temperatures and rainfall⁴; and
- increasing incidence of water-borne diseases such as cholera, cholera, dysentery, giardiasis, amebiasis and typhoid fever as a result of increasing temperature and rainfall, and the increased risk of water contamination as a result of flooding.

8. A climate information and Early Warning System (EWS) is an important part of adapting to the above mentioned climate change-related impacts, as it increases the resilience to future changes in these climate/weather-related hazards.

1.1 The problem the project seeks to address

9. The fundamental problem that this project seeks to address is that a coordinated and complete climate information (including weather monitoring and forecasting) and EWS in Liberia does not yet exist. This limits the effectiveness of long-term development planning and the delivery of timely climate/weather-related warnings to key sectors and communities vulnerable to climate change impacts such as an increase in frequency and intensity of floods and droughts.

⁴ National Malaria Control Program (NMCP) 2006. Malaria is the primary cause of in-patient deaths (42%) in Liberia and poses the most significant threat to public health, particularly among infants, pregnant mothers and their unborn children.

10. Infrastructure and capacity related to weather, climate and environmental observations is currently sparse and unconnected in Liberia. This has rendered the Government of Liberia (GoL) increasingly unable to assist different economic sectors and vulnerable communities to respond to long-term changes in climate and the short-term impacts of extreme weather events. The limited capacity for monitoring climate and weather in Liberia is partly attributable to a shortage of appropriate and functioning infrastructure in various components of the observational network, including: i) limited meteorological observations from synoptic and agro-meteorological stations; ii) inaccurate and insufficient spatial coverage of river stream flow measurement from hydrological gauges; iii) unreliable and spatially inconsistent internet access to international forecast centres and databases; iv) insufficient computer infrastructure for archiving and accessing digitised data; v) lack of database/GIS software for combining and analysing data; vi) limited access to information products through data portals; and vii) no established communication channels for dissemination of early warnings. The infrastructure, technology and capacity on which to build these services is lacking in Liberia. Without the necessary investments to generate climate information – especially the monitoring and forecasting of climate and extreme weather-related hazards – the weather and climate monitoring and EWS network in Liberia will not function as effectively as it could, lowering the potential resilience of sectors and vulnerable communities.

11. Compounding the problems of limited infrastructure and the limited availability of country-specific data, there is a lack of skilled personnel to operate and maintain an observational network, generate information for specific sectors, and interpret the data in a format suitable for intended end-users. Human capacity is required to: i) maintain and repair climate observation infrastructure; ii) manage and run climate and hydrology forecast models; iii) interpret data and design information packages that address the needs of end-users; and iv) combine, manipulate and overlay different data in GIS systems to assess geographic vulnerabilities to climate-related hazards. There is also insufficient use of satellite data. It is now common practice to utilize satellite imagery as a useful tool for monitoring areas where meteorological and hydrological monitoring stations do not exist, as well as for monitoring environmental variables to assess current and future risks, e.g. satellite-based vegetation monitoring to assess crop performance. Through the African Monitoring of the Environment for Sustainable Development (AMESD), satellite receiving stations at RIA and the Central Agricultural Research Institute (CARI) were installed. However, this system are not being utilized to their full capacity and the information is not integrated into the climate information system because of limited technical resources to adequately manage the data.

12. As a result of the problems discussed above, the current status of climate information and EWSs in Liberia, combined with climate variability and change, will severely undermine future social and economic development in the country.

1.2 Preferred solution

In order to enhance Liberia's capacity to manage its vulnerability to climate-related hazards and reduce the impact of climate change on critical socio-economic sectors, it is essential to:

- enhance capacity of hydro-meteorological services and networks for predicting climatic events and associated risks;
- develop a more effective, efficient and targeted delivery of climate information including early warnings; and
- support improved and timely preparedness and response to forecast climate-related risks and vulnerabilities.

13. These objectives require the development of robust, in-country weather and climate observation equipment as well as forecasting and nowcasting infrastructure which can be rapidly deployed and is relatively easy to use and maintain. An appropriate weather and climate monitoring system will provide Liberia with the capacity necessary to develop: i) an EWS for climate-related

hazards; ii) real-time weather and hydrological monitoring; iii) weather forecasting capabilities (Numerical Weather Prediction); iv) agro-meteorological information and services, including integrated crop and pest management; v) appropriate applications related to building and management of infrastructure; vi) improved protocols for land, air and maritime transport management; vii) integrated water resources management; viii) improved protocols for coastal zone and land management; and ix) improved planning and policy-making processes.

14. Information generated by an enhanced weather and climate observation network will be used to support the development of EWSs targeted to end-users in various vulnerable sectors. The ability to convey clear and timeous communications of impending climate-related hazards through EWSs to vulnerable groups and sectors will reduce the impact of climate change on multiple sectors in Liberia. There are four elements that make up an effective EWS: i) knowledge of risks and vulnerabilities; ii) climate monitoring and producing of warnings; iii) disseminating warnings; and iv) capacity to respond to warnings⁵. These elements need to be strongly inter-linked, with effective communication between all sectors in order for the EWS to function.

1.3 Barriers to the preferred solution

15. There are significant institutional, financial and technological barriers that prevent the preferred solution from emerging. These barriers include:

Inadequate weather and climate monitoring infrastructure, which limits data collection, analysis and provision of timely meteorological services.

16. Prior to 1989, Liberia had 47 hydrometric stations throughout the country to monitor meteorological and hydrological parameters. Many of these facilities were damaged or destroyed during the period of civil unrest of 1989-2003. Most of the established observation stations and weather data were lost. The hydro-meteorological monitoring capacity is currently extremely low and no recorded data for the recent period exists except for localised data collected by Roberts International Airport (RIA) and the Firestone Rubber Plantations Company. The RIA Automatic Weather Station (AWS) currently measures wind speed and air pressure but the temperature and dew point sensors are not working. RIA also maintains manually operated temperature and rainfall sensors, a European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) satellite receiver that is not utilised to its full capacity, and a message processing system used for communicating weather warnings for aviation. Data generated by this equipment is insufficient and inappropriate for developing forecasts and early warnings for climate-related hazards in Liberia and currently there are no existing sources of climate-related data other than that collected at the airport.

Limited knowledge and capacity to effectively project future climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.

17. The scientific and technical capabilities required to effectively identify hazards and forecast the potential impacts of the hazards on vulnerable communities in Liberia is currently weak. The Meteorological Department within the Ministry of Transport (MoT) has 3 meteorologists, 2 meteorological technicians and 3 support staff. At RIA there are 5 meteorological technicians and 1 manager. Some of these personnel have no formal training in meteorology, and the capacity to maintain a modern network of weather stations and to deliver and archive meteorological observations is low. Currently no services exist to provide weather and climate information to support the following sectors: i) agriculture, ii) hydrology/water resources, iii) transport, iv) coastal management; and v) disaster management.

⁵ UN. 2006. Global Survey of Early Warning Systems: An assessment of capacities, gaps and opportunities toward building a comprehensive global early warning system for all natural hazards. United Nations International Strategy for Disaster Reduction, Geneva, Switzerland.

Weak institutional coordination between institutions leading to limited packaging, translating and disseminating weather and climate information and warnings.

18. Hydro-meteorology activities in Liberia are fragmented across several institutions without a coordinating body. The MoT, Ministry of Lands Mines and Energy (MLME), Ministry of Agriculture (MoA), RIA, Environmental Protection Agency (EPA), Ministry of Planning (MoP), Liberia Maritime Agency (LMA), National Ports Authority (NPA), Forestry Development Authority (FDA) and Ministry of Internal Affairs (MIA) are all implementing hydro-meteorological activities with little coordination between them. Furthermore, there is not yet a National Meteorological Agency (NMA) which should be the principal authority in Liberia for monitoring the state of Liberian weather and climate, as well as to coordinate and supervise all meteorological and climatological related activities. The Act creating the NMA has been elaborated but is waiting to be ratified by the government.

No systematic forecasting of climate hazards, analysis of risks and timely dissemination of warnings and climate-related hazard information.

19. Data processing and communication facilities for meteorological data and derived products are currently not available because of a lack of observing stations, computers and telecommunications equipment. Furthermore, weather and climate forecasts are not regularly produced within Liberia, nor do they take conditions specific to Liberia into consideration. Besides a lack of climatic forecasts, there are no formal or official channels for the dissemination of these forecasts and any associated warnings or strategies that may be employed to mitigate any impacts.

Lack of environmental databases for assessing the risks posed by climate variability and change.

20. The absence of a national environmental database reduces the potential to use weather and climate information for decision-making in different sectors that make up the Liberian economy. These include planning and investment decisions related to urban and rural development, infrastructure, health, transport, agriculture and water resources. Additionally, the satellite receiving stations for environmental monitoring at RIA outside of Monrovia and at the CARI in Bong County are not functioning to full capacity. These were installed as part of the AMESD project. In order to understand the risks posed by extreme climate variability and change, a consistent and comprehensive environmental database is needed.

2. STRATEGY

21. This Least Developed Country Fund (LDCF) project will contribute to overcoming the above identified barriers by providing the required equipment and improving national capabilities to generate and use weather/climate information in the planning for and management of climate-induced hazards. It will achieve this by implementing the transfer of appropriate technology, infrastructure and skills to meteorological and hydro-meteorological services (MoT and MLME), user-agencies (EPA, NDRC, MoA, LMA, NPA, MoH and MoPEA) and end-users (local communities) in the country. This will contribute to the preferred solution by enhancing capacity to operate and maintain a climate observation network and use the resultant data to generate tailored, sector-specific information, as well as develop an efficient delivery system for the timely dissemination of early warnings and collect long-term observations for adaptation planning.

2.1. Project rationale and policy conformity

2.1.1 Consistency with national priorities

22. Liberia's NAPA priority intervention number 2 is "Improved monitoring of climate change: enhance adaptive capacity through the rebuilding of the national hydro-meteorological and meteorological monitoring system and improved networking for the measurement of climatic

parameters". Priorities 1 and 3 are already being implemented through LDCF projects. The LDCF project is consistent with the urgent needs identified in the NAPA, all of which are relevant for supporting the national development goals of achieving Millennium Development Goals (MDGs) 1, 3, 6 and 7.

23. The LDCF project is aligned with the framework of the Second Poverty Reduction Strategy (PRS-2, 2012-1017) and the Agenda for Transformation (AfT, 2012 – 2017) of which the relevant pillars are Governance (improved security, including security from natural disaster) and Agriculture (technology development and food security efforts). A large proportion of the development fostered by these strategies focuses on the development of climate change adaptation programmes. It is acknowledged, however, that appropriate climate information is not fully addressed under PRS-2, particularly forest and other natural resources sectors, communication, climate change monitoring and enhancing the capacity of the sector to provide timely and accurate information for the public to respond and adapt to climatic events. Other sectors being further developed by the PRS-2 include the agriculture infrastructure, education, health, tourism and mining sectors. This strategy calls for sustainable management of the environment to benefit the present generation and to support the socio-economic development and quality of life of future generations. The central goal of the PRS-2 is to revitalise the main economic sectors of the country, notably agriculture, fisheries and primary industries, in order to contribute to inclusive and sustainable economic development and growth. Additional goals are to provide food security, nutrition and employment.

24. The overarching goal of the LDCF project is to reduce the vulnerability of local communities to climate change and safeguard the accomplishments of on-going and planned development efforts from climate change impacts in Liberia. This goal is consistent with a number of important policies and strategies governing Liberia's national development and its specific responses to climate change further detailed below.

25. The LDCF is consistent with the National Environmental Policy, which calls for the sustainable management of Liberia's environment and natural resources, the National Reconstruction Development Plan (NRDP), and the three important agricultural policy documents since prepared after 2006: Statement of the policy intent for the Agricultural sector of 2006, the 2008 National Food Security and Nutrition Strategy (NFSNS), and the 2009 Food and Agriculture Policy and Strategy (FAPS). The key objective of the NFSNS is to make certain that all Liberians have reliable access to the food they need and are able to utilize that food to live active and healthy lives. It seeks to accomplish this goal by addressing four separate dimensions of food security and vulnerability. To enhance food available, the strategy calls for formulation of a policy statement on food self-sufficiency. Other policies of relevance include the National Disaster Risk Management Policy (NDRMP), Intergrated Water Resources Management (IWRM) policy (2007), Mineral Policy (2010), National Health Policy (2007) and the National Information Communication Technology (ICT) Policy (2010- 2015).

26. The NDRMP considers the development of the national policy for DRM to effective policy direction in place in an effort to respond to local, regional and national disaster related to storm, flooding, epidemics, sea erosion and other climatic hazards. The IWRM policy recognizes the economic benefit of managing water and related resources in an integrated manner. The Intergovernmental Panel on Climate Change (IPCC) also has identified IWRM as important climate-adaptation strategy, which becomes a critical management priority in light of climate change. The policy also improve water management framework including policy, principles, and strategies for the monitoring, assessment, allocation and protection of the hydro meteorological resources of Liberia.

27. The National Health Policy is committed to strengthening information system so that effective monitoring of operations through quantitative indicators to monitor the health sector progress has been developed with particular emphasis on studying health development from a sector wide perspective. The Mineral Policy is expected to provide an equitable and competitive mining sector fully integrated into the African market and constitute a major player national, continental,

and international capital and commodity markets. It is also intended to provide a framework that will guide the sustainable management of Liberia's mineral resources.

28. The ICT policy of Liberia aims to stimulate the development of the national telecommunication infrastructure needed to support the delivery of the ICT services throughout the country and provide universal access which can also promote climate/weather information and knowledge based society. This document presents the Government of Liberia's Policy for the Telecommunications and Information Communications Technology sectors. The GoL understands the important role that telecommunications and ICT play in the PRS-2 policy, which can be built on the involvement of climate information monitoring system.

29. The LDCF project is also consistent with the the national focus on the development of critical economic sectors such as agriculture, fisheries and forestry. The capacity of these sectors to adapt to climate change will be strengthened by the increased availability and quality of climate and weather data and appropriately packaged early warnings for climate-related hazards.

2.1.2 Consistency with objective and priorities of the LDCF

30. The LDCF project has been developed using the GEF Updated Results-Based Management Framework for the LDCF/SCCF and the Adaptation Monitoring and Assessment Tool (AMAT,GEF/LDCF.SCCF.9/Inf.4). The project is aligned with Climate Change Adaptation (CCA) objective 2 "Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level". Specifically, it relates to the following outcomes: 2.1) increased knowledge and understanding of climate variability and change-induced risks at country level and in targeted vulnerable areas; and 2.2) strengthened adaptive capacity to reduce risks to climate-induced economic losses.

31. In line with the LDCF eligibility criteria and priorities, the LDCF project will use LDCF resources to finance the additional costs of the deployment of EWSs in Liberia, thereby strengthening the climate change resilience of the baseline situation. This will build Liberia's existing, yet limited, climate monitoring and forecasting in the country to safeguard lives and livelihoods from climate-related hazards. The LDCF project is country-driven and well-coordinated with a number of GEF and non-GEF projects in the country. In line with the LDCF guidelines, the LDCF project has been developed and will be implemented using the following approaches: i) participatory; ii) learning-by-doing; iii) multi-disciplinary; iv) complementary; and v) gender sensitive.

- Participatory: A National Consultant undertook numerous consultations with all key representatives of the project from September 2012 to May 2013, and three in-country missions were undertaken by the International Consultant (24-28 September 2012, 14-18 January 2013 and 13-23 May 2013) while the project was in the development phase. See "Stakeholder baseline analysis" for further information.
- Supporting a "learning-by-doing" approach: Community-based EWSs will test the cost effectiveness of different approaches to disseminating a range of warnings to generate understanding of climate change adaptation and how long-term development planning could best be supported across the economy. This information will be used to facilitate policy and budgetary adjustments.
- Multi-disciplinary: The LDCF project will improve the availability and accuracy of meteorological data, but also the uptake of this data by other sectors including agriculture, water and health. This data will be used in planning purposes and also in the generation of short- and long-term warnings, issued to vulnerable communities through communication channels established through the project. The LDCF project will therefore have a meteorological focus, but will involve many planning activities that will build the climate resilience of vulnerable sectors and communities.
- Complementary: The LDCF project will build on a number of baseline projects, which are providing a total co-financing amount of US\$ 11,659,700. See Sections 2.3 and 2.4 for more

detailed description of the baseline projects the LDCF project will complement. The LDCF project is designed to accommodate the additional adaptation costs associated with these baseline projects, which have been identified through in-country stakeholder consultations.

32. Furthermore, the LDCF project focus is aligned with the scope of expected interventions as articulated in the LDCF programming paper and decision 5/CP.9. As climate impacts fall disproportionately on the poor, the project recognizes the links between adaptation and poverty reduction (GEF/C.28/18, 1(b), 29).

2.2. Country ownership: country eligibility and country drivenness

33. The Republic of Liberia ratified the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in 2002. Liberia submitted its NAPA in 2008 and is entitled to benefit from the LDCF for the implementation of priority measures identified in its NAPA. The proposed project is based on the NAPA 'second top priority' project, as outlined in Section 2.1.1. By implementing priority interventions identified in Liberia's NAPA, the project is consistent with the Conference of Parties (COP-9) and also satisfies criteria outlined in UNFCCC Decision 7/CP.7 and GEF/C.28/18.

34. The LDCF project outcomes are closely aligned and coordinated with on-going efforts in Liberia to promote development which is resilient to climate change at the national and local levels. This includes two other LDCF projects whose foci are the 1st (Integrated Cropping/ Livestock Farming) and 3rd (Coastal Defence System for the cities of Buchanan, Robersport and Monrovia) NAPA-identified priority activities. Outcomes of the present LDCF focus on strengthening the capacity of primarily the MoT and MLME to monitor climate change, generate reliable hydro-meteorological data and forecasts and to be able to combine this information with other environmental and socio-economic data to improve science-based decision-making for early warning and adaptation planning. The project will be implemented at the country-level in order to advance climate monitoring and climate data management at a national scale. Full collaboration between MoT, MLME, EPA, MoA, RIA and other relevant line ministries who rely on the information for planning purposes will be critical. Sub-national authorities, parliamentarians, civil society (women and youth associations, NGOs, media, farmers' associations) and the private sector will all be important stakeholders of the LDCF project. Further, in line with UNDP policy, this LDCF project will be implemented under the National Implementation Modality.

2.2.1 Stakeholder baseline analysis

35. Multi-stakeholder consultations were conducted to inform the design of the LDCF project. These included: i) an initial consultation mission (24-28 September 2012), including an inception workshop on 25 September 2012; ii) a series of stakeholder consultations from 14-18 January 2013; and iii) a validation mission and series of consultations (13-23 May 2013), including a validation workshop on 22 May 2013.

36. Workshops were attended by national operational focal points and government departments responsible for generating and using climate information and early warning systems, as well as a number of development partners, NGOs and civil society organisations. Bi-lateral stakeholder consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi-lateral and multi-lateral organisations, government departments and NGOs, as well as private sector partners. All consultations were conducted by the international consultant and/or the national consultant with support from the UNDP Country Office (CO). The Implementing Partner (IP) and Responsible Partners (RPs) played a considerable role in determining the activities for the LDCF project and were involved in most of the consultations. Furthermore, the UNFCCC operational focal point was involved in the project design through emails and consultations.

37. Details of stakeholder consultations – including reports, programmes and participant lists – are included in Annex 1. The Inception Report from the initial mission is included as Annex 2. Details of stakeholder involvement during the project implementation phase are provided in Section 2.9.

2.3. Design principles and strategic considerations

38. This LDCF project will be implemented as part of a broad multi-country programme that will implement similar initiatives on climate information and Early Warning Systems in at least 10 countries in Africa (including Benin, Burkina Faso, Ethiopia, Liberia, Malawi, Sierra Leone, São Tomé & Príncipe, Tanzania, Uganda and Zambia). These individual country projects have been developed through a multi-country approach with a view to aligning regional priorities and identifying opportunities to increase knowledge sharing.

39. In all project countries, upgrades and rehabilitation of the hydro-meteorological monitoring network will be complemented by providing local stakeholders (instrument technicians) with training and capacity-building in operation and maintenance of the improved infrastructure (Output 1.2). In Liberia, this will include the development of a climate observation quality control and maintenance toolbox (including remotely accessible and online calibration and training courses, handbooks and manuals for AWSs and manual station maintenance). Similar toolboxes will be developed in other countries, such as Zambia, Uganda and Malawi, and the content of the toolboxes can be aligned. In addition, project countries will be provided with training and capacity building for modeling and forecasting climate and weather, as well as generating tailored climate information packages and sector-specific Early Warnings (Outputs 1.2, 1.4 and 3.1). It is anticipated that there will be considerable scope for much of these training and capacity-building activities to be undertaken in coordination with other project countries.

40. All LDCF-funded African EWS projects under this multi-country programme will include activities which require considerable technical support in specialized applications related to the design and implementation of standard operating procedures and tailored warnings/advisories, and the communication of advisories/warnings (Outputs 2.2 and 2.3). The appointment of suitably qualified technical staff to provide technical support to all project countries, including Liberia, will improve the coordination and standardization of activities between all project countries. In addition, all project countries will benefit from shared information, lessons learned and identified best-practices. For example, the training of meteorological observers, meteorological officers and meteorologists (Output 1.2 for Liberia) to produce forecasts and develop tailored hydro-meteorological information can be undertaken through regional workshops, as this is a training requirement of most countries.

41. By strengthening ties and collaboration between regional stakeholders, the individual projects will benefit from sharing relevant data and information packages (for example, in the case of shared watersheds and river systems). Stakeholders in Liberia who can benefit from participating in regionally-aligned training and workshops include MoT, MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA. Relevant national sector policies, strategies and plans – which will be strengthened through regionally-aligned workshops and training activities – will include the Agenda for Transformation. The development of standardized processes for disseminating flood, drought, health and other climate-related warnings through NDRC in Output 2.2 (and the priority districts in Grand Gedeh, Bong County, Grand Cape Mount, Montserrado or Grand Bassa counties in Output 2.3) will be enhanced by sharing knowledge, experiences and best-practices between all project countries participating in regionally-aligned activities. In the case of Liberia, protocols and agreements for strengthening interactions and coordination between MoT, MLME, MoA, NDRC and EPA – including those related to the sharing of hydro-meteorological information/data – will be enhanced by including experiences from the other LDCF-funded projects, particularly those in West Africa i.e. Benin, Burkina Faso, Sierra Leone and São Tomé & Príncipe.

42. All of the above-mentioned climate information and Early Warning System projects include outputs that will develop a sustainable financing strategy for ongoing operation and maintenance of

the newly enhanced hydro-meteorological networks. These may include leveraging financing and logistic support from private sector companies and relevant socio-economic sectors, notably agriculture and telecommunications (Output 3.4). Wherever possible, activities (which include establishing public-private partnerships in various project countries, such as between MoT/NMA and private sector agricultural insurance companies, mobile phone companies, and agro-forestry companies in Liberia) will be coordinated to assist participating private sector companies to engage efficiently and cost-effectively with the LDCF projects in the different countries. In the case of multi-national companies this can improve the negotiating position of each individual government. Further details on the cost-effectiveness benefits of this approach are provided in section B.3.

2.3.1 Baseline projects and related on-going initiatives

43. The LDCF project is focused on strengthening the capacity of national and sub-national entities to monitor climate change, generate reliable climate and meteorological information, and be able to combine this information with other environmental and socio-economic data to improve evidence-based decision-making for early warning and planning adaptation responses.

44. To ensure that LDCF funds are used in a strategic manner, the LDCF project aims to build upon existing climate and weather information (including monitoring) and EWS-related activities implemented by both government, multi- and bi-lateral donors, and NGOs. This includes coordinating with climate and weather information gathering and EWS efforts in the country and strengthening the national framework for EWS implementation. Specifically, the LDCF project will finance the additional adaptation costs of priority actions not currently funded by the baseline projects, described below. Table 1 indicates each of the specific baseline projects and the indicative co-financing amounts. See Annex 3 for co-financing letters for the baseline projects.

Table 1: Specific baseline projects and indicative co-financing amounts.

Funding source	US\$
Co-financing sources	
Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation – funded by Norwegian Water Resources and Energy Directorate (NVE) and implemented through MLME	2,690,000
Agriculture Sector Rehabilitation Programme – funded by the African Development Bank and implemented through MoA	2,313,072
MetAgri (Roving seminars on Weather, Climate and farmers) - funded by the World Meteorological Organisation (WMO) and implemented jointly by UN Food and Agriculture Organisation (FAO), WMO and MoT	691,200
GoL, Meteorological Division (within MoT) budget allocation	257,920
GoL, Hydrological Services (within MLME) budget allocation	1,107,508
GoL, National Disaster Relief Commission (within MIA) budget allocation	200,000
GoL, Environmental Protection Agency budget allocation	4,400,000
UNDP Country Programme	200,000
Least Developed Country Fund (LDCF) project grant requested	6,730,000
Total	18,589,700

A description of the baseline projects upon which the LDCF investments will build (see Section 2.4) is provided below.

45. The **Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation** project supports the MLME through funding by the Norwegian Water Resources and Energy Directorate (NVE). The project aims to develop a monitoring and management system for water and electricity resources in Liberia. A significant component involves building institutional capacity, as well as a legal framework within the water and energy sectors, for hydrology, rural and renewable energy. A project document was finalized in 2010 on the request of MLME, outlining the various activities to be included in a 5-year institutional cooperation between NVE and

MLME. Thereafter an institutional agreement between MLME and NVE was signed during 2010. The project is due to end in 2015, but an extension of funding from NVE is being requested and is anticipated. The focus is on assistance to monitoring and management of water and energy resources, with special attention to institutional strengthening. This includes a programme for installing meteorological and hydrological monitoring equipment, as well as the databases and archiving infrastructure. The main activities of the project include:

- procurement of hydrological and meteorological equipment;
- construction of 9 hydrometric stations – 4 within the St. Paul River Basin, and 5 on other main Liberian rivers;
- installation of 10 – 15 manual rain gauges in main Liberian river basins;
- installation of 4 automatic weather stations;
- establishment of hydro-meteorological database; and
- short- and long-term training of hydro-meteorological technicians, in-country and abroad.

46. At the time of the LDCF project development, the majority (90%) of the equipment had been procured, 5 hydrometric stations had been installed, 4 manual rain gauges had been deployed and training was on-going (see Section 2.4.1 for more details). The project was originally designed to address the following constraints:

- lack of human resources at all levels with knowledge of technical hydro-meteorological network-related details;
- lack of human resources with computational capacity to operate the required database;
- lack of qualified hydrologists and meteorologists to analyze data and prepare forecasts;
- limited number of available, qualified staff to train;
- lack of available training opportunities for meteorology and hydrology specialists in Liberia; and
- lack of Liberia Hydrological Services GoL budget for travel, repair, periodic maintenance, observer salaries and sensor replacement i.e. sustainability of the observation network.

47. Through meetings with the project managers and MLME, it was ascertained that the most pressing requirements of the hydrological sector in Liberia, which are not able to be funded by the NVE project are:

- scholarships for long-term, international studies for meteorologists, agro-meteorologists, hydrologists, database specialists and maintenance engineers;
- short-term training of the hydro-meteorological staff in Liberia and abroad;
- extension of the meteorological observation network in Liberia through the purchase and installation of additional AWS's;
- extension of the hydrometric observation network through the procurement and installation of hydrometric stations in the upper parts of basins to inform flood warnings; and
- maintenance and operation of the MLME hydro-meteorological network.

48. Funded by the World Meteorological Organisation (WMO) and implemented jointly by UN Food and Agriculture Organisation (FAO), WMO and MoT, the **MetAgri (Roving seminars on Weather, Climate and farmers)** training and capacity building programme is delivering a series of seminars to make farmers become more self-reliant in dealing with weather and climate issues that affect agricultural production on their farms and to increase the interaction between the farmers and the MoT. The overall goal of these seminars is to secure farmer self-reliance, through helping them better informed about effective weather and climate risk management by sustainable use of natural resources for agricultural production. The project has six components: i) travelling seminars and distribution of rain gauges; ii) improving agro-meteorological techniques; iii) improving relations with media and dissemination of meteorological and climate information; iv) developing tools for information sharing and evaluation feedback; building institutional awareness and forming operational inter-agency groups; and vi) project supervisions and coordination.

49. At the time of LDCF project development, 166 rain gauges had been installed through the MetAgri programme in collaboration with small-scale farmers, although no data had been collected.

This was because of uncertainty of where the gauges had been installed. The LDCF project will assist with geo-referencing of the rain gauges, and will benefit from the MetAgri project through the integration of the available data into the meteorological database (to be established through the LDCF project). The LDCF project will generate information that can be provided to farmers through the MetAgri project, and will build on the awareness created to date, and the training provided at the local level.

50. With 70% of the population in abject poverty, and an unemployment rate of 85%, Liberia faces many challenges, among which are poor quality of life and lack of adequate capacity to feed its own population. The Poverty Reduction strategy focuses on, among other things, the revitalization of the Agricultural Sector to enhance food security as well as household incomes. The **Agriculture Sector Rehabilitation Project** was designed to target the rice sub-sector, through rehabilitation of irrigated rice fields in the lowlands. The project will achieve the rehabilitation and construction of 1,620 ha of irrigated rice and have a wide range of environmental implications. It will involve rehabilitation of reservoirs and canals for diversion of water to irrigated fields, land preparation for irrigation, development of drainage systems, application of fertilizers and pesticides, development of 100 km of farm tracks and roads, micro-hydropower generation, construction of warehouses and market structures, mechanization of farming, re-use of agricultural wastes. Positive impacts have been identified as: improved food security, increased household incomes, increased employment opportunities, increased access to water, flood control, and improved health/quality of life. Possible negative impacts have been identified as: change of land use, water table modification, stream flow modification, increased consumptive use of water, potential for salinization of soils, increased incidences of diseases (malaria & bilharzia), and potential for water pollution.

51. The MoA will be the implementing agency of the project, with EPA providing the necessary guidance and oversight on matters concerning environment. The project will train relevant Government extension staff and farmers to enhance their skills, particularly in water quality monitoring, soil-moisture management, on-farm technologies, operation & maintenance of hydraulic works, data collection & processing. The project will facilitate the production of guidelines, equipment and tools required for environmental monitoring (hydrometric measurements, water quality sampling and testing) and socio-economic monitoring.

52. A description of the related, on-going initiatives to which the LDCF project will link to is provided below.

53. **GEF-LDCF coastal defence project.** The project “enhancing resilience of vulnerable coastal areas to climate change risks in Liberia” has the objective of reducing vulnerability and building resilience of local communities and socio-economic sectors to the additional threats of climate change in Liberia’s low-elevation coastal zones. Whilst the project concentrates on reducing vulnerability in the coastal zone, there is an information gathering component which monitors sea level rise and areas at risk. However, this is currently not receiving forecast information which could be used for ex-ante early warning and preparation.

54. The project managers of the LDCF coastal project and present LDCF project will work closely together as part of an LDCF “think-tank” to ensure synergies are created and lessons learned from the one project are applied to the other. Information generated through the LDCF coastal project will be used in the generation of coastal-specific forecasts and used to inform warnings, disseminated through the channels strengthened through the present LDCF project, when applicable.

55. **GEF-LDCF agriculture project.** The project “enhancing resilience to climate change by mainstreaming adaptation concerns into agricultural sector development in Liberia” has the objective of increasing resilience of poor, agricultural-dependent communities and decreasing the vulnerability of the agricultural sector to climate change in Liberia. Districts within two counties (Bong and Grand Gedeh) have been selected as demonstration sites, and increased resilience measures, including supporting extension officers, are being implemented. However, no early warning information related

to climate forecasts or monitoring is used – this would be provided through extension officers by the present LDCF project.

56. Similar to the LDCF coastal project, the project manager of the LDCF agriculture project will form part of the LDCF “think-tank” to ensure that information from the present PDCF project is incorporated into the LDCF agriculture project, and *vice versa*.

57. The **Strengthening Emergency Preparedness and Response Framework in Liberia**, funded by the World Bank and implemented through the World Food Programme (WFP) and MIA/NDRC, focuses on implementing systems to effectively manage the impact of disaster risks within the broader context of Disaster Relief management. It is intended to support the GoL through the Ministry MIA and other relevant ministries by designing and implementing an Emergency Preparedness and Response (EPR) system, which will include developing institutional capacity and national and inter-agency contingency plans. More specifically, the project aims to: i) establish an effective and functional legal and institutional framework for disaster risk management including links with climate change adaptation and risk management; ii) strengthen risk identification mechanisms in the country; iii) enhance the underlying risk and vulnerability factors by improving risk management application at all levels; and iv) strengthen disaster preparedness and emergency response and recovery practices in the country. The LDCF project will co-ordinate with the WFP project by providing the climate information required to strengthen risk management, disaster preparedness and emergency response activities. The LDCF project will benefit from the capacity being developed in the disaster risk reduction sector through the WFP project, and will also provide the communication channels needed to convey emergency preparedness-related information to intended receivers. The WFP project is due to end in mid-2014, and the LDCF project will build on the structures established through the collaboration between WFP and MIA/NDRC.

58. The WFP project builds on the successes of the UNDP Bureau for Crisis Prevention and Recovery (BCPR) and the GoL project entitled **Building National and Local Capacities for Disaster Risks Management in Liberia**. Project activities were implemented through the EPA and NDRC. The four main outcomes are: i) enhanced capacity of national institutions in disaster risk management; ii) disaster risk issues integrated into national plans and policies; iii) national database on disaster losses established and functioning and iv) gender-focused disaster preparedness and emergency response practices developed. Databases of disaster losses and hazard mapping have been undertaken, on which the LDCF project will build. In particular, the project notes: “the urgent need to re-build the hydro-meteorological stations and activate the PUMA Project. In the absence of modern weather forecasting tools, there is need to sharpen and strengthen traditional early warning and communication systems”.

59. In addition to these related, on-going initiatives the LDCF project will link and coordinate with activities under the: i) African Center of Meteorological Application Development (ACMAD) – particularly ViGiRiC project which is developing a regional EWS and vigilance systems to cope with climate risks in Africa; ii) Group on Earth Observations’ (GEO) AfriGEOSS initiative; iii) the AMESD and Monitoring of Environment and Security in Africa (MESA); and iv) WMO’s Global Framework Climate Services (GFCS) initiative.

2.3.2 National and local benefits

60. The LDCF project is expected to deliver benefits at both the national and local levels. The installation of weather observation and computer infrastructure will benefit the MoT, as they are the department responsible for maintaining meteorological equipment. However, as result of the improved forecasting capabilities, the whole of Liberia will benefit from previously unavailable access to climate information, presented in an understandable manner. The EPA, RIA, MLME, NDRC, MoA, LMA, NPA and MoH will also benefit through training on tailoring meteorological forecasts to provide sector-specific information, and through strengthening of computer databases, access to information and ability to communicate with other regions. Coordination between

government departments and the sharing of information will be improved, which will lead to strengthened climate-related products and services. With these changes implemented in the long term, these institutions will be able to market such products and services to private entities that will pay for the tailored information. These will include satellite monitoring and climate forecast products in particular.

61. Other national benefits of the improved access to climate information provided through the LDCF project include increased food security and nutritional status – thereby positively affecting MDG 1 – and better integration of climate change understanding into the health sector – thereby positively affecting MDGs 4 and 6. Furthermore, the improved availability of climate information will improve environmental planning, infrastructural development, and farming practices – thereby positively affecting MDG 7. Capacity will also be strengthened to integrate climate change risk reduction strategies into development policies and programmes. Overall, the project will contribute to building adaptive capacity to climate change in all sectors in Liberia.

62. Additional economic benefits of the LDCF project will be associated with: i) improved transport planning, especially shipping that will take advantage of improved forecasts of winds and waves; and ii) aviation, that will take advantage of improved local forecasts over Liberian airspace. These and commercial agriculture represent sectors with some of the largest potential private clients for early warning services and tailored forecasts.

63. At the local level early warnings and climate hazard mapping, disseminated correctly and acted on appropriately, will provide economic benefits to local communities by reducing: i) losses of agricultural produce; ii) damage to infrastructure (roads and bridges); and iii) disruption to people's businesses and other income generating activities. This will have positive implications for people's health and wellbeing and thus benefit communities and social structures. Communities at the pilot sites will immediately benefit through warnings related to inter alia agriculture, coastal management, water, flood management and wildfires. Many of the beneficiaries of the early warnings and climate hazard mapping will be women, who comprise 50% of Liberia's population and 54% of the workforce. This is particularly relevant to the agriculture sector where women: i) make up the majority of smallholder farmers; ii) produce as much as 60% of agricultural products; iii) carry out 80% of trading activities; and iv) are most vulnerable to food insecurity.

64. An agricultural application of the EWS will be implemented in target districts in one of Grand Gedeh or Bong county, and a coastal application in target districts in one of Grand Cape Mount, Montserrado or Grand Bassa county. The former counties are those included in the LDCF agriculture project, where measures for increasing climate resilience of local agriculture are being tested, and the latter are those included in the LDCF coastal project, where adaptation measures to protect against sea level rise, storms, sea-surges and coastal flooding are being tested. The target districts and community sites where the EWSs will be implemented will be decided by the time of the LDCF project Inception Workshop – the decision will be made in collaboration with the LDCF agriculture and coastal project managers, as well as through a rapid vulnerability assessment of the districts. Implementing the EWSs in the counties where the LDCF agriculture and coastal projects are being implemented, means the successes of the current on-going projects can be built on, and will ensure synergies and therefore most effective use of LDCF resources. The respective counties are shown in Figure 1.

65. While the LDCF project will introduce agricultural EWS interventions to target districts in one of Bong or Grand Gedeh counties, the entire population of the target county will benefit from improved climate and weather information and timely dissemination of local-level early warnings. Based on Liberia's 2008 National Population and Housing Census⁶, the total populations of Bong and Grand Gedeh counties are 333,481 and 125,258 respectively, representing ~10% and ~4% of Liberia's

⁶ LISGIS. 2008. National Population and Housing Census. Liberia Institute of Statistics and Geo-Information Services. Government of Liberia.

total population, respectively. Women comprise 50.6% and 48.1% of the population of these countries, respectively.

66. For the coastal EWS interventions the total populations of Montserrado, Grand Bassa or Grand Cape Mount counties which will benefit from LDCF interventions are estimated to be 1,118,241; 221,693 and 127,076 respectively, representing ~32%, ~6% and ~4% of Liberia’s total population. Women comprise 50.8%, 50% and 48.3% of the population of these countries, respectively.

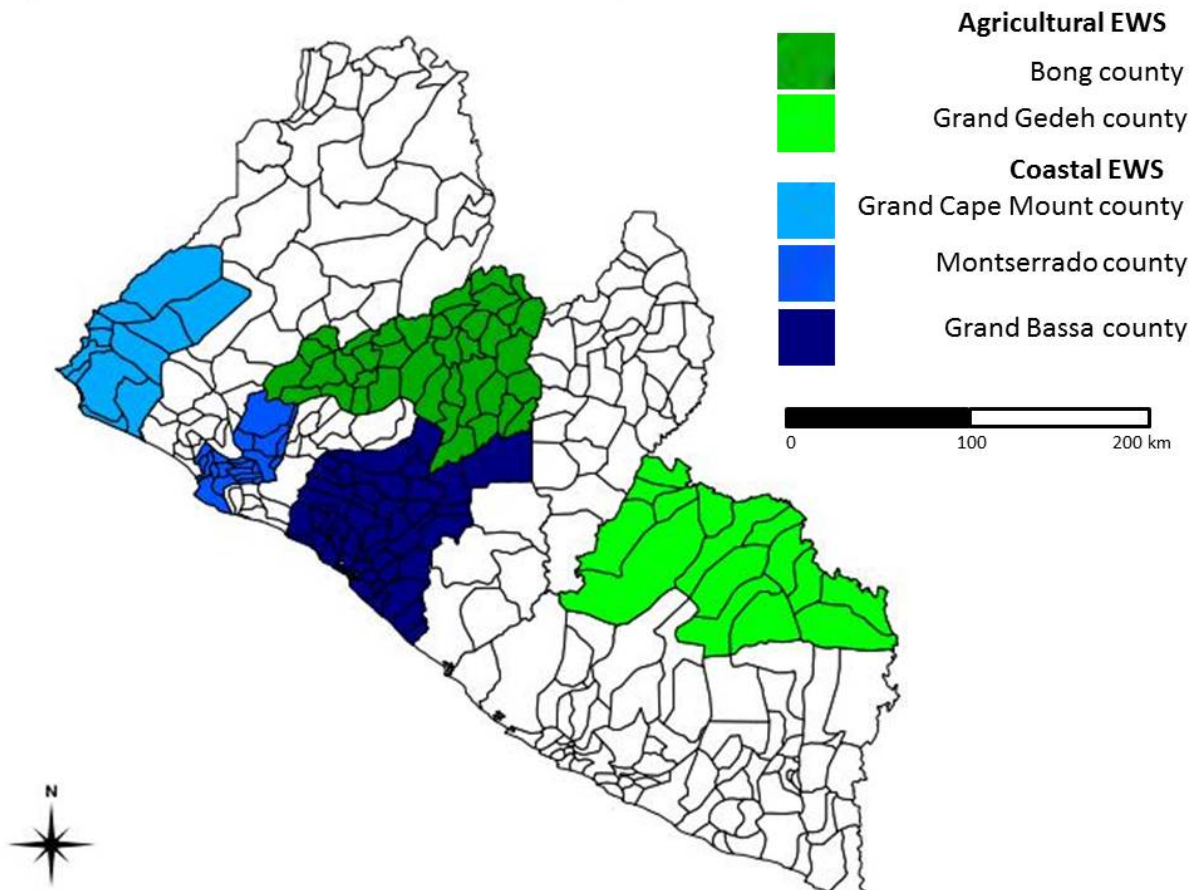


Figure 1: Target counties for the agriculture (target districts in one county) and coastal (target districts in one county) EWSs to be implemented through the LDCF project.

2.3.3 UNDP comparative advantage

67. The project is in line with the United Nations Development Action Framework (UNDAF) 2013-2017 which includes a focus on: i) governance and public institutions; ii) peace, security and the Rule of Law; iii) sustainable economic transformation; and iv) human development. Activities and results that will be developed under this project are also fully consistent with the UNDAF outcome 2.1 “Improved sustainable Natural Resource Utilization and food security”, 2.2 “Improved access to sustainable livelihoods opportunities in an innovative and competitive private sector”, and UNDAF outcome 2.3 “Improved access to sustainable basic infrastructure”. The UNDAF 2013-2017 has yet to be finalized and signed. Should any changes occur they will be addressed through evaluations or board meetings or both.

68. UNDP’s comparative advantage in implementing this project is underpinned by: i) its Country Programme Document for the current and new cycle (2013-2017); ii) its overarching role of capacity development; and iii) the Energy and Environment Program Strategy. This strategy aims to

mainstream environment and disaster prevention measures into national and local development policies, strategies and plans.

69. Public service reform and institutional building is one of UNDP's flagship programming areas. The proposed capacity development activities in all three components of the LDCF project will benefit from UNDP's overarching and strategic role in this area, helping to ensure that related outcomes are sustainable in the long-term.

70. Since 2009, UNDP has been helping to finance the development of Liberia's national disaster management framework, leading to the development of policy and legal structures, as well as a national implementation framework based on regional and local disaster management bodies. UNDP has specific experience of climate change risks in coastal areas through its GEF-financed pilot project titled "Enhancing Resilience of Vulnerable Coastal Areas to Climate Change Risks in Liberia". This project is piloting a series of strategies for promoting coastal resilience to climate change in 3 counties, including techniques for the rehabilitation of degraded mangroves, and training in integrated coastal management. Through this project, the UNDP will support coastal communities around Lake Piso to conserve mangrove vegetation and to construct energy efficient ovens for drying fish.

71. UNDP also has considerable in-country experience in the organization and management of public works programme, particularly using labour intensive approaches. UNDP has collaborated with the Ministry of Public Works and other UN agencies to implement several road rehabilitation programmes to open up roads that were closed during the period of the civil conflict. At present UNDP is helping to mobilise and train young men and women, providing them with the necessary skills to broaden their opportunities and livelihoods strategies under the GoL Youth Empowerment program.

72. Moreover, UNDP's Energy and Environment Programme is helping to strengthen both national and decentralized capacities for environmental management through on-going support to the EPA, MoA, MLME and the FDA. An element of this support relates to how climate change is impacting on the national economy and how to develop both adaptation and mitigation strategies that take into account both risks and opportunities. This is a key area of dialogue with the national government that positions UNDP well with regard to key strategic bodies, such as the proposed National Climate Change Secretariat (NCCS), helping to ensure that LDCF resources are programmed and implemented in line with key opinion leaders. This experience is important for successfully promoting the inter-ministerial dialogue as part of Component 3 of the LDCF project.

73. The Energy and Environment Programme will engage the Pro-poor Economic Growth practice area and the Democratic Governance practice area. The UNDP CO Environment and Energy Unit currently has a Programme Specialist (with a strong environment/natural resource management background), National Climate Change Policy Advisor (with a strong environment and climate change negotiation background) and a Programme Associate who work as a team to coordinate and support energy and environment initiatives. The Democratic Governance practice area has 1 Programme Analyst and 1 Programme Associate with a strong experience in policy mainstreaming, institutional capacity building and gender equality.

74. Finally, other UNDP GEF-financed projects in the country (including LDCF financed projects such as "Enhancing resilience to climate change by mainstreaming adaptation concerns into agricultural sector development in Liberia") have complementary objectives which will benefit from the proposed project. Additionally there are other UNDP GEF-financed projects within the region with similar objectives, which means that there is substantial in-house technical expertise within UNDP that can be brought to bear to support the Government with the project as outlined above. UNDP has close links with governments, as well as a high level of experience managing other LDCF projects in the region, in particular those with an early warning component. UNDP is therefore already working with EWS in many countries and many sectors, strengthening its capability to coordinate and providing the flexibility to handle changing needs between countries. UNDP CO

operations are supported by regional advisory capacity based in the UNDP Regional Centre in Pretoria. UNDP has dedicated Regional Technical Advisers focusing on supporting adaptation programming and implementation in a range of technical areas relevant to the LDCF project, including capacity development, coastal zone management, disaster management, infrastructure development and ecosystem based adaptation. The network of global Senior Technical Advisers provide additional technical oversight and leadership helping to ensure that programmes on the ground achieve maximum policy impact.

2.4. Project Objective, Outcomes and Outputs/activities

75. The objective of the LDCF project is “to strengthen Liberia’s climate-related monitoring capabilities, early warning systems and available information for responding to climate shocks and planning adaptation to climate change.”

This will be achieved by delivering threeintegrated and complementary outcomes:

- Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.
- Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.
- Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.

The overall budget for the LDCF project is US \$ 6,730,000 over four years (Table 2).

Table 2: LDCF budget per outcome.

LDCF outcome	LDCF Funding (US\$)	Indicative Co-financing (US\$)
1. Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.	2,733,000	4,596,628
2. Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.	2,532,000	2,463,072
3. Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.	1,150,000	4,300,000
Project Management	315,000	500,000
Total	6,730,000	11,859,700

76. The **baseline situation** (*without the LDCF project*) and **adaptation alternative** (*with the LDCF project*) – including relative outputs and indicative activities – are detailed below for each component and associated outcome.

2.4.1 Component 1: Improve the climate monitoring network, database archives, access to satellite environmental products and ability to issue forecasts.

Outcome 1: Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.

77. This component will address the weaknesses in infrastructure and human resources that currently limit the effective collection of relevant climate-related information. The interventions of

this component will improve the generation of climate information and the processing of collected data for risk analyses, thereby supporting the establishment of a functioning EWS in Liberia.

Outputs under this outcome are specifically aligned with outcomes linked to CCA-FA Objective 2, including 2.1) increased knowledge and understanding of climate variability and change-induced risks at country level and in targeted vulnerable areas; and 2.2) strengthened adaptive capacity to reduce risks to climate-induced economic losses (see Annex 3, UNDP/GEF M&E Framework for Adaptation). The overall budget for this outcome under the LDCF project is US\$ 7,529,628. This includes US\$ 2,733,000 LDCF project grant requested and US\$ 4,796,628 indicative co-financing (see Table 3).

Table 3: Total project value for Outcome 1 (including project management).

Funding source	
Co-financing sources	
Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation – funded by Norwegian Water Resources and Energy Directorate (NVE) and implemented through MLME	2,690,000
MetAgri (Roving seminars on Weather, Climate and farmers) - funded by the World Meteorological Organisation (WMO) and implemented jointly by UN Food and Agriculture Organisation (FAO), WMO and MoT.	691,200
GoL, Meteorological Division (within MoT) budget allocation	257,920
GoL, Hydrological Services (within MLME) budget allocation	1,107,508
UNDP Country Programme	50,000
LDCF project grant requested	2,733,000
Total	7,529,628

Baseline situation (without LDCF project)

78. The Meteorology Department within the MoT is responsible for establishing and maintaining a weather observation network in Liberia. Hydrological Services within the MLME is responsible for establishing and maintaining a hydrological observation network along Liberia’s major river basins, and collects meteorological data as well to inform hydrological planning. However, Fourteen years of civil war and decades of low investment in infrastructure have severely disrupted the meteorological and hydro-meteorological services in Liberia. There are currently only 2 – 1 automatic and 1 manual station – semi-functioning weather stations in Liberia, at RIA. One station is providing accessible, real-time data, however, not all the sensors are functioning effectively. The second manual station measures wind, rainfall and visibility. There are currently no functional automatic hydrological stations providing real-time information on stream flow or water levels in Liberia’s rivers.

79. The MoT, MLME and MoA do not have access to real-time satellite monitoring of the state of Liberia’s environment. A functioning EUMETSAT satellite receiving station exists at RIA, however, is currently not used. This is because of problems with security clearance, and therefore access to the RIA facilities – meteorologists from MoT are not able to make use of the available hardware and software. A second functioning receiver is located at CARI in Bong County, however, an inconsistent power supply and a lack of trained staff limits the use of this system. Equipment requirements for the PUMA/SYNERGIE and AMESD (e-station) at RIA include reception cards, hard drives, a Universal Power Supply (UPS) tower, an ethernet switch, printers (colour and black & white) and a plotter. Requirements at the CARI station include a printer, plotter and a GIS licence and software (see Table 4 for a summary of existing meteorological and hydrological equipment).

Table 4. Existing meteorological and hydrological equipment in Liberia.

Station type	Existing
Automatic weather stations (semi-functioning)	1 at RIA
Manual station including 1 Stevenson screen, 1 wet and dry bulb thermometer, 1 rain gauge, 1 anemometer and 1 digital	1 at RIA

barometer (semi-functioning)	
Rain gauge	1 at MLME
PUMA-SYENERGIE satellite receiver and hardware and software at RIA ⁷	1 at RIA
AMESD or e-station satellite receiver and hardware and software	1 at CARI (not functioning) & 1 at RIA (not utilised)

80. The Norwegian Water Resources and Energy Directorate (NVE)-funded project “Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation” will support the MLME install 6 hydrometric stations, more than 30 manual rain gauges and 4 AWSs – one of which will be a small, mobile station – in the 6 major river basins in Liberia. To date, 4 water-level stations have been installed: 1 on the Lofa River, 1 on the St Johns River and 2 on the St Paul River. The MLME, MoA plan to install 15⁸ and 160⁹ rain gauges respectively, with EPA planning the installation of 1 rain gauge¹⁰. The number of water-level measuring stations installed or planned for installation (i.e. 6) is sufficient for downstream flow monitoring. Further hydrometric stations are, however, needed upstream; and additional AWSs are required to monitor the range of severe weather events experienced in Liberia. This is particularly relevant for rainfall events and differences in rainfall experienced by inland and coastal areas. The limited number of AWSs restricts the ability to monitor large areas in real time.

81. Forecasts from other international centres can be used at a coarser spatial scale, but this is limited by unreliable internet connections which restrict the amount of data that can be downloaded. Furthermore, there is currently no functioning link between the MoT/MLME and the Global Telecommunication System (GTS), through which National Hydro-Meteorological Services (NHMS) worldwide normally report observations. Weather and climate observations from Liberia are therefore not being effectively incorporated into regional and global circulation models which decreases the accuracy of these models for the Liberian context.

82. Currently, the capacity of the Meteorological Department in Liberia is under-developed. Nineteen meteorologists are employed by the GoL. This includes: i) 6 trained climate and weather technicians at MoT (not currently involved in meteorological activities); ii) 1 trained meteorologist at MLME (trained in operating PUMA SYNERGIE and AMESD systems); iii) 1 trained technician at MoA (at the CARI where AMESD station is not functioning); and iv) 1 weather forecaster, 5 meteorological observers, 3 assistants and 2 system administrators at RIA. These trained personnel are spread across different institutions, fulfill different roles and have different levels of technical expertise. Furthermore, not all the meteorologists are actively involved in meteorology; and the role of the staff at the RIA is limited to the aviation sector. Consequently, there is little technical capacity to make short-term (i.e. daily to seasonal) forecasts for Liberia.

83. There is limited technical and human capacity to digitally process, store/archive and analyse the data being received from the automatic station. Data transmitted from the automatic station at RIA are recorded from a display screen using pen and paper and stored in an official book at the airport station. The lack of appropriate infrastructure and technical expertise for processing data restricts the capacity to analyse and tailor climate-related information for use within different sectors and by different local communities. In particular, there is limited staff capacity to use climate change models or downscale these to the Liberian territory in order to inform discussions and decisions related to future adaptation interventions. Sectors such as forestry and agriculture would benefit from satellite observations and analyses, including vegetation indexing and wildfire monitoring. However, such observations are currently unavailable. The National Meteorological Agency (NMA) is in the process of being established. Once the NMA is functional, it will replace the Meteorological Division within

⁷Currently only used for aeronautical purposes.

⁸Location for installation still be determined.

⁹Location for installation still to be determined. Some of these have already been installed; however, the number that or the location has not been recorded.

¹⁰Location for installation still be determined.

MoT, and will be the lead agency responsible for meteorology in Liberia. The NMA, which will be funded by the GoL, will be an important factor in the sustainability of LDCF project interventions. However, its establishment is independent of the LDCF project. The NMA will be provided with GoL funding to employ further meteorologists, but the timing of its establishment is uncertain. Even once the NMA is established it will take time and capacity development to enable a fully functional meteorological service in Liberia.

Adaptation alternative (with LDCF project)

84. The four outputs under Outcome 1 will build on the existing and planned investments being made in the meteorological and hydrological sector by the GoL (baseline operations and maintenance described above), including the NVE-funded support project and the MetAgri project (see Section 2.3 for further details on these baseline projects).

- Activities under this outcome will increase the capacity of MoT and MLME to generate meteorological and hydrological information, respectively. LDCF resources will be used to improve MLME's and MoT's existing meteorological and hydrological observation network to ensure Liberia's monitoring of weather, climate and hydrological is able to cope with the additional impacts expected from climate change and that adaptation planning is based on reliable and extensive information. This will include using LDCF resources to procure, install and rehabilitate meteorological and hydrological monitoring stations that will generate weather and climate data in areas of Liberia that are currently not monitored. Furthermore, LDCF resources will be used to procure and install the hardware and software needed to integrate, display, analyze and provide output of observed and model data as well as other graphical information.
- Equipment and infrastructure being installed under the NVE-funded project "Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation" will provide a base from which a more comprehensive network of meteorological and hydrological observing stations will be established. The NVE project is funding the installation of 6 hydrometric stations on the 6 major river basins in Liberia i.e. the Mano, Lofa, St Paul, St Joh, Cesto and Cavalla river basins. Furthermore, 4 AWSs are being installed by the NVE investment project (including 1 mobile AWS). The location of these AWSs has not yet been decided. LDCF resources will be used to procure and install a further 6 automatic hydrometric stations. The focus will be on the upper catchments, in the major tributaries of the 6 major river basins.
- Capacity built and equipment installed through the MetAgri will be further developed through LDCF training opportunities and additional, complementary meteorology and hydro-meteorology monitoring equipment.
- Technical capacity in MLME and MoT will be built to support the development of appropriate sector-specific tailored forecasts. International assistance will be provided through the LDCF project to initiate the development of appropriate models to generate the required weather and climate forecasts. This will build on the NMA establishment process and provide a transition support phase while the currently low capacity within the meteorological and hydrological sector in Liberia is being strengthened.
- During the inception phase of LDCF project implementation, locations for the installation of AWSs will be prioritised based on further input from MoT and MLME. When implementation commences, coordination with NVE-financed activities will – in particular - take place in Liberia between the Implementing Partner for this project, UNDP and representatives for the NVE-funded project. At that point, discussions should focus on the exact location for installation of observation equipment, how the Liberian climate information and early warning system can be strengthened in an integrated way, including compliance with system specifications and standards. Based on these discussions, AWSs installed under this LDCF project will be located with a focus on generating meteorological information linked to hydrological flow i.e. they will link and not duplicate NVE-funded activities and be located in the major river basins being monitored by MLME.
- Outcome 1 activities will be aligned with the WMO's GFCS initiative. WMO have indicated that 9 AWSs will be sufficient to provide an adequate coverage of monitoring stations for Liberia. The

AWSs will conform to (i.e. meet WMO standards) and be compatible with the already installed NVEAWS network to ensure ease of integration, installation and operation.

- With the assistance of a Communication on Instruments and Methods of Observation (CIMO) technician from the WMO, a systematic gap analysis will be undertaken to map the: i) required spatial distribution of the AWSs to adequately cover agro-meteorological, climatological, hydro-meteorological, synoptic and isohyet (rainfall variability) zones in the country; ii) required climate parameters to be monitored; and iii) required number of observation hours per station. The mapping will lead to an informed decision on exactly where to install new AWSs, how frequently these need to transmit data, and how to integrate them in the network being established through the NVE project.
- LDCF resources will be used to facilitate the establishment of an National Meteorological Centre (NMC), which at present does not exist in Liberia. Office space for this NMC will be provided by GoL, including all organisation involved in meteorology i.e. MoT, MLME, NDRC, MoA and EPA.

Output 1.1 Procurement and installation of 11 AWSs and 6 automatic hydrometric stations, including all associated infrastructure, in critical areas across the country, and rehabilitation of 1 automatic and 1 manual meteorological monitoring station, including communications and centralised archiving technologies.

85. Eleven AWSs will be procured and installed through the LDCF project. This includes two AWSs to support LDCF community-based project demonstration sites – see Output 2.3. LDCF resources will be used to rehabilitate the RIA AWS which – although only monitors weather variables related to aviation – has a long-term data set of weather recordings which will be useful for analysis of long-term climate trends in Liberia. All stations will be fitted with General Packet Radio Service (GPRS) telemetry equipment and a data processing unit and will be integrated via reception stations into a climate database. This will ultimately be housed within the NMA, but will temporarily be housed within the MoT, until the NMA is established. Data will also be compatible with the database housed at MLME, and will be shared between agencies as directed by the regulatory framework developed through Output 1.4. Stations will be installed within a secure, fenced area and will be powered by solar panels and reserve battery packs.

86. The AWSs will be installed in a systematic and phased approach, as opposed to all 11 being installed concurrently. This will allow for lessons learned from the initial installations to be applied to those installed in subsequent phases, as well as making it easier to adapt technologies and processes early on, i.e. to ensure the system is stable and functioning before scaling up operations.

87. LDCF resources will be used to procure and install a further 6 hydrometric stations in upper catchments in major tributaries of Liberia’s six major river basins. This will improve the MMLEs capacity to monitor and predict flow levels in Liberia’s most important river basins. By increasing the availability and geographical coverage of real-time hydrological data across Liberia, the MLME will have an enhanced capacity to forecast floods and inform warnings to be issued to vulnerable groups and sectors downstream. The exact location of the hydrometric stations will be determined through the systematic analysis mentioned above, in collaboration with MLME and NVE project technicians.

Output 1.1 includes the following activities:

1.1.1 Undertake a systematic analysis of the climatological, agro-meteorological, hydro-meteorological, synoptic and isohyet (rainfall variability) zones in Liberia to determine the exact number of and location for stations procured through Activity 1.1.2 and installed through Activity 1.1.3. This will include identification of the required climate parameters to be monitored and required number of observation hours per station.

1.1.2 Procure 10 synoptic automatic weather stations, 1 automatic agro-meteorological weather station and 6 automatic hydrometric stations.

1.1.3 Install the stations procured in Activity 1.1.2, including solar panels, batteries, security fences, data transmission software packages and networking facilities at the locations identified in Activity 1.1.1.

1.1.4 Rehabilitate/upgrade 1 AWS as well as the manual station at RIA including procuring and replacing relevant sensors and data loggers for automated stations, and instruments for manual stations.

1.1.5 Integrate the new stations and data outputs into the climate database established through Output 1.2, and the existing database at MLME, as directed by the regulatory framework developed through Output 1.4.

Output 1.2 Technical capacities of staff in Meteorology Department developed to produce standard and customized weather and climate forecasts and package meteorological data and information into a suitable format for user agencies and local community end-users.

88. To assist with the transition from the currently under-developed Meteorological Division, to the fully functional NMA, international meteorological assistance will be provided through the LDCF project. This international assistance will enable the production of weather and climate forecasts specific to Liberia in a relatively short time period (6 months) after initiation of the LDCF project. While the customized weather and climate forecasting system will be hosted offshore initially, meteorologists from the Meteorological Department will be actively involved in the production and dissemination of forecasts and climate information produced. Additionally, a representative of the international organization will be based in Liberia until the end of the Year 2 of the LDCF project. This involvement will be part of capacitating the Meteorological Department, and ultimately the NMA. Capacity development will continue for the duration of the LDCF project, with the customized forecasting system taken over by NMA during Year 3 of the LDCF project. This will be dependant on when the NMA is established.

89. Global forecasts (111 km resolution at the equator) will be downscaled using higher-resolution regional models, with three levels of nesting at resolutions of 36 km, 12 km and 4 km (the latter centered over Liberia). Initially, the internationally hosted system will produce twice-daily operational weather forecasts from downscaled models, developed specifically for Liberia. Liberian meteorologists will access the forecasts via the internet, and in turn apply their own local interpretation, under the guidance of the international specialists. These locally downscaled forecasts will be issued to the public through the communication channels established in Output 2.2. Over the course of the LDCF project implementation, the downscaling and forecasting operations undertaken offshore will be transferred to the NMA. This will be based on NMA capacity development progress achieved and include the validation of model outputs, and the incorporation of data collected through the equipment installed through Activity 1.1.1.

90. LDCF resources will be used to develop human technical capacity, internal arrangements, procedures and frameworks required to maintain and operate the meteorological observation network installed through Activity 1.1.1. Capacity development and technical assistance will support the establishment of the following two divisions under the MoT/NMA¹¹: i) Instrumentation and Communication; and ii) Meteorological Instruments. The capacity of personnel responsible for operating and maintaining equipment as well as receiving and archiving data – including data from manually operated stations – will be built. The capacity of computer technicians will be developed for maintaining the computer infrastructure and telecommunications systems, both existing and provided through the LDCF project. Cost-effective technologies which are able to interface with existing

¹¹Once established.

systems and which minimize dependence on external suppliers of hardware and software will be prioritised for LDCF project activities.

Output 1.2 includes the following activities:

1.2.1 Customize the weather forecasting system for Liberia, including the development of climate outlook products, downscaled models and analysis tools for generating weather and climate forecasts.

1.2.2 Conduct training of: i) 20 meteorological observers; ii) 5 meteorological officers; and iii) 5 meteorologists to capacitate the NMA for operationalizing the regular production of well-packaged short-, medium- and long-term weather and climate forecasts based on the internationally hosted (numerical and global) model output.

1.2.3 Develop the capacity of 3 instrument technicians to maintain and repair newly installed and rehabilitated meteorological equipment, as well as newly installed and existing computer infrastructure and telecommunications systems.

1.2.4 Develop a climate observation quality control and maintenance toolbox, including remotely accessible and online calibration and training courses, handbooks and manuals for AWSs and manual station maintenance.

Output 1.3 Weather and climate forecasting systems enabled through procuring and installing required equipment (data servers, computational nodes, visualisation software and suitable bandwidth communications technology, GTS, SYNERGIE and SADIS), and through integrating satellite observations for monitoring and assessing the changing state of the environment and the impact of current and future climate on key environmental variables.

91. LDCF resources will be used to procure and install the hardware and software needed to integrate, display, analyze and provide output of observed and model data as well as other graphical information. This will allow the capacity developed through Output 1.2 to be applied in Liberia once the weather and forecasting system has been transitioned to Liberia and hosted locally. The following will be procured and installed: i) a climate information database; ii) forecasting workstations; iii) a GTS link; iv) required equipment for the effective functioning of the PUMA/SYNERGIE and AMESD satellite systems; and v) a Satellite Distribution System (SADIS) to provide proxy upper air monitoring ascent measurements.

92. Processing the data from the newly installed and connected AWSs will require an appropriate climate database and modernized workstations (hardware and software). These workstations will provide the platform for MoT meteorologists to: i) visualize meteorological, environmental and oceanographic data; ii) produce standard and customized < 1 day severe weather nowcasts, 1-10 day weather forecasts, 1-6 month seasonal forecasts and > 6 month climate forecasts; and iii) edit and package weather and climate data and information into a suitable format for user-agencies and end-users. A GTS will be installed to link the AWSs, via GSM/GPRS, to the MoT headquarters in Monrovia, as well as to regional and international climate centres.

93. Forecasting and monitoring using data and imagery from installed PUMA/SYNERGIE and AMESD (e-station) satellite receivers will be strengthened. A MoU between RIA and meteorologists from MoT and technicians from MLME, MoA, NDRC and EPA will be developed and implemented to provide the necessary security clearance for meteorologists and technicians to access the installed software and hardware. Hardware and software limitations as well as power supply will be resolved by installing the necessary solar panels, battery packs and additional equipment needed (see Activity 1.3.4). A SADIS will be installed to provide proxy upper air monitoring ascent measurements. Procuring and installing this equipment as well as providing training on the appropriate utilisation of the equipment (under Output 1.2 above) will enable processing of satellite data sets for developing

environmental and climate information to support appropriate adaptation planning for: i) agriculture; ii) maritime operations; iii) energy operations; iv) environmental protection; v) forestry; vi) fisheries; vii) wetland protection; viii) transportation; and ix) coastal zone management.

Output 1.3 includes the following activities:

1.3.1 Procure and install an appropriate climate database at the National Meteorological Centre (to be established in parallel with the LDCF project – through GoL co-financing).

1.3.2 Review and install appropriate telecommunication infrastructure to establish connectivity of the installed AWSs with MoT headquarters in Monrovia, as well as via the GTS.

1.3.3 Procure and install equipment including the hardware and software required for modern meteorological forecasting workstations at the NMC.

1.3.4 Procure and install the required equipment at RIA (including reception cards, hard drives, a UPS tower, an ethernet switch, printers and a plotter) and CARI (solar panels, battery packs, a printer, plotter and a GIS licence and software) and establish a MoU between RIA and meteorologists from MoT and technicians from MLME, MoA, NDRC and EPA, to allow access to the satellite receivers and workstations at RIA.

1.3.5 Install the SADIS to provide proxy upper air monitoring ascent measurements. SADIS is provided free of charge to LDCs. Capacity will be built on how to operate the SADIS and how to incorporate the resultant data in weather and climate forecasting under Output 1.2.

Output 1.4 Staff in MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA trained to use information from meteorological, hydro-meteorological and satellite monitoring equipment to tailor forecasts for climate-related hazards specific to the respective sectors.

94. LDCF resources will be used to develop the human technical capacity required to produce ‘tailored’ products which are specifically designed to meet the information requirements of end-users in various sectors and locations. These tailored products will be based on the information provided by the Meteorological Department through the activities of Output 1.2. The tailored information products – including alerts, risk and vulnerability maps, and results from an integrated cost-benefit analysis – will be developed through consultations with end-users and appropriate research organizations. This will include consultations with the intended end-users of the information and appropriate research organisations. Furthermore, this will be informed by a comprehensive assessment of best practices and gaps with regards to centralized and decentralized climate information and early warning dissemination regionally and internationally.

95. Interactions between MoT, MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA will be strengthened to design and disseminate tailored information through an online climate information and early warning system platform hosted within the associated technical committees. This platform will provide technical as well as non-technical information to end-users. When the information constitutes a warning, this will be disseminated through the channels established through Output 2.2.

Output 1.4 includes the following activities:

1.4.1 Undertake a comprehensive assessment of the tailored climate information requirements of the agriculture, water, energy, health, coastal, transport and other climate-sensitive sectors – including information exchange mechanisms, communication channels and dissemination mechanisms between information producers, user agencies and end-users – to establish best practices, gaps and opportunities for streamlining and collaboration on data-use and -sharing.

1.4.2 Develop the capacity of 4 technical personnel from each of MLME, MoA, NDRC , EPA, MoH, LMA, NPA and MoPEA to, in collaboration with MoT, produce climate risk and vulnerability sector-specific maps and resultant tailored information/forecasts (to be disseminated via the communication channels established through Output 2.2) using the improved climate information available through outputs 1.2. This will include *inter alia* daily, ten-day and monthly agro-meteorological bulletins, seasonal forecasts, severe rain and flood forecasts and risk and vulnerability maps, based on sector specific and end-user needs. Standard Operating Procedures (SOPs) will be developed for the generation of such information, and a “train the trainer” approach will be used whereby the 4 personnel trained per institution will develop the capacity of staff at their respective institutions.

1.4.3 Develop a statutory regulatory framework to guide information sharing and analysis between the institutions listed in Activity 1.4.2 (including MoT/NMA), to generate tailored, sector-specific information. This framework will guide the dissemination of: i) sector-specific climate information (via e-mail, online platform, print media and extension services); and ii) climate-related warnings (through NDRC via the communication channels implemented in Outcome 2.2). This regulatory framework will guide the use of and access to improved meteorological data (collected and held by MoT) by MLME, MoA, NDRC , EPA, MoH, LMA, NPA and MoPEA, and will be based upon the mandates of all collaborating institutions.

1.4.4 Evaluate the costs and benefits of accurate, timely and accessible tailored, sector-specific information, based on improved weather and climate data, and develop handbooks and policy and information briefs to highlight the value of enhanced meteorological services and early warning systems to policy and decision-makers, civil society organisations, development partners and local communities.

1.4.5 Initiate an outreach programme in schools and universities to encourage learners to continue studies in the fields of meteorology and related disciplines e.g. agro-meteorology, hydro-meteorology, coastal/marine studies, climate forecasting and disaster management. This will include directing teachers/lecturers to the climate information made available through the LDCF project, so that it can be used in school/university projects. Scholarships will be provided for students at appropriate institutions, including the WMO Regional Training Centre in Lagos.

2.4.2 Component 2: Establishment of an early warning system for the dissemination and communication of extreme weather warnings, seasonal outlooks and increased risks due to climate change.

Outcome 2: Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.

96. Within this component, the hydro-meteorological and satellite-derived information produced through Component 1 will be analysed in conjunction with existing socio-economic information to assess current and predicted climate risks. The end product of this will be a suite of information packages that convey early warning messages in an appropriate format for specific targeted end-users. Effective channels of communication will be identified, including mobile phones, radio and the traditional ‘word of mouth’ system, and tested for different products and end-users. An agricultural application will be tested at a selected district in Grand Gedeh or Bong county, and a coastal application in one district in Grand Cape Mount, Montserrado or Grand Bassa county. Feedback from end-users and lessons from pilot activities will be used to improve and develop the packages for other EWSs.

97. The overall budget for this outcome under the LDCF project is US\$ 5,195,072. This includes US\$ 2,532,000 LDCF project grant requested and US\$ 2,663,072 indicative co-financing (Table 5).

Table 5. Total project value for Outcome 2 (including project management).

Funding source	US \$
Co-financing sources	
Agriculture Sector Rehabilitation Programme – funded by the African Development Bank and implemented through MoA	2,313,072
GoL, National Disaster Relief Commission (within MIA) budget allocation	200,000
UNDP Country Programme	150,000
LDCF project grant requested	2,532,000
Total	5,195,072

Baseline situation (without LDCF project)

98. Several government departments have specific units that deal with disaster related issues (see Table 6), however, the NDRC/MIA is the office that is mandated to coordinate emergency preparedness and response activities on behalf of the GoL. The NDRC was established in 1976 to: i) cater to disaster victims; ii) review, coordinate and plan different disaster prevention, preparedness, relief and rehabilitation measures; and iii) establish and maintain liaison with representatives of UN agencies and donors which have disaster relief related programs in the country. Although the NDRC is the institution tasked with managing disaster risk reduction and related activities, its approach is reactionary rather than preventative. Furthermore, the institutional capacity to lead and coordinate emergency response procedures is low. The NDRC does not have adequate resources and capacity to effectively carry out this mandate and therefore has not been able to effectively coordinate humanitarian or disaster management activities in the country.

Table 6: Lead Agencies for Specific Hazards /Disasters.

Hazards/Incidents	Lead Agencies
Flood	Ministry of Internal Affairs
Refugee Crisis	Ministry of Internal Affairs,; Liberia Refugee, Repatriation and Resettlement Commission (LRRRC)
Pest, Drought	Ministry of Agriculture
Wild Fire	Liberia Fire Service; Ministry of Justice
Epidemics and other health hazards	Ministry of Health and Social Welfare
Terrorists	Ministry of Defence
Desertification, environmental degradation, landslides	Environmental Protection Agency; Ministry of Lands, Mines and Energy
Oil spills, Exploration at Sea	Lands, Mines and Energy Ministry; Environmental Protection Agency
Chemical and Industrial Accident	Environmental Protection Agency; Ministry of Lands, Mines and Energy
Road, Aviation and Rail Disaster	Ministry of Public Works; Ministry of Transport

99. The National Disaster Management System in Liberia includes the following¹²: i) a National Disaster Management Commission (NDMC) consisting of all line ministries represented by the relevant minister; ii) a National Disaster Management Secretariat (NDMS) – once established will be – the operational arm of the NDMC consisting of a Director, two Deputy Directors (Operations and Administration) and four Disaster Risk Reduction Coordinators¹³; iii) a National Disaster Management Technical Committee (NDMTC) subdivided into subcommittees responsible for different sectoral/thematic areas including food and agriculture, water and sanitation, education and child protection, health services, environment, shelter and refugees, early recovery and infrastructure – the lead agencies, according to their respective mandates, are shown in Table 6 above; iv) County Disaster Management Committee headed by the County Superintendent – still to be established; v) Districts Disaster Management Committees; vi) Chiefdom Disaster Management Committees; and vii) Community Disaster Management Committees. The DRM policy and associated Act are yet to be

¹²According to the National Disaster Risk Management Policy of 2008.

¹³Responsible for: i) emergency and recovery; ii) policy and planning; iii) risk analysis and early warning; and iv) information management.

ratified into law, and most of the above structures are yet to become operational. Systems of disseminating information to the community level are therefore not formalised.

100. At present, NDRC uses primarily a telephone and thus verbal chain of command to send messages. The chain –from start to end-user – includes: i) superintendent at NRDCR (national level, based in Monrovia); ii) commissioner at the district level; iii) paracheif; iv) clan chief; v) general town chief; vi) town chief; vii) town crier; and viii) local communities at the village level. The general time taken for a message be be relayed from NDRC national level headquarters in monrovia to the village level is 1-2 days. Other means of disseminating disaster-related information include local radio stations, megaphones, whistles, community flags and handwritten letters. The current communication channels are ineffective, because of limited awareness of communities and officials at all levels regarding the relevance and importance of disaster risk management-related messages.

101. Liberia has low capacity to manage climate-change related threats. In particular, the capacity to synthesise different data on environment, climate and socio-economic vulnerabilities is extremely limited. This is a result of a lack of data, computer hardware and software, and a shortage of technical skills. The UNDP BCPR, in collaboration with the NDRC, implemented a disaster risk management project in 2008 entitled “Building National and Local Capacities for Disaster Risks Management in Liberia”. The project inter alia: i) raised awareness at a county level of the importance of establishing disaster management and response structures; and ii) undertook 3 regional training exercises – the last of which was in December 2012 – on climate change and developing county-specific emergency preparedness plans. The WFP project “Strengthening Emergency Preparedness and Response Framework in Liberia” has built on what was initiated through the UNDP project. NDRC, through the WFP project, is planning to collect baseline data at national and county levels to establish the disaster risk management system. However, this data will be collected mostly from secondary sources, and funding is required to collect data from primary sources at the community level.

102. According to the National Action Plan and disaster risk management capacity needs assessment – developed by MIA and UNDP – emergency response capacity needs in Liberia include:

- communication equipment to establish and strengthen early warning system at national and local levels;
- regular EWS reports to be used for planning and decision making purposes;
- meteorological information disseminated at national, county and community levels;
- awareness training about communication and reporting procedures, protocols and clear indicators;
- support to raise awareness of all actors for risk assessment, incorporation of early warning information/alerts and communication of the risks to district level;
- training for MIA/NDRC staff on the use of SPSS and GIS application;
- establishment of databases in fifteen counties and at a national level;
- assistance in establishing baseline information for disaster risk management activities;
- motor bike to facilitate data collection activities at district and community levels;
- field vehicle to enhance disaster risk management activities at national and county level;
- technical support at national and local level to integrate the national early warning system with sectoral ministries, departments and emergency centers;
- support in mainstreaming DRM into development planning; and
- assistance in establishing disaster risk management structures at national and local levels.

103. Despite the advancements in disaster risk reduction activities by the GoL through the actions of the MIA/NDRC, the sector is still relatively weak and additional support is required to enable systems to allow for the the co-ordination of generating and disseminating climate-related early warnings. Currently there are no functioning EWSs in Liberia. Whilst numerous on-going projects (see Section 2.3) have built up useful knowledge and data for an EWS, they remain disaggregated. There is minimal integration or attempts to align activities from different projects into a coherent system for communicating warnings at the national-level. A system which coordinates the activities of these on-going projects and enables systems to allow communication of climate information to

vulnerable sectors and communities would be a cost-effective approach to integrating available local knowledge and data to strengthen the national capacity for the dissemination of early warnings. Without additional support, the effectiveness of the current disaster risk reduction activities in Liberia– including local communities and socio-economic sectors supported by these activities and projects – will be undermined by climate change impacts.

Adaptation alternative (with LDCF project)

104. Despite the advancements in disaster risk reduction activities by the GoL through the actions of the MIA/NDRC, the sector is still relatively weak and additional support is required to enable systems to allow for the the co-ordination of generating and disseminating climate-related early warnings. Under this outcome, LDCF resources will be used to build capacity and procure the necessary equipment and software to allow the NDRC to combine the tailored, sector-specific forecasts generated in Outcome 1 with risk and vulnerability data to generate warnings, and to communicate these warnings to the appropriate sectors and vulnerable communities. The LDCF investments will build on the momentum created through the UNDP project to build capacity for disaster risk management in Liberia, and will align with the WFP project aiming to establish an emergency preparedness and response framework.

105. The three outputs under Outcome 2 will build on the existing investments being made in the sector by the GoL and the Agriculture Sector Rehabilitation Project.

- LDCF resources will be used to build capacity and procure the necessary equipment and software to allow the NDRC to combine the tailored, sector-specific forecasts generated in Outcome 1 with risk and vulnerability data to generate warnings, and to communicate these warnings to the appropriate sectors and vulnerable communities. This will include hardware and software needed to develop a centralised risk and vulnerability database housed at and maintained by NDRC. This will allow for the collation of all climate and non-climate risk and vulnerability data, and will allow for the identification of vulnerable areas based on the sector-specific forecasts generated through Outcome 1. The development of the database will be associated with capacity development of NDRC technicians to ensure efficient operation and maintenance of the system.
- The LDCF investments will build on the momentum created through the UNDP project to build capacity for disaster risk management in Liberia, and will align with the WFP project aiming to establish an emergency preparedness and response framework.
- Capacity built and equipment installed through the Agriculture Sector Rehabilitation Project will be further developed through LDCF training opportunities and additional, complementary meteorology and hydro-meteorology monitoring equipment.
- Vulnerability mapping at a national level will be undertaken and the processed and stored in the database. This will compliment the work currently being undertaken through the WFP project, so as to ensure that efforts are not duplicated and resources are most efficiently used. In addition to the mapping, participatory vulnerability assessments will be undertaken in the target districts to inform the most effective means of communicating warnings to local communities.
- A communication and co-ordination strategy will be developed for disseminating weather and climate information and early warnings across all levels, e.g. community-, district-, county-, national and regional-level (to neighbouring countries). A range of communication methods, including radio, television, print media, SMS-based/smart phone alerts, satellite phones, word-of-mouth and local, indigenous methods will be considered. A cost-benefit analysis will be undertaken to establish the advantages and disadvantages of each system.
- The communication strategy will include liaising with meteorological and hydro-meteorological centres in neighbouring countries – this will be important for cross-border flooding warnings and sharing information on cross border transport routes. The Regional Maritime Rescue Co-ordination Centre, under the LMA, will share coastal information with neighbouring countries.
- Capacity will be built within local and national government to ensure that the advantages of the EWS are apparent. This will strengthen the uptake of activities implemented through the LDCF project by the relevant GoL institutions. In particular, county supra-intendants and district

commissioners' capacity will be built to instruct chiefs and communities on the appropriate responses to warnings issued. This train-the-trainer approach is a cost-effective means of informing a large number of community members of the benefits of the LDCF project.

- Capacity will be built within communities in the target districts, where awareness of climate change-related issues is low. This capacity building will be necessary to ensure that the LDCF projects are accepted and supported by local communities. This will include the application of an EWS for agricultural stresses in a target districts in one of Grand Gedeh or Bong county, and a coastal application in target districts in one of Grand Cape Mount, Montserrado or Grand Bassa county.
- The dissemination of climate information will be distinct from the dissemination of early warnings, as directed by the mandates of the different institutions involved.

Output 2.1 Systems and communication with the NDRC are developed to use hydrological, weather, climate and environmental monitoring data and existing vulnerability assessments to identify areas of high vulnerability to climate change.

106. Hydrological, weather, climate and environmental monitoring information and products from Component 1 and existing social vulnerability data from the BCPR project will be combined to identify regions where current climate risks are severe and expected to increase in the future. This information will be combined with agricultural (crop), flood risk or other sectoral models to develop climate change vulnerability maps. These maps will be housed at NDRC but available to all government agencies who require the information. Training on the use of these maps will be provided to NDRC staff. Further training and thematic workshops will be given to build the capacity of national and local government user agencies to use and interpret climate and vulnerability maps.

Output 2.1 includes the following activities:

2.1.1 Develop a centralised climate vulnerability and risk database – including procuring and installing the relevant hardware and software – that integrates hydrological, weather, climate and environmental data to assist user agencies to assess current and future climate risks.

2.1.2 Train 4 technical personnel from NDRC on hazard and vulnerability mapping and produce hazard and vulnerability maps at a national level at relevant scales, focussing efforts on climate disaster-prone regions.

2.1.3 Review and propose revisions to planning documents of user agencies to mainstream climate change adaptation and EWS protocols into future development, poverty reduction, disaster risk reduction and sector-specific strategies of user agencies.

2.1.4 Build the capacity of national and local government user agencies to effectively support EWS and data/information exchange/sharing protocols through training and thematic workshops at national and county levels.

Output 2.2 Communication channels, SOPs and legal mandates developed for disseminating climate information and issuing warnings through government institutions and NGOs.

107. Under Output 2.2, a national weather and climate information and early warning system communication and coordination strategy will be developed to coordinate decision-makers in government, private sector, civil society and development partners in the communication of weather and climate alerts to vulnerable sectors and local communities. SOPs for disseminating weather and climate information and early warnings will be developed. The SOP will be complemented by a dissemination toolbox, which will include a trainer manual on the use of a range of national and local gender sensitive media for disseminating weather and climate information, as well as early warnings, to end-users.

108. The LDCF project will support the NDRC establish partnerships with local radio stations, television broadcasters, mobile phone service providers and county/district representatives in order to establish the most appropriate channels to communicate with communities in different districts across Liberia. A mechanism to receive and evaluate feedback from end-users will also be established in order to allow the efficacy of the various communications channels and early warning information to be evaluated.

Output 2.2 includes the following activities:

2.2.1 Develop a weather and climate information and early warning system communication and coordination strategy. This will include SOPs for disseminating weather and climate information and early warnings across all levels, e.g. community-, district-, county-, national and regional-level (to neighbouring countries).

2.2.2 Develop a national and local dissemination toolbox, including a trainer manual on the use of radio, television, print media, short message service (SMS)-based mobile/smart phone alerts, satellite phones, word-of-mouth and local, indigenous methods used to disseminate climate information and alert communities of climate-related hazards in Liberia.

2.2.3 Establish links with local radio stations to disseminate climate information and early warnings in local languages.

2.2.4 Establish links with national television broadcasters to provide daily short-term weather forecasts and early warnings on local television stations.

2.2.5 Strengthen traditional 'word of mouth' dissemination system by building capacity of county supra-intendants and district commissioners to instruct chiefs and communities on the appropriate responses to warnings issued.

2.2.6 Establish an Open Data Platform, in collaboration with mobile phone operators, including server and software for SMS alert system.

2.2.7 Establish legal mandates for issuing warnings, including the role the Ministry of Information.

2.2.8 Equip and facilitate NDRC to support the dissemination of weather and climate information and early warning, including the establishment of call centres/hotline and internet connections.

<p>Output 2.3 Two applications – agricultural and coastal – of the EWS implemented and tested for their effectiveness.</p>

109. The communication channels developed in Output 2.2 will be implemented and tested in two districts in Liberia. An agricultural application of the EWS will be implemented in one district in Grand Gedeh or Bong county, and a coastal application in one district in Grand Cape Mount, Montserrado or Grand Bassa county. The former counties are those included in the LDCF agriculture project, where measures for increasing climate resilience of local agriculture are being tested, and the latter are those included in the LDCF coastal project, where adaptation measures to protect against sea level rise, storms, sea-surges and coastal flooding are being tested. Specific target community sites within these areas will be determined during Project Inception – the decision will be made in collaboration with the LDCF agriculture and coastal project managers, as well as through rapid vulnerability assessment of the districts.

110. Communities in the selected districts will be engaged and trained to respond effectively to the weather and climate early warnings. This will ensure that indigenous knowledge is incorporated and that the communities are able to respond to the advisories issued. The range of communication channels developed through Output 2.1 will be tested, including the development of a two-way SMS colour-coded alert system for agriculture stress advisories, and coastal storm/flooding warnings. The two-way system will provide: i) alerts to local communities at risk; and ii) a communication channel to disseminate feedback on the usefulness and impact of the alert received as well as the current status of the particular weather or climate extreme being experienced. Furthermore, simulation exercises for enhanced flood, storm and coastal surge preparedness in the selected districts will be conducted to complement the SMS-alert system. This will be guided by SoPs developed under Output 2.2.

Output 2.3 includes the following activities:

2.3.1 Undertake rapid, participatory vulnerability assessments of districts in Grand Gedeh and Bong counties (for the agricultural EWS) and in districts in Grand Cape Mount, Montserrado and Grand Bassa counties (for the coastal EWS) and select two districts for LDCF project implementation.

2.3.2 Map sub-basin climate hazards in the priority districts, including geospatial interpretation and groundtruthing. This will inform the development of tailored and area-specific warnings and the generation of alerts for the two districts.

2.3.3 Train communities the importance of climate change adaptation, how to respond to early warnings, and how to send climate information back to NDRC (through the two-way system) This will include undertaking field visits and stakeholder consultations in a subset of targeted users in the target districts to understand how users of early warning advisories and warnings use the information for managing climate and weather related risks and how their decision frameworks affect the interpretation of advisories and warnings.

2.3.4 Develop and implement a range of communication strategies, including community radio, word-of-mouth and a two-way, SMS-based alert system in the priority districts. The SMS system will require the development of data quality and SMS thresholds (for the provision of warnings and information feedback) and Crowdsourcing Information Technology specialist and maintenance support. Two-way radios will be integrated into the system to assist community members and farmers with no mobile phone or on a different service provider contract.

2.3.5 Assess the merits of the different types of communication strategies, through community surveys and a cost-benefit analysis. This will include household surveys of a subset of targeted users of climate information in the target districts conducted to understand the social and economic costs and benefits of using advisories and warnings for *ex-ante* risk management in agriculture and coastal management.

2.3.6 Conduct simulation exercises for enhanced flood, severe storm and coastal surge preparedness to complement the alert system implemented in Output 2.3.3 in the two selected districts.

2.4.3 Component 3: Strengthening of institutional capacities to develop policies and strategies that take climate change risks into account.

Outcome 3: Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.

111. Within this component, the capacity of the GoL to assess the impacts of climate change on vulnerable sectors and communities will be strengthened. This will facilitate discussions within government departments and the private sector on cost-effective adaptation options that improve livelihoods and safeguard local communities. EWS information from outcome 1 and 2 will be used as a basis for discussing climate change-related vulnerabilities and their likely impacts on local communities. The long-term sustainability of the EWS will be promoted through engagement with the private sector and government and include identifying paid-for services for different sectors, which in turn will maintain and sustain the EWS.

112. The overall budget for this outcome under the LDCF project is US\$ 5,550,000 This includes US\$ 1,150,000 LDCF project grant requested and US\$ 4,400,000 indicative co-financing (Table 7).

Table 7. Total project value for Outcome 3 (including project management).

Funding source	US \$
Co-financing sources	
GoL, Environmental Protection Agency budget allocation	4,400,000
LDCF project grant requested	1,150,000
Total	5,550,000

Baseline situation (without LDCF project)

113. The EPA is the principle authority for implementing the national environmental policy and sustainable management law for the protection of natural resources in Liberia. The EPA Act of 2002 charges the EPA with coordinating, monitoring, supervising and consulting with relevant stakeholders on all activities in the protection of the environment and sustainable use of natural resources. EPA is also the GEF and UNFCCC focal point in Liberia, and therefore is tasked with overseeing matters related to climate change in the country. This includes developing and implementing policies that ensure the long-term economic prosperity of Liberia through sustainable, social and economic development to meet the needs of present generations. The EPA is responsible for the following functions:

- collecting and disseminating environmental data and concerns;
- proposing environmental policies and strategies to the Policy Council;
- establishing integration of environmental concerns into national development planning;
- helping build the capacity of ministries and agencies in dealing with the environment in Liberia;
- investigating reports of pollution and environmental degradation;
- identifying projects, activities and programs for which environmental impact assessment must be conducted under the EPA Act;
- ensuring the preservation of important historic, cultural and spiritual values of natural resources heritage;
- encouraging public awareness of Liberia’s environmental issues; and
- promoting regional cooperation on matters relating to the environment.

114. To enable the EPA to perform the functions listed above, a decentralised support team provides assistance to the national level staff at the EPA headquarters in Monrovia. This decentralised system includes: i) environmental inspectors at the county and district level; ii) technical committees to collaborate with line ministries such as MoT, MLME, MoA and LMA; iii) county environmental committee; iv) county environmental officers in each county; v) district environmental committees; and vi) district environmental officers in each district.

115. Significant and visible progress has been made in building Liberia’s environmental governance framework, which will act as a platform for integrating climate change adaptation activities into long-term national planning. Key achievements include: i) approval of the National Environmental Policy and adoption of two major environmental laws (Environment Protection and

Management Law, and the Environmental Protection Agency Act); ii) publication of Liberia's first State of the Environment Report in June 2007 which has established a baseline for monitoring environmental conditions and trends; iii) deployment of environmental inspectors in all fifteen counties; iv) establishment of a basic environmental laboratory facility at the EPA to help monitor environmental conditions and trends and enforce legislation; v) progress on establishment of environmental units in government ministries and agencies¹⁴; vi) environmental impact assessment administrative procedures have been developed; vii) certification of environmental consultants to conduct environmental impact assessments; viii) development of a National Biodiversity Strategy and Action Plan; ix) active participation in multi-lateral environmental agreements, regional cooperation initiatives and implementation of projects supported by the GEF; x) preparation of a national action plan and strategy to address land based sources of marine pollution; xi) approval of the Forestry Reform Law in 2006; xii) draft Integrated Water Resources Management Policy prepared; and xiii) draft Energy Policy prepared.

116. Despite the achievements listed above, current national policies do not adequately integrate climate change across Liberia's development plans and processes in a coherent manner. An example is the Agenda for Transformation (2012-2017) – Liberia's medium term economic growth and development strategy – which details government objectives and medium-term strategies to achieve the MDGs. Climate change is only mentioned in passing and the strategy does not have a focus on how to address and adapt to the impacts of climate change.

117. The integration of climate change into the Agenda for Transformation as well as related sectoral policies will be instrumental in achieving the MDGs but is hindered by limited: i) knowledge of large-scale projected changes in Liberia's climate; ii) data for accurate predictions of climate change impacts on different sectors and communities; iii) assessments of the effectiveness of different adaptation options have been undertaken within a Liberian context; iv) dialogue and coordinating efforts between different policy making entities; and v) engagement of the private sector in adaptation interventions. Currently there are no easily accessible climate projections which can be applied to a small territory such as Liberia. This hinders the development of appropriate adaptation options as it is not currently clear which vulnerable sectors and communities will need to consider adaptation in the near future or how resilient they currently are to the expected changes in climate. The sector-specific impacts of climate change are difficult to predict as a result of the limited availability of knowledge on the current state of Liberia's biophysical environment, the effect of climate on vulnerable populations and uncertainty in future climate models. This limits the integration of climate change adaptation options and recommendation into sectoral policies.

118. As the meteorological and hydrological observation network in Liberia is currently very limited, the private sector is at present not benefitting from climatic data generated by the GoL. Liberia is a country rich in natural resources, including minerals, water, timber and oil. This, among other factors, has resulted in a strong private sector presence in the country. Private sector companies require climatic (meteorological and hydro-meteorological) data to plan for and increase the efficiency of operations. Weather and hydrological stations are therefore often installed by private sector companies, but the number and location is not known, nor is it known when the stations are abandoned. These stations represent a potentially important source of information for the meteorological and hydrological sectors in Liberia, but negotiations are required with private sector companies to: i) make the data available; and ii) continue funding the operation and maintenance costs of the stations. Furthermore, once improved data is being generated by the meteorological and hydrological services in the country, the private sector will need to be made aware of the benefits of this data.

119. Despite the achievements of the GoL – primarily through the work of the EPA – and the support of the baseline projects outlined under Outcomes 1 and 2, additional support is required to strengthen institutional capacities to develop policies and strategies that take climate change risks into

¹⁴ This is currently still underway.

account. This will result in the climate information and dissemination of warnings being streamlined into national development planning, resulting in a coordinated approach to the national EWS in Liberia. Without additional support, the effectiveness of the work presently undertaken by the EPA, and indeed the climate information and EWSs established through Outcomes 1 and 2 of the LDCF project will be undermined by current policies that do not support the sustainability of LDCF investments.

Adaptation alternative (with LDCF project)

120. The four outputs under Outcome 3 will build on the existing investments being made in the sector by the GoL.

- Regional climate scenarios will be developed to enable the identification of vulnerable regions and communities in Liberia. This will allow the EPA to focus on sector-specific policies that take environmental sustainability and climate change into account. This complements the present activities of the EPA’s decentralized approach including environmental inspectors, district and county officers and environmental committees supporting region-specific regulation and monitoring activities that impact on the natural environment. The on-the-ground presence of EPA through the district environmental committees and district environmental officers in each district will facilitate the implementation of the LDCF project activities.
- Adaptation options for the agriculture and coastal sectors are being developed through two ongoing LDCF projects (see Section 2.3.1). These are being implemented by MoA and MLME respectively. This LDCF project will build on lessons learned from these projects as well as use regional climate scenarios generated to develop a list of low-cost – and importantly including “no-cost”¹⁵ – adaptation options. These adaptation options – with a focus on low-cost, no-regret and flexible activities – will be made available to communities through the EPA’s decentralized, on-the-ground network of staff.
- LDCF resources will be used to strengthen institutional capacities to develop policies and strategies that are sensitive to climate change. This will include a revival of the National Climate Change Steering Committee (NCCSC), which was in the process of being established in 2011. The NCCS, which is the operational arm of the NCCSC, will be the body tasked with developing and/or revising the required policies and strategies. The NCCS will work within the existing structures of the EPA and their communication channels with the GoL Policy Council.
- Innovative financing options – including public-private partnerships and market-based mechanisms – will be identified, developed and promoted for providing sustainable finance for the operation and maintenance of the installed meteorological observation, forecasting and early warning systems. A platform with the NCCSC will be established through which the private sector can be engaged and relationships with climate information generators (primarily MoT and MLME) can be established and maintained.

Output 3.1 Regional climate change scenarios developed for Liberia and used to enable the identification of ‘hotspots’ where climate change is expected to have severe biophysical and socio-economic impacts.

121. Regional climate change scenarios are required to understand and plan for regional impacts of global climate change. Such scenarios will be used to generate climate statistics such as meteorological trends, and probability and severity of climate-related hazards, including sea level rise (SLR). The development of these scenarios will provide evidence-based input for GoL decision-making on: i) climate change adaptation interventions to reduce vulnerability to climate change; ii) planning long-term economic development in a wide range of sectors, including agriculture, water, energy, transport, construction and civil works; and iii) designing durable and resilient infrastructure.

¹⁵ No-cost is a term used by the GoL for adaptation actions that can be implemented by extremely poor communities at no direct cost e.g. instead of planting new variety of drought resilient seed which will cost a certain amount, no-cost options will include adaptation options such as adapting ploughing techniques and/or using appropriate low or no tillage. These should be grouped and highlighted.

The identification of 'hotspots' will be based on maps developed through climate simulations and the probability and severity of the forecasted climate hazards.

Output 3.1 includes the following activities:

3.1.1 Develop a protocol on generating regional climate change scenarios, including: i) selecting IPCC global climate change scenarios; ii) downscaling using a nested regional climate model; iii) conducting the required simulation; and iv) identifying sector-specific 'hotspots'.

3.1.2 Provide training to MoT staff on implementation of the protocol developed in Activity 3.1.1.

3.1.3 Provide workshops to facilitate the understanding of national and local government user agencies and line ministries on the implications of the regional climate change scenarios, to raise awareness about the value of adapting to climate change.

Output 3.2 Adaptation options (including EWS-related options) developed for the most vulnerable sectors and local communities based on the identified climate change 'hotspots'.

122. Guidelines will be developed to build the capacity of decision-makers to understand the implications of the different scenarios developed in Output 3.1. Scenarios and adaptation options can then be compared with other regions to identify the most appropriate activities to build climate change resilience. This information will be used by decision-makers, technical staff from relevant institutions, NGOs and farmers to explore the set of possible adaptation interventions for most vulnerable sectors and local communities, based on the 'hotspots' identified through Output 3.1. Identified adaptation options will need to be screened to ensure compatibility with national development and sectoral policy documents such as the National Integrated Water Resources Management Policy, the National Gender Policy Strategic Framework and Plan (2010-2015) and the Back to the County Agriculture Initiative.

123. Superintendents from the 15 county and commissioners from the 68 districts will be trained through a series of county-level workshops to raise awareness and assist communities implement adaptation options identified – including community-based EWS related adaptation options. This will include the generation of pamphlets and manuals in local languages, informing community leaders on how to instruct communities to implement low and no-cost adaptation options. This 'train-the-trainer' approach will increase the cost-effectiveness of the LDCF project.

Output 3.2 includes the following activities:

3.2.1 Develop a suite of adaptation interventions for the most vulnerable sectors and local communities based on the results of the regional climate change scenarios and associated climate change 'hotspots'.

3.2.2 Undertake consultations with relevant line ministries and vulnerable communities to build awareness of the range of cost-effective, tailored adaptation interventions available.

3.2.3 Develop user-friendly pamphlets and manuals on how community leaders should advise communities to implement adaptation options developed. This will include community-based EWS related adaptation options and in particular appropriate response mechanisms for a range of warnings generated through Outcome 2, based on the climate information generated through Outcome 1.

3.2.4 Undertake a campaign at a county level to capacitate county superintendents and district commissioners, through a 'train-the-trainer' approach, to advise communities on the planning and implementation of adaptation options developed.

Output3.3 A system established for inter-ministerial dialogue on incorporating climate change considerations into government policies and strategies.

124. Through the creation of a mechanism for inter-ministerial communication, support will be provided for integration of climate change into national planning. In addition, a platform will be established for the development of new climate-sensitive policies. The NCCSC will serve as this mechanism, and will be housed within the EPA. The NCCSC will engage with ad-hoc working groups comprised of representatives from relevant sectoral ministries such as MoA, MoP, MoF and the climate change unit within the EPA. A primary objective of the NCCSC will be to identify climate-sensitive sectoral and/or environmental regulatory frameworks, as well as report on and coordinate on-going climate change related activities.

125. A further objective of the NCCSC will be to engage government to ensure the medium- to long-term sustainability of the i) Meteorology Department within the MoT; ii) hydrological services within the MLME; and iii) climate change adaptation support mechanisms within the NDRC. Sustainability will be achieved by ensuring adequate annual budget allocations to fund the operation and maintenance activities of the respective institutions involved in the generation and use of climate information and early warnings in Liberia.

Output 3.3 includes the following activities:

3.3.1 Strengthen the NCCSC, based on the platform developed during 2009-2011.

3.3.2 Undertake a review of government sectors and related policies to identify entry points for climate change adaptation.

3.3.3 Assess the recommendations emanating from the development of regional climate change scenarios in Output 3.1, to inform reviews undertaken in Activity 3.3.2 and proposed revisions in Activity 3.3.4.

3.3.4 Propose revisions to national sectoral policies and strategies to enable the inclusion of climate change adaptation.

3.3.5 Engage with government to motivate for sufficient budget allocations to ensure the medium- to long-term sustainability of key line ministries and agencies involved in the generation of climate information and early warnings.

Output3.4 Engagement of the private sector to develop paid-for meteorological and hydrological services, including a mechanism for discussing public and private financing for supporting the generation of climate information and early warnings.

126. The sustainability of the EWS will be assessed, taking cognizance of the current funding mechanisms and allocated ministerial budgets. A comprehensive needs assessment for climate services will be carried out, and the willingness and ability to pay for such services across a range of private sector stakeholders will be investigated. Activities will need active engagement with customers to determine user-specific needs in terms of product/service, frequency of update and form of delivery. Potential paid-for applications of climate information include: i) weather index-based insurance products; ii) mobile phone platforms to disseminate site specific information; and iii) tailored forecasts for large scale agro-forestry plantations. Where suitable legal arrangements exist and where governments are willing, private companies will be approached to test their willingness to engage in a public-private partnership. This output will include a review of the business plans of MoT, MoA, MLME, NDRC and the NMA. A sector-specific marketing strategy and programme will be developed and implemented to capitalise on potential income streams.

127. This output will coordinate with the inter-ministerial dialogue (Output 3.3) to ensure generated revenue will be used to supplement GoL budget allocations for the purpose of sustaining the EWS and maintaining the services developed through the LDCF project. A platform with the NCCSC will be established through which the private sector can be engaged and relationships with climate information generators (primarily MoT/NMA and MLME) maintained.

Output 3.4 includes the following activities:

3.4.1 Undertake a needs assessment to understand the climate information requirements and willingness to pay of potential private sector clients/end-users.

3.4.2 Establish a consultative forum with major private sector partners to confirm their needs and the possibility of providing paid-for services.

3.4.3 Review the business plans of MoT/NMA, MoA, MLME and NDRC and propose revisions based on the market potential for specialised EWS products (e.g. weather index-based insurance products, mobile phone platforms to disseminate site specific information, and tailored forecasts for large scale agro-forestry plantations).

3.4.4 Facilitate the development of business plans of NMA and by the private sector clients, and the introduction of clients to potential private sector funders. This should include an NMA business plan to generate revenue from a portion of: i) landing charges from the Liberian Airport Authority; ii) en-route flight charges collected by RIA; iii) sales tax surcharge on tickets and cargo by the Civil Aviation Authority; iv) maritime charges from the Liberia Maritime Authority; v) port and other charges from the National Port Authority; and vi) licence fees from the National Transport Authority levied on land and rail transports and drivers.

3.4.5 Establish a public-private partnership between a suitable company and the MoT/NMA. This will include the establishment of SOPs and agreements to allow the company to use the data generated by the meteorological observation network for the purpose of selling products to other private sector individuals or companies.

2.5. Key indicators, risks and assumptions

2.5.1 Project Indicators

128. The indicators are designed to measure change in the coverage, impact, sustainability and replicability of the LDCF project. These indicators track progress in achieving project objective and outcomes. The baseline, target, source of verification, risks and assumption per indicator are detailed in the Project Results Framework (see Section 3). Baseline values and targets per indicator will be verified within the first six months of project implementation.

129. At the level of the project objective and the two project outcomes, indicators are:

Objective: To strengthen Liberia's climate-related monitoring capabilities, early warning systems and available information for responding to climate shocks and planning adaptation to climate change.

Indicators:

1. Capacity as per capacity assessment scorecard.
2. Domestic finance committed to Meteorology Department, Hydrological Services and NDRC to monitor and warn against extreme weather and climate change.

Outcome 1: Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.

Indicators:

1. Percentage of national coverage of climate monitoring network (fully operational).
2. Frequency of data transmission and reception.
3. Number of sector-specific, tailored climate information packages produced using improved information

Outcome 2: Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.

Indicators:

1. Number of communication channels operational to disseminate climate-related early warnings.
2. Percentage of population within the two target districts with access to improved climate-related flood, storm and coastal surge warnings (disaggregated by gender).

Outcome 3: Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.

Indicators:

1. Development frameworks that integrate climate information in the formulation.

2.5.2 Risks, mitigation/reduction measures and assumptions

130. Risks, mitigation/reduction measures and assumptions to/of the LDCF project are summarised in Table 8 below, and assigned to indicators in the Project Results Framework (see Section 3). The risks are further detailed in the Risk Log in Annex 4.

Table 8: LDCF project risks, mitigation/reduction measures and assumptions.

#	Risk	Mitigation/reduction measure	Assumption
1	Human, technical capacity within MoT particularly, as well as MLME, NDRC, MoA and EPA, including within extension service providers and decentralized offices, is insufficient to effectively implement the LDCF project.	The capacity of technicians within MoT, MLME, NDRC, MoA and EPA is developed through training opportunities provided through the LDCF project.	Training opportunities provided through the LDCF project result in the development of the required capacity, and the government provides the necessary budget to provide the required institutional framework in which the newly skilled staff can operate.
2	Poor coordination between IP (EPA), RPs (MoT, MLME, NDRC, MoA and EPA) and UNDP CO results in institutional failure, compartmentalized progress and delayed implementation of the LDCF project.	A project organisation structure (see Section 5) is implemented including representation of EPA, MoT and MLME on the Project Board. These three institutions will steer the LDCF project and ensure that a coordinated approach is adopted.	The management arrangements established through the LDCF project result in a coordinated approach to implementing the project.
3	Insufficient institutional support and political commitments from the GoL leads to a decrease in the political will ensured during project design, ultimately destabilizing the LDCF project.	Continuous lobbying and sensitization of the key government officials will be undertaken based on evidence from the pilot sites to secure cooperation and commitment.	GoL commitment established during the design phase of the LDCF project is maintained for the project duration.

#	Risk	Mitigation/reduction measure	Assumption
4	The slow pace of policy modification means that identified development frameworks do not integrate climate change in a timely fashion.	Continuous lobbying and sensitization of the policy makers will be undertaken based on evidence from the pilot sites to secure cooperation and commitment.	Climate change adaptation considerations are included in development framework formulation, based on advancements in climate information and forecasting achieved through the LDCF project.
5	Delayed implementation of baseline projects by the government and donors negatively affects LDCF project outcomes.	The PM will work closely with the relevant persons responsible for the baseline projects to synergise activities and assist in facilitating the implementation of baseline projects where possible.	Baseline projects are implemented according to the timeline identified in the design phase of the LDCF project, and achieve the desired outcomes and objectives.
6	Installed hydro-meteorological equipment fails because it is vandalised or not maintained.	Awareness raising activities will be undertaken in target communities to highlight the importance of the installed equipment. In addition, the equipment will be housed within a secure fence.	Communities living in proximity to installed hydro-meteorological equipment commit to taking active measures to prevent the equipment from being vandalised; and the equipment is adequately maintained by the responsible institution.
7	Climate shocks occurring during the design and implementation phase of the LDCF project result in disruptions to installed equipment and severely affect communities, prior to the EWSs being established.	Disaster mitigation and response activities will be prioritized at the target communities whilst the EWS is being established.	Any climate shocks occurring whilst the EWSs are being established will not be so severe as to result in a relocation of the communities where the effectiveness of the EWSs will be tested, or to irreparably damage hydro-meteorological equipment.
8	Local information technology and telecommunications infrastructure restricts the transfer of data from installed equipment to necessary recipients, and restricts communication amongst key role players and end-users.	The LDCF project has been designed in accordance with local conditions, taking, where applicable, the latest available international technology into account.	Information technologies and telecommunications systems implemented or used through the LDCF project are best suited to the local context and do not restrict the transfer and communication of information.
9	Procurement and installation of hydro-meteorological equipment, including hardware and software, is delayed because of complications with the release of funds and/or national procurement procedures.	Effective administrative planning will be undertaken, with support from UNDP CO, which will include procuring equipment at an early stage in the project implementation phase.	UNDP CO and HQ will co-ordinate with the IP to ensure effective administrative planning and the timely procurement and installation of equipment.
10	Lack of commitment from communities where EWS are established undermines the effectiveness of the LDCF project demonstrations.	The LDCF project will avoid a 'top down' approach and seek to create community ownership of the EWSs through community training and encouraging participation in project activities.	Awareness-raising activities and the demonstration of the advantages of responding to the information provided through the established EWS will ensure the commitment of the communities participating in the LDCF project.

2.6. Cost-effectiveness

131. Quantifying the cost effectiveness of improved climate information and early warning system investments is acknowledged to be difficult, and is therefore not regularly undertaken¹⁶. Cost-benefit analyses of investments in improved climate monitoring and effective early warning systems are scarce. However, evidence suggests that investment in prevention is more cost-effective than spending on relief¹⁷. In developed countries in general, the benefits of improved weather services to inform severe weather warnings exceed costs by an average of more than 10 times (taken from Tsirkunov and Rogers, 2010)¹⁸. There is potential for similar cost-benefits to be realised through investing in improved climate monitoring and early warnings systems in developing countries. These benefits are expected to be proportional to: i) the population of the country; ii) level of climate-related risk; and iii) exposure to weather due to the state of infrastructure.

132. The total benefits are estimated to be between US\$ 4 and US\$ 36 billion per year. The cost of improving hydro-meteorological services and producing the required warnings is estimated to be lower than US\$ 1 billion. The benefit-cost ratio is thus, on average for developing countries, between 4 and 36. The objective of the LDCF project is to strengthen climate monitoring capabilities through the installation of weather monitoring equipment to inform early warning systems, and for planning for adaptation to climate change. However, there are various approaches that could be adopted to achieve this objective. The proposed outputs and procurement purchases of the LDCF project were assessed, in collaboration with government stakeholders, for cost-effectiveness and sustainability of investments and weighed against alternative approaches. In some instances, investments in technologically advanced equipment and techniques e.g. repairing and installing radar technologies, were considered too expensive to be implemented through the LDCF project.

133. The approach taken to ensure cost-effectiveness of the LDCF project's outcomes is detailed further below and in Table 9.

Outcome 1. Enhanced capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.

134. Although the meteorological networks and capacity in Liberia is extremely limited, the LDCF project will strongly link and build on the existing – may be it limited – national programming that provides the existing infrastructure, staff and resources of the the early warning network. This includes all related programming deployed by the EPA, MoT Meteorology Department; MLME Hydrological Services; and MIA/NDRC. In additional to this national programming the LDCF project will bring in international assistance to generate information and assist GoL establish an effective and locally applicable meteorological monitoring system. This will allow institutional capacity to be built cost-effectively, ultimately assisting in planning and implementing the early warning system. Furthermore, this is a more cost-effective approach then attempting to build solely on the what is available in-county. While international assistance will be used, this will include collaboration with local stakeholders at all times, ensuring that local capacity is built through assisting in planning and implementing the early warning system. Furthermore, the LDCF project has been aligned with existing, related projects in the meteorological and hydro-meteorological sectors. This approach of complementing existing, related projects is more cost-effective than the implementation of a separate initiative, as it will allow the LDCF project to be managed within the existing institutional and management frameworks.

¹⁶Tsirkunov, V. and Rogers, D. 2010. Costs and benefits of early warning systems. Global Assessment report on Disaster Risk Reduction. The World Bank.

¹⁷ Healy, A. and Malhotra, N. 2009. Myopic Voters and Natural Disaster Policy. *The American Political Science Review* 103(3): 387-406.

¹⁸Tsirkunov, V. and Rogers, D. 2010. Costs and benefits of early warning systems. Global Assessment report on Disaster Risk Reduction. The World Bank.

Outcome 2. Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.

135. Lessons learned from on-the-ground climate monitoring and early warning interventions will be captured and disseminated through inter alia: i) in-house training for technicians; ii) an online platform for the dissemination of tailored information/forecasts and warnings; and iii) a toolbox that will include courses, handbooks and manuals. This integrated approach provides a cost-effective manner of informing and increasing the capacity of an extensive range of stakeholders, which include government technical staff, policy-makers, restoration practitioners, scientists, university students, school children and the general public.

136. A baseline self-capacity assessment was conducted during the project preparation phase in order to guide the identification and prioritisation of stakeholder needs. Equipment and capacity-building investments were selected based on identified priorities as well as the available budget and focal areas of the LDCF project. Proposed outputs and procurements were reviewed in a representative validation workshop and revised to reflect considerations of sustainability and cost-effectiveness.

Outcome 3: Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.

137. Regional climate change scenarios and adaptation options to respond to the climate information and early warnings will be generated through the project. This will increase the cost-effectiveness of the LDCF project interventions, in that action will be initiated by the options presented. Instead of establishing a new committee to focus on climate information and EWS, the existing NCCSC will be strengthened. The NCCSC is an existing body with mandatory functions, but in need of financial and technical assistance in particular to include a focus on climate information and EWS services. Working with local partners and within existing systems is a cost-effective approach to ensuring that the climate information generated by the LDCF project is included in policy updates, and that the private sector is engaged to contribute towards sustaining the equipment and communication channels in place as a result of the LDCF project. The LDCF project will create an enabling environment for the engagement of the private sector to develop paid-for services through climate information and EWS commercial products. This will include developing mechanisms for discussing public and private financing streams and facilitating the development of business plans to support revenue generation. There is potential for improved early warning services and tailored forecasts to generate revenue from the aviation and commercial agriculture sectors. Proposed outputs are considered cost-effective relative to the alternative approaches considered to address project barriers, as shown in Table 9 below.

138. This LDCF project is not a standalone project; it is part of a wider multi-country programme that will implement similar initiatives on generating climate information and Early Warning Systems in at least 10 countries in Africa (including Benin, Burkina Faso, Ethiopia, Liberia, Malawi, Sierra Leone, São Tomé & Príncipe, Tanzania, Uganda and Zambia). Synergy between these projects will enhance the cost-effectiveness of hiring of specialized technical staff, coordination of data and information (including inter-country sharing where feasible) and training (operations & maintenance of equipment; forecasting techniques; tailored advisories and warnings). It will also ensure effective use of communications and standard operating procedures.

139. After surveying the technical support needs for each country a set of common specialized technical staff were identified, each with particular skills related to: i) the development of hydroclimatic observing systems; ii) the effective design and implementation of standard operating procedures; iii) tailored warnings/advisories; and iv) the communication of advisories/warnings. Hiring 3 or 4 full-time technical staff, which can provide the needed support for all countries, will be

more cost-effective than hiring consultants for each country and all projects will benefit from the diverse technical support that will be provided. Further benefits include time saved on HR procurement procedures (e.g. for hiring, advertising etc.) and the ability to compare and standardize support across countries where possible. UNDP will directly undertake the recruitment for all project staff which will support all countries in this multi-country programme.

140. A common priority that was identified in all project countries was the need to provide training and capacity building for operation and maintenance of the newly enhanced hydro-meteorological infrastructure and for modeling and forecasting (Outputs 1.1, 1.2, 1.3 and 1.4). Training and capacity-building activities will be coordinated at a regional level. This approach of enhancing skills in all project countries simultaneously will have several benefits in addition to enhancing cost-effectiveness. Bringing stakeholders from all project countries together will: i) encourage knowledge sharing and the development of collective skills; ii) promote the sharing of information between countries, regarding best practices and lessons learned; and iii) increase the size of the pool of skilled resources which each country can draw upon, thereby increasing the likelihood of future training workshops to be conducted by experts within the region. Regional training and capacity-building activities will be closely coordinated with other regional and international partners/centres including *inter alia* ACMAD (ViGiRiC project), SARCOF, AfriGEOSS, AMESD, MESA and WMO's GFCS initiative.

141. A multi-country approach will also help strengthen the development of standard operating procedures (both protocols and the legal basis of inter-ministerial agreements) in Outputs 1.4, 2.2, 3.3 and 3.4. In Liberia, such standard operating procedures include those for: i) developing climate risk and sector-specific vulnerability maps and resultant tailored information and warnings using improved information (Output 1.4); ii) disseminating weather and climate information and early warnings across all levels i.e. community-, district-, county-, national- and regional level (Output 2.2); and iii) allowing the private sector to use data generated by the hydro-meteorological observation network (Output 3.4). A multi-country approach will allow Liberia to benefit from experiences and development/implementation of standard operating procedures in other countries in the region, which in turn will benefit from Liberia-specific actions. In addition, capacity building/development workshops can be undertaken at a regional level. This will allow all project countries to benefit from shared information, lessons learned and best-practices, and will be more cost-effective as costs such as workshop facilities and accommodation, hiring technically skilled trainers and purchasing/developing appropriate training materials can be shared between countries. For example, the training of meteorological observers, meteorological officers and meteorologists (Output 1.2) to produce forecasts and develop tailored hydro-meteorological information can be undertaken through regional workshops, as this is a training requirement for most countries.

142. All projects under this programme will develop a sustainable financing strategy for ongoing operation and maintenance of the newly enhanced hydro-meteorological networks. These strategies may include leveraging financing and logistic support from private sector companies and relevant sectors. In the instance of Liberia, revenue could be generated from a portion of: i) landing charges from the Liberian Airport Authority; ii) en-route flight charges collected by RIA; iii) sales tax surcharge on tickets and cargo by the Civil Aviation Authority; iv) maritime charges from the Liberia Maritime Authority; v) port and other charges from the National Port Authority; or vi) licence fees from the National Transport Authority levied on land and rail transports and drivers. Where private sector engagement includes multi-national corporations, regional support will assist in engaging head offices in multiple countries. This will increase the total effective services being offered and the bargaining position of each government. In the case of mobile (cellular) communications (which will be used for both disseminating alerts and the collection of data used to generate alerts), the multi-country support programme will leverage collective negotiations for data services. The programme will also engage with corporate social responsibility programmes of multi-national corporations to enhance services where possible. This is a more cost effective approach than were individual countries to approach such corporations individually.

Table 9: Comparison of LDCF project outputs and alternates considered.

Output	Barrier Addressed	Alternatives Considered
<p>Output 1.1 Procurement and installation of 11 AWSs and 6 automatic hydrometric stations, including all associated infrastructure, in critical areas across the country, and rehabilitation of 1 automatic and 1 manual meteorological monitoring station, including communications and centralised archiving technologies.</p>	<p>Inadequate weather and climate monitoring infrastructure, which limits data collection, detection of climate trends, analysis and provision of timely meteorological services.</p>	<p>Alternative 1: Only use manual stations and incorporate SMS communication services, using the existing capacity to monitor and report data with familiar and user-friendly equipment. Automated data collection is necessary in order to generate timely alerts, particularly at night when manual stations will not be monitoring or reporting data.</p> <p>Alternative 2: Lightning detection systems. At present, there is considerable variability around the costing for lightning detection systems ranging from \$50,000 to \$3.5m (Sources: Astrogenic, SAMPRO, Earth Networks). Besides startup costs, which in some cases are a significant portion of the project budget, the costs of implementing new technologies, training and maintenance, as well the requirement for ground based observations (for calibration) and the untested nature of the technology in Africa were significant concerns.</p> <p>Alternative 3: The rehabilitation and installation of radar technologies has the potential to generate high-quality spatial data of various weather indices in near-real-time. However, the high costs and extensive technical capacity requirements for operation and maintenance of these technologies suggest that investments in simpler, more fundamental skills and technologies would be more sustainable and appropriate to the local context.</p>
<p>Output 1.2 Technical capacities of staff in Meteorology Department developed to produce standard and customized weather and climate forecasts and packaging meteorological data and information into a suitable format for user agencies and local community end-users.</p>	<p>Limited knowledge and capacity to effectively project future climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.</p> <p>Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.</p>	<p>Alternative 1: Generalised weather and climate forecasts can continue to be produced at periodic intervals with comparatively little economic investment. However the limited availability of tailored sector-specific climate information packages is likely to result in a low level of use of climate information as the data is not directly applicable to many end users.</p> <p>Alternative 2: Only regional and international products are used. This would reduce their applicability and usefulness within the districts and sectors targeted in Liberia.</p> <p>Alternative 3: Only local forecasting and data management</p>

		conducted for the duration of the LDCF project and no international assistance brought in to assist the GoL. Currently, the capacity of the meteorological department in Liberia is under-developed; therefore, international assistance and offshore weather and climate forecasting will be needed in the short-term while meteorologists from the meteorological department are being trained.
Output 1.3 Weather and climate forecasting systems enabled through procuring and installing the required equipment, and through integrating of satellite observations for monitoring and assessing the changing state of the environment and the impact of current and future climate on key environmental variables.	Limited knowledge and capacity to effectively predict future weather and climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.	Alternative 1: Moderate investments directed to restoring the functionality of existing facilities. This will not result in a modernization of the hydro-meteorological monitoring and forecasting system and there will be only a limited development of national capacity as a result of LDCF investments. If existing facilities are not appropriately modernized and data is not readily accessible to various stakeholders, it will be challenging to incorporate other user-agencies of weather, climate and hydrological information.
Output 1.4 Staff in MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA trained to use information from meteorological, hydro-meteorological and satellite monitoring equipment to tailor forecasts for climate-related hazards specific to the respective sectors.	Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings. Low community level uptake of warnings, advisories and available climate/weather information.	Alternative 1: Rely on additional infrastructure (e.g. rehabilitated and newly installed weather stations) to improve information generation. While the additional infrastructure allows improvements in the gathering of information, without tailoring the information this will be of limited value to decision-makers in the various sectors. Decision-makers will not have access to sector-specific information that would guide planning and budgeting. Alternative 2: Ongoing and planned monitoring, forecasts and EWS initiatives will continue to operate independently and as a result there will be limited development of national capacity.
Output 2.1 Systems and communication with the NDRC are developed to use hydrological, weather, climate and environmental monitoring data and existing vulnerability assessments to identify areas of high vulnerability to climate change.	Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings. Low community level uptake of warnings, advisories and available climate/weather information.	Alternative 1: Allow decision-makers to receive their information independently through current sources. With this option, there is no central focal point for reporting information and clarifying disaster prevention and adaptation strategies. In addition, there would be no standards applied to the generation and packaging of adaptation and disaster risk management information. Thus, information would not have consistency in terms of content and quality. This would lead to poor coordination of strategies and DRR activities, resulting in duplication of efforts and/or gaps in delivery of DRR services.

		Alternative 2: Rely on additional infrastructure (e.g. rehabilitated and newly installed weather stations) to improve information generation. However, while the additional infrastructure allows improvements in the gathering of information, without tailoring the information may be of limited value to decision-makers in the various sectors.
Output 2.2 Communication channels, SOPs and legal mandates developed for disseminating climate information and issuing warnings through government institutions and NGOs.	<p>Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.</p> <p>Low community level uptake of warnings, advisories and available climate/weather information.</p>	<p>Alternative 1: Continue using present communication channels and procedures for issuing alerts. This would result in a poor coordination of alerts being issued. Also, there would be no standards in terms of <i>inter alia</i> protocols, content, timing and modalities of alerts. Consequently, alerts may contain insufficient information, be of poor quality, not reach the proper recipients, and/or be transmitted/received too late.</p> <p>Alternative 2: Have separate data portals for each agency to ensure security. This would prohibit the accessibility and usability of data across agencies as well as regional and/or internationally.</p>
Output 2.3 Two applications – agricultural and coastal – of the EWS implemented and tested for their effectiveness.	Low community level uptake of warnings, advisories and available climate/weather information.	Alternative 1: Rely only on strengthened national structures, NGOs and frameworks to initiate on-the-ground and concrete application of EWSs. However, to stimulate and institutionalize linked community-based/traditional EWSs to national and NGO structures demonstrations are needed to firstly test appropriate methods and secondly highlight the success of actively engaging local communities in EWSs established. Lessons learned can be used to replicate successful approaches in other parts of the country.
Output 3.1 Regional climate change scenarios developed for Liberia and used to enable the identification of ‘hotspots’ where climate change is expected to have severe biophysical and socio-economic impacts.	Limited knowledge and capacity to effectively project future climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.	Alternative 1: Rely on global predictions/scenarios without contextualizing them to the Liberian context. However, with this option, the detailed information produced specifically for Liberia is of less value when applied to a global model than for scenarios developed for Liberia. This will therefore not allow the identification of “hotspots”, which is important to incorporate into future development planning.
Output 3.2 Adaptation options (including EWS-related options) developed for the most vulnerable sectors and local communities based on the identified climate change ‘hotspots’.	Limited knowledge and capacity to effectively project future climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.	Alternative 1: Climate information and climate change scenarios strengthened without linking these to appropriate adaptation options. Translating climate information and climate change scenarios into adaptation actions for implementation is a necessity to ensure this information can be applied at the local level.

	Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.	
Output3.3A system established for inter-ministerial dialogue on incorporating climate change considerations into government policies and strategies.	Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.	Alternative 1: Allow national, district and local policy-making and planning to continue under present <i>modus operandi</i> . This would perpetuate the current reactive approach to climate change adaptation and disaster risk management planning. This would result in poor coordination of early warning-related planning and implementation across all levels, leading to duplication of efforts and/or gaps in delivery of services (especially in localized flood, drought and extreme weather management and relief efforts).
Output 3.4 Engagement of the private sector to develop paid-for meteorological and hydrological services, including a mechanism for discussing public and private financing for supporting the generation of climate information and early warnings.	Long-term sustainability of observational infrastructure and technically skilled human resources is threatened. GoL agencies are unable to grow and develop services to generate revenue.	Alternative 1: Operation and maintenance of upgraded hydro-meteorological network can be financed purely through allocation of public budgets. However this will reduce the participation of various socio-economic sectors in the development of tailored forecasts and EWS services i.e. reduce dialogue regarding most vulnerable services. Furthermore, the limited availability of funding from MoT and MLME budgets is likely to affect the efficacy and sustainability of the LDCF project's investments.

2.7. Sustainability

143. To sustain the LDCF project interventions beyond the project implementation period, ownership of the LDCF project by government structures (primarily EPA, MoT, MLME and NDRC) is essential. Consequently, relevant government departments, as well as local communities, need to be involved in the design and implementation of project interventions. This participatory approach has been initiated through collaboration with national government departments in designing the LDCF project approach and interventions. Implementation of the LDCF project activities will include technical capacity building focused on appropriate government departments that will coordinate and/or support the implementation of the LDCF project. Furthermore, local communities will be consulted during the development of early warning systems in the target districts. The LDCF project will thereby address needs identified by local communities which will instil community ownership of the project's activities. Government staff will be involved in these community capacity building exercises, and as a result the capacity of government staff working within the project to develop and implement climate information and early warning-related measures will be significantly strengthened, which will be beneficial for future projects within Liberia.

144. To further strengthen the sustainability of the LDCF project, interventions will be implemented in a phased approach. This applies to the development of human technical capacity as well as to installing meteorological equipment. Lessons learned as the equipment is installed will be used to inform future installations, and capacity developed in government staff will be used to build in-house capacity of other personnel through employing a 'train the trainers' approach. Additionally, agreements will be established with individuals who receive training in order to ensure that they remain in the relevant government departments for a minimum period after receiving the training. All capacity that is developed will be linked to an explicit deliverable of the LDCF project, such as the production of maps or assessments, such that capacity-building exercises contribute directly to the implementation of the LDCF project.

145. Budget allocations for Operation and Maintenance of installed meteorological equipment is an important part of sustainability of the LDCF project interventions. This is particularly relevant to MoT/MLME as there is uncertainty as to whether the minimum level of funding required for annual recurrent costs will be made available. Therefore the LDCF project will develop and implement promising innovative financing options for enhancing the long-term functionality and sustainability of the meteorological observation and forecasting systems. This will include identifying, developing and promoting public-private partnerships, innovative market-based financing mechanisms, institutional restructuring and cost recovery, i.e. developing operation and maintenance units under MoT/MLME.

146. Ultimately, the sustainability of the LDCF project will largely depend on the willingness of stakeholders to adopt interventions and continue to pursue them beyond the duration of the project. Suitable technical, legal and institutional capacity is necessary at both local and national level for sustainability to be achieved. This capacity will be strengthened by:

- improving institutional coordination within government;
- building awareness to climate change risks and the benefits of improved climate information and early warnings from local to national level;
- enhancing stakeholder capacity to use the climate information generated through the LDCF project; and
- developing an evidence base to stimulate greater levels of investments in climate information and early warning system projects, and to develop understanding of sector-specific needs and climate information priorities, as well as which policies and strategies are expected to provide economic growth benefits.

2.8. Replicability

147. The LDCF project will generate improved climate information at a national level, and activate communication channels and procedures for issuing early warnings at a national and local level. This will include the development of a range of alert platforms in the target districts. There is thus considerable scope for replication of activities in the other areas of Liberia where related projects are not operational, using the improved climate information generated at a national level. To facilitate the effective replication of project activities, the lessons learned during the project implementation will be disseminated nationally through training programmes, the online platform and toolboxes including courses, handbooks and manuals.

148. The close involvement of government institutions and departments – principally EPA, MoT, MLME and NDRC – in the LDCF project’s development and implementation means that there is considerable potential for future incorporation of the project’s approaches into on-going planning and strategies. Additionally, it is expected that the strengthening of capacities among key government stakeholders will enable continued mainstreaming of the use of climate information and early warnings into sectoral planning and decision-making.

149. Furthermore, the extensive training and capacity building of local communities and technical staff regarding the application of climate information and the response to early warnings will ensure that future local-level initiatives in Liberia are climate-aware and able to focus quickly on effective responses/information. As a result, LDCF project interventions are more likely to be replicated and/or upscaled to other areas in Liberia where similar benefits could be realised.

2.9 Stakeholder involvement plan

150. Stakeholder consultation has been a key feature in the design of this LDCF project, and stakeholders have been involved in identifying and prioritizing the LDCF project activities. Details of the stakeholder engagement during the design phase are provided in Section 2.2 and Annex 1. On-going public consultation will be critical for successful implementation of the project. This section outlines some of the key consultation principles and processes at a strategic level that will need to be translated into practical action during the project implementation. It provides guidance based on the initial stakeholder analysis, conducted as part of the project preparation process, and the consultations so far. This will be used to define exact activities that will form part of a communication and consultation strategy developed during the inception period of implementation.

Objectives

151. The stakeholder consultation during project implementation will be expected to support all outcomes. Overall, the objective of the consultation plan is to provide a framework to guide and promote two-way engagements between the Implementing Partner (EPA), Responsible Parties (MoT – lead RP, MLME, NDRC, MoA, LMA, NPA, MoH and MoPEA) and the key stakeholders with whom the project will engage and directly impact upon.

It is proposed that several more specific objectives for consultation are adopted:

- To ensure a general vision and understanding of the LDCF project and its expected outcomes by all concerned stakeholders.
- To engage key stakeholders in planning, implementing and monitoring of specific interventions.
- To ensure consistent, supportive and effective communication (information, documentation, sharing, learning and feedback) processes with key implementing partners as well as the wider public including farmers and pastoralists.
- To influence and ensure strategic level support for project implementation from state and non-state organizations and international agencies through engagement in effective community, private sector and donor forums or platforms.

152. In delivering these objectives, there are a number of simple qualitative considerations that need to be taken into account when planning engagement processes and what they should be seeking to achieve:

- Identify constraints and solutions: As a two-way engagement, the consultation process should be used as an opportunity to identify with stakeholders possible constraints to or with the project's implementation and to work with the stakeholders in finding sustainable solutions.
- Managing expectations: The LDCF investment is relatively minor, compared to the adaptation demands facing Liberia. It will be important that consultations take due consideration to manage expectations of stakeholders and stakeholder groups.
- Partnerships for co-financing: The LDCF seek to add value to their investments by building on existing and parallel projects that represent co-financing and consultations should consider opportunities for partnerships that will leverage co-financing into innovative approaches or technologies that may improve efficiencies and enhance impact. Secured co-financing partners and amounts are detailed in Sections 2.4 and 4 of the LDCF project document.

Activities planned during implementation and evaluation

153. During implementation, the communication and consultation process will be divided into three main phases:

- Phase I – the mobilization phase in the first year of the project. The exact details of the activities and implementation structures will be designed, partnerships for action will be forged and stakeholder engagement will focus around these design processes.
- Phase II –the main implementation phase where investments will be made on the ground in the target areas and stakeholder consultation will focus on output-oriented action.
- Phase III –the completion of the LDCF project and the plans for scale-up and long-term sustainability of the LDCF investments. Consultation will focus on learning, bringing experience together and looking at processes for continued post-project impact.

Phase I – Developing a strategy and action plan

154. At mobilization, a simple communications strategy will be developed. Key principles to be considered in the development of the strategy include:

- An assessment of who the key stakeholders are. During the project design a stakeholder analysis was undertaken and key Responsible Parties were identified – during implementation this will be reviewed.
- The inclusion of women and children in line LDCF project, and the most appropriate means of engagement with these groups.
- The strategy should make as much use of existing mechanisms (institutions and processes) where possible, avoiding establishing new structures.

155. Types of consultation mechanism will include:

- an overarching multi-stakeholder group, i.e. the Project Board (Steering Committee), that will play governance role but also be a forum for stakeholder engagement;
- specific focus groups on technical interventions; and
- information briefings for government and co-financing institutions.

Phase II - Consultation through implementation

156. Once implementation begins, public consultations should become an ongoing exchange of information, with two main purposes for the various mechanisms outlined under Phase I:

- to gather information from beneficiaries and stakeholders about the impact and effectiveness of the planned adaptation packages (an efficient and reliable EWS) to support adaptive management – this will be achieved through surveys and consultations in Outputs 2.1 and 2.3; and
- to provide interested government and donor stakeholders and the general public with information about the progress and impact of the LDCF project as it is implemented – this will be achieved through the online platform established under Output 2.1.

Phase III - Project completion and scale up promotion

157. This will be a process of ensuring completion, hand-over and long-term sustainability of the LDCF investment. Consultation will focus on bringing experience together, sharing key lessons learnt (through the UNDP Adaptation Learning Mechanism and the online platforms established through Outcome 2 of the LDCF project) and looking at processes for promoting scale up of the LDCF project activities, particularly the application of activities in Output 2.3 in other vulnerable districts.

Stakeholders

158. The lead institution for project outputs will be MoT/MLME for Outcome 1, NDRC for Outcome 2 and EPA/MoT for Outcome 3. The outputs that the RPs and other groups will be key stakeholders in are shown in Table 10.

Table 10: Relevant partners and stakeholders identified for engagement by project outcome/output.

Outcome	Output	Lead Institution	Key Partners	Key Responsibilities
Outcome 1: Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.	Output 1.1 Procurement and installation of 11 AWSs and 6 automatic hydrometric stations, including all associated infrastructure, in critical areas across the country, and rehabilitation of 1 automatic and 1 manual meteorological monitoring station, including communications and centralised archiving technologies.	MoT/MLME	MoA, NDRC, EPA	Undertake systematic analysis. Procure and install AWSs and hydrometric stations. Undertake repairs. Integrate data into established database.
	Output 1.2 Technical capacities of staff in Meteorology Department developed to produce standard and customized weather and climate forecasts and packaging meteorological data and information into a suitable format for user agencies and local community end-users.	MoT	MLME, MoA, NDRC, EPA	Customize the weather forecasting system. Conduct training of meteorologists, observers and officers. Develop the capacity of instrument technicians Develop a climate observation quality control and maintenance toolbox.
	Output 1.3 Weather and climate forecasting systems enabled through procuring and installing the required equipment, and through integrating of satellite observations for monitoring and assessing the changing state of the environment and the impact of current and future climate on key environmental variables.	MoT	MLME, MoA, NDRC, EPA	Procure and install a climate database at NMC. Review and install appropriate telecommunication. Procure and install modern meteorological forecasting stations. Conduct training on the Satellite Distribution System (SADIS).

	Output 1.4 Staff in MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA trained to use information from meteorological, hydro-meteorological and satellite monitoring equipment to tailor forecasts for climate-related hazards specific to the respective sectors.	MoT, MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA	Schools, universities, regional training centres	Undertake a comprehensive assessment of the tailored climate information requirements. Develop the capacity of technical personnel from each of MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA. Develop a statutory regulatory framework to guide information sharing and analysis between the institutions. Cost-benefit analysis. Initiate an outreach programme in schools and universities and provide scholarships.
Outcome 2: Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.	Output 2.1 Systems and communication with the NDRC are developed to use hydrological, weather, climate and environmental monitoring data and existing vulnerability assessments to identify areas of high vulnerability to climate change.	NDRC	MoT, MLME, MoA, EPA	Develop a centralised climate vulnerability and risk database. Train technical personnel from NDRC on hazard and vulnerability mapping and produce hazard and vulnerability maps Review and propose revisions to planning documents. Build the capacity of national and local government user agencies to effectively support EWS and data/information exchange/sharing protocols.
	Output 2.2 Communication channels, SOPs and legal mandates developed for disseminating climate information and issuing warnings through government institutions and NGOs.	NDRC	MoT, MLME, MoA, EPA	Develop a national weather and climate information and early warning system communication and coordination strategy. Develop a national and local dissemination toolbox. Establish links with local radio stations. Establish links with national television broadcasters. Strengthen traditional 'word of mouth' dissemination system. Establish an Open Data Platform. Establish legal mandates

				for issuing warnings. Establish call centres/hotline and internet connections
	Output 2.3 Two applications – agricultural and coastal – of the EWS implemented and tested for their effectiveness.	NDRC	MoT , MLME, MoA, EPA	Undertake a rapid, participatory vulnerability assessment. Map sub-basin climate hazards in the priority districts. Train communities. Develop and implement a range of communication strategies. Assess the merits of the different types of communication strategies. Develop and conduct simulation exercises.
Outcome 3: Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.	Output 3.1 Regional climate change scenarios developed for Liberia and used to enable the identification of ‘hotspots’ where climate change is expected to have severe biophysical and socio-economic impacts.	MoT	MLME, NDRC, MoA, EPA	Develop a protocol on generating regional climate change scenarios. Provide training to MoT. Provide workshops to facilitate the understanding of national and local government on the outputs.
	Output 3.2 Adaptation options (including EWS-related options) developed for the most vulnerable sectors and local communities based on the identified climate change ‘hotspots’.	NDRC	MoT , MLME, MoA, EPA	Develop a suite of adaptation interventions for the most vulnerable sectors and local communities. Undertake consultations with relevant line ministries and vulnerable communities. Develop user-friendly pamphlets and manuals on how community leaders should instruct communities to react once warnings are received. Undertake a campaign at a county level
	Output 3.3 A system established for inter-ministerial dialogue on incorporating climate change considerations into government policies and strategies.	EPA	MoT , MLME, MoA, NDRC	Establish the NCCSC. Undertake a review of governments/policies to identify entry points for climate change adaptation. Assess the recommendations emanating from the development of regional climate change scenarios. Propose revisions to national/sectoral policies/strategies. Engage with government

				to motivate for budget allocations for the sustainability of LDCF project interventions.
	Output3.4 Engagement of the private sector to develop paid-for meteorological and hydrological services, including a mechanism for discussing public and private financing for supporting the generation of climate information and early warnings.	MoPEA	MoT , MLME, MoA, NDRC, EPA	Undertake a needs assessment. Establish a consultative forum with major private sector partners. Review the business plans of MoT/NMA, MoA, MLME and NDRC. Facilitate the development of business plans of NMA and by the private sector clients. Establish a public-private partnership between a suitable company and the MoT/NMA.

3. PROJECT RESULTS FRAMEWORK

<p>This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: Output 2.1.4) Utilization of Natural Resources (land, water and forest) improved; and Output 4.4.4) By 2016, National Disaster Risk Reduction (DRR) policy implemented and supported by a commission/agency with clearly defined mandates</p>					
<p>Country Programme Outcome Indicators</p>					
<p>Primary applicable Key Environment and Sustainable Development Key Result Area: Promote climate change adaptation</p>					
<p>Applicable GEF Strategic Objective and Program: Objective 2 “Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level”.</p>					
<p>Applicable GEF Expected Outcomes: Outcome 2.1 “Increased knowledge and understanding of climate variability and change-induced risks at country level and in targeted vulnerable areas”; and Outcome 2.2 “Strengthened adaptive capacity to reduce risks to climate-induced economic losses”.</p>					
<p>Applicable GEF Outcome Indicators:</p> <ul style="list-style-type: none"> • Relevant risk information disseminated to stakeholders • Type and no. monitoring systems in place • % of population covered by climate change risk measures 					
	Indicator	Baseline	Targets End of Project	Source verification of	Risks and Assumptions
<p>Project Objective: To strengthen Liberia’s climate-related monitoring capabilities, early warning systems and available information for responding to climate shocks and planning adaptation to climate change.</p>	1. Capacity as per capacity assessment scorecard.	1. Average capacity scorecard rating of <u>57</u> across men and women (see Annex 5).	1. Capacity scorecard rating is increased to an average of <u>134</u> for both men and women (see Annex 5).	1. Focus group interviews with climate information and EWS-related stakeholders; consultant reports.	<p><u>Risk:</u> Human, technical capacity within MoT particularly, as well as MLME, NDRC, MoA and EPA, including within extension service providers and decentralized offices, is insufficient to effectively implement the LDCF project. <u>Assumption:</u> Training opportunities provided through the LDCF project result in the development of the required capacity, and the GoL provides the necessary budget to provide the required institutional framework in which the newly skilled staff can operate.</p> <p><u>Risk:</u> Poor coordination between IP (EPA), RPs (MoT, MLME, NDRC, MoA and EPA) and UNDP CO results in institutional failure, compartmentalized progress and delayed implementation of the LDCF project. <u>Assumption:</u> The management arrangements established through the LDCF project result in a coordinated approach to implementing the project.</p> <p><u>Risk:</u> Insufficient institutional support and political commitments from the GoL leads to a decrease in the political will ensured during project design,</p>
	2. Domestic finance committed to Meteorology Department, Hydrological Services and NDRC to monitor and warn against extreme weather and climate change.	2. Annual budget of <u>US\$ 64,480</u> allocated to Meteorology Department; annual budget of <u>US\$ 276,877</u> allocated to Hydrological Services; and annual budget of <u>US\$50,000</u> allocated to NDRC.	2. 20% increase ¹⁹ in annual domestic finance allocated to Meteorology Department, Hydrological Services and NDRC to monitor and warn against extreme weather and climate change.	2. Review of annual budgets.	

¹⁹To be confirmed during project inception.

					ultimately destabilizing the LDCF project. <u>Assumption:</u> GoL commitment established during the design phase of the LDCF project is maintained for the project duration.
Outcome 1: Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.	<p>1. Percentage of national coverage of climate monitoring network (fully operational²⁰).</p> <p>2. Frequency data transmission.</p> <p>3. Number of sector-specific, tailored climate information packages produced using improved information.</p>	<p>1. AWS: 0% Hydrometric stations: 0%²¹.</p> <p>2. At present, the 1 AWS transmits data at the synoptic hours of (GMT) 06h00, 09h00, 12h00, 15h00, 18h00 and 00h00, although not consistently.</p> <p>3. At present, the only sector-specific information produced is for the aviation sector.</p>	<p>1. AWS: 100% (at least 9 AWSs). Hydrometric: 100% (at least 6 stations).</p> <p>2. 18 AWSs and hydrometric stations (11 new AWSs, 1 rehabilitated AWS, 6 hydrometric stations), transmitting continuously.</p> <p>3. Sector-specific, tailored climate information packages produced for three of the following: agriculture, water, aviation²², fisheries/coastal water users, health, tourism, construction, and energy, and road, rail and sea transport.</p>	<p>1. Field inspection of AWS sites; review of climate information database.</p> <p>2. Review of climate information databases.</p> <p>3. Interviews with line ministries and a review of the information packages released.</p>	<p><u>Risk:</u> Delayed implementation of baseline projects by the GoL and donors negatively affects LDCF project outcomes. <u>Assumption:</u> Baseline projects are implemented according to the timeline identified in the PPG phase of the LDCF project, and achieve the desired outcomes and objective.</p> <p><u>Risk:</u> Installed hydro-meteorological equipment fails because it is vandalised or not maintained. <u>Assumption:</u> Communities living nearby installed hydro-meteorological equipment commit to taking active measures to prevent the equipment from being vandalised; and the equipment is adequately maintained by the responsible institution.</p> <p><u>Risk:</u> Climate shocks occurring during the design and implementation phase of the LDCF project result in disruptions to installed equipment and severely affect communities, prior to the EWSs being established. <u>Assumption:</u> Any climate shocks occurring whilst the EWSs are being established will not be so severe as to result in a relocation of the communities where the effectiveness of the EWSs will be tested.</p> <p><u>Risk:</u> Local information technology and telecommunications infrastructure restricts the transfer of data from installed equipment to necessary recipients, and restricts communication amongst key role players and end-users. <u>Assumption:</u> Information technologies and telecommunications systems implemented or used, where such suitable system already exist, through the LDCF project are best suited to the local context and do not restrict the transfer and communication of</p>

²⁰This is interpreted as all sensors and equipment functioning as intended, including the communication/data transfer system.

²¹At present, there is only 1 AWSs and 1 manual station, both housed at RIA. WMO has set the number of AWSs needed as 9. MLME is installing 6 hydrometric stations, and require a further 6. As the AWS at RIA is not fully functional, and the hydrometric stations are yet to be fully installed the current coverage is: 0%.

²² Forecasts for aviation are already being produced, but the indicator stresses the use of “improved climate information”.

					<p>information.</p> <p><u>Risk:</u> Procurement and installation of hydro-meteorological equipment, including hardware and software, is delayed because of complications with the release of funds and/or national procurement procedures.</p> <p><u>Assumption:</u> UNDP CO and HQ will coordinate with the IP to ensure effective administrative planning meaning the equipment is procured and installed in a timely manner.</p>
<p>Outcome 2: Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.</p>	<p>1. Number of communication channels operational to disseminate climate-related early warnings.</p> <p>2. Percentage of population in within the two target districts with access to improved climate-related flood, storm and coastal surge warnings (disaggregated by gender).</p>	<p>1. At present, information is relayed to communities mostly via <u>word-of-mouth</u>, but without the structure of SOPs.</p> <p>2. <u>0%</u> of men; <u>0%</u> of women²³.</p>	<p>1. At least 3 of the following: <u>Radio, television, print media (newspapers, fliers), word-of-mouth and mobile phone</u> communication channels operational.</p> <p>2. <u>100 %</u> of men; <u>100 %</u> of women²⁴.</p>	<p>1. Review of SOPs in place, review of records of early warnings issued and received.</p> <p>2. Gender-sensitive field surveys undertaken within identified priority sites; consultant reports</p>	<p><u>Risk:</u> Lack of commitment from communities where EWS are established undermines the effectiveness of the LDCF project demonstrations.</p> <p><u>Assumption:</u> Awareness raising activities, and the demonstration of the advantages of responding to the information provided through the established EWS, will ensure the commitment of the communities in participating in the LDCF project.</p> <p><u>Risk:</u> Poor coordination between IP (EPA), RPs (MoT, MLME, NDRC, MoA and EPA) and UNDP CO results in institutional failure, compartmentalized progress and delayed implementation of the LDCF project.</p> <p><u>Assumption:</u> The management arrangements established through the LDCF project result in a coordinated approach to implementing the project.</p> <p><u>Risk:</u> Human, technical capacity within MoT particularly, as well as MLME, NDRC, MoA and EPA, including within extension service providers and decentralized offices, is insufficient to effectively implement the LDCF project.</p> <p><u>Assumption:</u> Training opportunities provided through the LDCF project result in the development of the required capacity, and the GoL provides the necessary budget to provide the required institutional framework in which the newly skilled staff can operate.</p>

²³ To be confirmed through Activity 2.3.1 of the LDCF project.

²⁴ To be confirmed through Activity 2.3.1 of the LDCF project.

					<p><u>Risk:</u> Insufficient institutional support and political commitments from the GoL leads to a decrease in the political will ensured during project design, ultimately destabilizing the LDCF project.</p> <p><u>Assumption:</u> GoL commitment established during the design phase of the LDCF project is maintained for the project duration.</p>
<p>Outcome 3: Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.</p>	<p>1. Development frameworks that integrate climate information in the formulation.</p>	<p>1. <u>The Agenda for Transformation</u> (2012-2017) highlights the need to develop climate change mainstreaming and response strategies, but not the need for improved information to inform the strategies</p>	<p>1. At least <u>updated</u> Agenda for Transformation (to be revised in 2017)to incorporate the availability of climate information into planning for the five year period.</p>	<p>1. Review updated Agenda for Transformation.</p>	<p><u>Risk:</u> The slow pace of policy modification may mean that identified development frameworks do not integrate climate change in a timely fashion</p> <p><u>Assumption:</u> Climate change adaptation considerations are included in development framework formulation, based on advancements in climate information and forecasting achieved through the LDCF project.</p> <p><u>Risk:</u> Insufficient institutional support and political commitments from the GoL leads to a decrease in the political will ensured during project design, ultimately destabilizing the LDCF project.</p> <p><u>Assumption:</u> GoL commitment established during the design phase of the LDCF project is maintained for the project duration.</p>

4. TOTAL BUDGET AND WORKPLAN

Award ID:	00074351	Project ID(s):	00086796
Award Title:			
Business Unit:	LBR10		
Project Title:	Strengthening Liberia's capability to provide climate information and services to enhance climate resilient development and adaptation to climate change		
PIMS no.	4858		
Implementing Partner (Executing Agency)	EPA		

SOF (e.g. GEF) Outcome/Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (US\$)	Amount Year 2 (US\$)	Amount Year 3 (US\$)	Amount Year 4 (US\$)	Total (US\$)	See Budget Note:
OUTCOME 1:	Environmental Protection Agency / Ministry of Transport	62160	GEF LDCF	71300	Local Consultants	61,375	45,125	27,375	16,875	150,750	a
				71400	Contractual services	423,200	145,200	38,200	45,400	652,000	b
				72300	Materials and Goods	240,000	435,000	355,000	19,300	1,049,300	c
				74200	Audio Visual and Print Prod Costs	108,075	80,975	39,975	24,975	254,000	d
				75700	Training, Workshops and Conferences	281,250	97,500	95,500	85,500	559,750	e
				71300	Local consultants	16,800	16,800	16,800	16,800	67,200	f
				Total Outcome 1					1,130,700	820,600	572,850
OUTCOME 2:	Environmental Protection Agency / National Disaster Relief Commission	62160	GEF LDCF	71300	Local Consultants	41,875	96,875	64,375	24,375	227,500	g
				71400	Contractual services	83,200	145,200	38,200	45,400	312,000	h
				72300	Materials and Goods	216,300	362,000	115,000	0	693,300	i
				74200	Audio Visual and Print Prod Costs	80,475	135,475	145,475	66,575	428,000	j
				75700	Training, Workshops and Conferences	59,000	395,000	225,000	125,000	804,000	k
				71300	Local consultants	16,800	16,800	16,800	16,800	67,200	l
				Total Outcome 2					497,650	1,151,350	604,850
OUTCOME 3:	Environmental Protection Agency	62160	GEF LDCF	71300	Local Consultants	5,000	36,250	63,750	72,500	177,500	m
				71400	Contractual services	231,600	162,600	19,100	22,700	436,000	n
				74200	Audio Visual and Print Prod Costs	65,000	60,000	65,000	60,000	250,000	o
				75700	Training, Workshops and	19,500	30,000	108,400	95,000	252,900	p

			Conferences					
			71300 Local consultants	8,400	8,400	8,400	8,400	33,600 q
			Total Outcome 3	329,500	297,250	264,650	258,600	1,150,000
			71300 Local consultants	46,200	46,200	46,200	46,200	184,800 r
			71600 Travel	7,500	7,500	7,500	7,500	30,000 s
			74500 Miscellaneous Expenses	10,944	11,460	10,602	13,602	46,608 t
			74500 UNDP cost recovery chrgs-Bills	14,106	13,590	14,448	11,448	53,592 u
			Total Project Management Costs	78,750	78,750	78,750	78,750	315,000
			PROJECT TOTAL	2,036,600	2,347,950	1,521,100	824,350	6,730,000

Summary of funds:

	Amount Year 1	Amount Year 2	Amount Year 3	Amount Year 4	Total
GEF	2,036,600	2,347,950	1,521,100	824,350	6,730,000
NVE	1,345,000	1,345,000	0	0	2,690,000
AfDB	578,268	578,268	578,268	578,268	2,313,072
WMO	172,800	172,800	172,800	172,800	691,200
GoL	1,491,357	1,491,357	1,491,357	1,491,357	5,965,428
UNDP	50,000	50,000	50,000	50,000	200,000
TOTAL	5,674,025	5,985,375	3,813,525	3,116,775	18,589,700

Budget notes:

a	<p>National meteorological and hydrological specialist (30 days @ \$250/day)</p> <p>National meteorological specialist (20 days @ \$250/day), National hydrological specialist (20 days @ \$250/day), National Communications and ICT specialist (20 days @ \$250/day)</p> <p>National meteorological and hydrological specialist (20 days @ \$250/day)</p> <p>National meteorological and hydrological specialist (20 days @ \$250/day)</p> <p>National communication and ICT specialist (10 days @ \$250/day)</p> <p>National meteorological specialist (20 days @ \$250/day)</p> <p>National communication and ICT specialist (20 days @ \$250/day)</p> <p>National meteorological and hydrological specialist (20 days @ \$250/day)</p> <p>National adaptation, early warning system and disaster management consultant (15 days @ \$250/day)</p> <p>National climate change modeller/risk and vulnerability assessment and mapping (10 days @ \$250/day), National Communications and ICT specialist (10 days @ \$250/day), National Agricultural expert (10 days @ \$250/day)</p> <p>National meteorological, hydrological and policy expert (25 days @ \$250/day)</p> <p>National social and natural resource economist (18 days @ \$250/day)</p>
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	National community development / meteorological specialist (45 days @ \$250/day) National climate change/environmental programme specialist
b	Cost of region-based technical assistance to the Implementing Partner for outcome 1 of this project from a pool of project-based chief technical advisors (hydrological and meteorological specialists assisting weather, climate and hydrological observation systems and forecasting) supporting this and other EWS projects in the UNDP-GEF/LDCF supported multi-country initiative on EWS/CI (432 days @ \$550/day + 10 flights @ \$2,000 + 50 days DSA @ \$200/day). <i>Note: that the full cost of the Technical Support is covered by all 10 projects participating in the GEF/LDCF financed EWS multi-country initiative.</i> This will be managed separately. International support to develop climate modelling and forecasting system for Liberia International M&E expert (9 days @ \$550/day; 1 flight @ \$2000; 5 DSA @ 250/day) Independent Mid-term evaluation (@ \$30000/ea therefore \$12000 from Outcome 1), Independent Terminal evaluation (@ \$45000/ea therefore \$18000 from Outcome 1), 4 Budget/Project audits (@ \$3000/ea therefore \$4800 from Outcome 1)
c	17 AWSs and hydrometric stations for priority districts (@ \$15000/AWS) 17 Installation and civil works including stabilizing power supply with solar panels, batteries, inverters and including security fence (@ \$6000/ea) 1 Upgrade AWS stations at RIA (@ \$20000/ea) 1 Upgrade manual stations at RIA- including thermometers, stevenson screens, manual wind and solar sensors with digital sensors and calibrate thermometers and barometers (@ \$5000/ea) 50 Modern forecasting workstations (hardware and software) to support synoptic stations including internet modems and access (@ \$5000/ea) Required equipment for PUMA/SYNERGIE and e-stations at CARI and RIA, including solar panels and battery packs for CARI station Installation of SADIS (@ \$50000/ea) Sector-specific vulnerability maps and tailored weather and climate alerts. Facilitation of tasks required by technical hydro-meteorological staff and disaster management offices for field visits and other project activities related to ensuring the effective operation and maintenance of all equipment installed.
d	Cost of developing, hosting and maintaining a climate prediction model (@ \$50000/ea) Cost of editing, printing and publishing protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems Cost of developing, hosting and maintaining an integrated hydro-meteorological database and information management system (@\$91100/ea) Cost of developing, hosting and maintaining a telecommunications system with GTS access (@\$85000/ea) Cost of editing, printing and publishing protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems Cost of developing, implementing and maintaining coordination protocols and agreements Cost of editing, printing and publishing protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems Cost of editing, printing and publishing protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems Cost of editing, printing and publishing brochures, pamphlets, handbooks and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems Cost of reporting, communications (telephone and internet) and transport facilitation
e	Cost of national training for 20 meteorological observers; 5 meteorological officers and 5 meteorologists on state-of-the-art region-specific weather and climate forecasting and in-house capacity building; and continued training throughout the project duration period by through the assistance in Activity 1.2.1.

	<p>Cost of in-country training of instrument technicians (3 x 2 weeks).</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems</p> <p>Cost of development training packages and toolkits for assisting trained meteorologists and hydrologists build in-house forecasting and capacity and enhance collaboration in the MoT and MLME.</p> <p>Cost of training of technicians from MLME, MoA, NDRC, EPA, MoH, LMA and NPA</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems.</p> <p>Cost of scholarships for school and university students</p> <p>Cost of Inception Workshop to launch project</p>
f	<p>Local consultants support for organising and conducting equipment surveys/reports, identifying and liaising on procurement of equipment with line ministries and facilitating NHMS etc. training programs.</p>
g	<p>National adaptation, early warning system, database and disaster management consultant (80 days @ \$250/day)</p> <p>National climate change policy consultant (30 days @ \$250/day)</p> <p>National adaptation, early warning system and disaster management consultant (60 days @ \$250/day)</p> <p>National adaptation, early warning system and disaster management consultant (30 days @ \$250/day)</p> <p>National early warning, communication and ICT specialist (40 days @ \$250/day)</p> <p>National early warning, communication and ICT specialist (40 days @ \$250/day)</p> <p>National community, early warning system and disaster management consultant (60 days @ \$250/day)</p> <p>National communication and ICT consultant (20 days @ \$250/day)</p> <p>National climate change policy consultant (20 days @ \$250/day)</p> <p>National vulnerability, early warning system and disaster management consultant (30 days @ \$250/day)</p> <p>National GIS hazard mapping consultant (40 days @ \$250/day)</p> <p>National community, early warning system and disaster management consultant (800 days @ \$250/day)</p> <p>National adaptation, early warning system and disaster management consultant (40 days @ \$250/day)</p> <p>National adaptation, early warning system and disaster management consultant (30 days @ \$250/day)</p> <p>National adaptation, early warning system and disaster management consultant (40 days @ \$250/day)</p> <p>National climate change/environmental programme specialist</p>
h	<p>Cost of region-based technical assistance to the Implementing Partner for outcome 2 of this project from a pool of project based chief technical advisors (communication systems, knowledge sharing, SOPs and fund mobilization) supporting this and other EWS projects in the UNDP-GEF multi-country initiative on EWS/CI (432 days @ \$550/day + 10 flights @ \$2,000 + 50 days DSA @ \$200/day). <i>Note that the full cost of the Technical Support is covered by all 10 projects participating in the GEF/LDCF financed EWS multi-country initiative.</i></p> <p>This will be managed separately.</p> <p>International M&E expert (9 days @ \$550/day; 1 flight @ \$2000; 5 DSA @ 250/day)</p> <p>Independent Mid-term evaluation (@ \$30000/ea therefore \$12000 from Outcome 2), Independent Terminal evaluation (@ \$45000/ea therefore \$18000 from Outcome 2), 4 Budget/Project audits (@ \$3000/ea therefore \$4800 from Outcome 2)</p>

i	<p>Hardware and software for vulnerability and risk database (@ \$200000/ea)</p> <p>National weather and climate information and early warning system communication and coordination strategy (@ \$55800/ea)</p> <p>Hardware and software for Open Data Platform (@ \$40000/ea)</p> <p>Hardware and software for call centre (@ \$50000/ea)</p> <p>Hardware and software for GIS hazard maps for the priority districts (@\$45000/ea)</p> <p>Hardware and software for EWSs in the priority districts (@ \$100000 each)</p> <p>Facilitation of tasks required by technical hydro-meteorological staff and disaster management offices for field visits and other project activities related to ensuring the effective operation and maintenance of all equipment installed.</p>
j	<p>Cost of developing, hosting and maintaining an vulnerability and risk database</p> <p>Cost of developing, hosting and maintaining an Open Data Platform (@ \$40000/ea)</p> <p>Cost of developing, hosting and maintaining a call centre</p> <p>Cost of developing and implementing protocols for participatory vulnerability assessments</p> <p>Cost of developing, hosting and maintaining EWSs in the priority districts (@ \$50000 each)</p> <p>Cost of developing and implementing protocols for simulation exercises in the priority districts</p> <p>Cost of editing, printing and publishing protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems</p> <p>Cost of reporting , communications (telephone and internet) and transport facilitation</p>
k	<p>Cost of training technicians on hazard and vulnerability mapping</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on vulnerability mapping</p> <p>Cost of training relevant ministries/departments/agencies on the use of climate information and EWS and integration into annual workplans</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems.</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on the use of radio stations to disseminate information through early warning systems</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on the use of television to disseminate information through early warning systems</p> <p>Cost of training county- and district-level representatives on the applicability of climate information and EWS, and on responses to the information and warnings provided</p> <p>Cost of training communities in the priority districts on how to respond to the climate information and warnings issued</p> <p>Cost of Inception Workshop to launch project</p>
l	<p>Local consultants costs to monitor the utility of forecasts/predictions for end-users and the efficacy of the Standard Operation Procedure for alert communication. Organise workshops, meetings and feedback sessions from users of forecasts and SOPs</p>
m	<p>National climate modelling and climate change adaptation consultant (35 days @ \$250/day)</p> <p>National climate change adaptation consultant (40 days @ \$250/day)</p> <p>National climate change adaptation consultant (30 days @ \$250/day)</p> <p>National climate change adaptation consultant (25 days @ \$250/day)</p> <p>National community engagement and adaptation consultant (100 days @ \$250/day)</p>

	<p>National climate change policy consultant (35 days @ \$250/day)</p> <p>National climate change policy consultant (50 days @ \$250/day)</p> <p>National climate change policy consultant (50 days @ \$250/day)</p> <p>National climate change policy consultant (80 days @ \$250/day)</p> <p>National climate change adaptation and private sector relations consultant (80 days @ \$250/day)</p> <p>National climate change adaptation and private sector relations consultant (25 days @ \$250/day)</p> <p>National climate change adaptation and private sector relations consultant (100 days @ \$250/day)</p> <p>National climate change adaptation and private sector relations consultant (60 days @ \$250/day)</p>
n	<p>Cost of region-based technical assistance to the Implementing Partner for outcome 3 of this project from a pool of project based chief technical advisors (adaptation early warning & disaster management, institutional development & co-ordination and social & natural resource specialists) supporting this and other EWS projects in the UNDP-GEF multi-country initiative on EWS/CI (215 days @ \$550/day + 4 flights @ \$2,000 + 20 days DSA @ \$200/day). <i>Note that the full cost of the Technical Support is covered by all 10 projects participating in the GEF/LDCF financed EWS multi-country initiative.</i> This will be managed separately.</p> <p>International support to develop climate change scenarios and model resultant impacts</p> <p>International M&E expert (6 days @ \$550/day)</p> <p>Independent Mid-term evaluation (@ \$30000/ea therefore \$6000 from Outcome 3), Independent Terminal evaluation (@ \$45000/ea therefore \$9000 from Outcome 3), 4 Budget/Project audits (@ \$3000/ea therefore \$2400 from Outcome 3)</p>
o	<p>Cost of editing, printing and publishing protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems</p> <p>Cost of developing and implementing protocols for the operation of the NCCSC</p>
P	<p>Cost of training of meteorologists and hydrologists on the implementation of protocols developed for modelling climate change scenarios</p> <p>Cost of training relevant ministries/departments/agencies on the use of the scenarios and integration into annual workplans</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation, hydro-meteorological and early warning systems</p> <p>Cost of training government policy makers on the need for allocation of budget to the relevant ministries for climate change adaptation activities</p> <p>Cost of developing and promoting 'toolboxes', protocols, handbooks, policy and information briefs and/or guidelines on climate change adaptation in the private sector</p> <p>Cost of training private sector representatives on the use of climate information and early warnings</p> <p>Cost of Inception Workshop to launch project</p>
q	<p>Local consultant costs to monitor and organise training, development and use of regional climate change scenarios, development of adaptation options, inter-ministerial dialogue, and engagement of the private sector.</p>
r	<p>Cost of Programme Manager housed within EPA (48 months @ \$1250/month) - costs to be shared with other LDCF projects</p> <p>Cost of Financial/Administrative Officer housed with MoT (48 months @ \$2000/month)</p> <p>Cost of Project Driver (48 months @ \$600/month)</p>
s	<p>Cost of Project Manager travel, project team travel and local transport around counties and districts</p>
t	<p>Miscellaneous Expenses and contingency, including vehicle O&M and office supplies.</p>
u	<p>Cost of UNDP County Office support services including: i) identification and recruitment of project personnel, international and local consultants; ii) identification and facilitation of training activities abroad; and iii) procurement of equipment, computers and furniture, travel. See Annex 3.5</p>

Annual Work Plan:

Outcome	Output	2013			2014			2015			2016			2017		
Outcome 1: Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.	Output 1.1 Procurement and installation of 11 AWSs and 6 automatic hydrometric stations, including all associated infrastructure, in critical areas across the country, and rehabilitation of 1 automatic and 1 manual meteorological monitoring station, including communications and centralised archiving technologies.															
	Output 1.2 Technical capacities of staff in Meteorology Department developed to produce standard and customized weather and climate forecasts and packaging meteorological data and information into a suitable format for user agencies and local community end-users.															
	Output 1.3 Weather and climate forecasting systems enabled through procuring and installing the required equipment, and through integrating of satellite observations for monitoring and assessing the changing state of the environment and the impact of current and future climate on key environmental variables.															
	Output 1.4 Staff in MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA trained to use information from meteorological, hydro-meteorological and satellite monitoring equipment to tailor forecasts for climate-related hazards specific to the respective sectors.															
Outcome 2 Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated	Output 2.1 Systems and communication with the NDRC are developed to use hydrological, weather, climate and environmental monitoring data and existing vulnerability assessments to identify areas of high vulnerability to climate change.															
	Output 2.2 Communication channels, SOPs and legal mandates developed for disseminating climate information and issuing warnings through government institutions and NGOs.															

5. MANAGEMENT ARRANGEMENTS

159. The LDCF project will be implemented over a four year period. EPA will function as the IP for this project. This is based on the decision by GoL that the EPA will function as the IP for all UNDP projects within the Energy and Environment Unit for the next Programme Period. MoT (Meteorological Department) will function as the lead RP, will be responsible and held accountable for managing the LDCF project on a day-to-day basis as per UNDP's NIM procedures. The identification and government endorsement²⁵ of MoT as the lead RP is based on their legislative enactment to host and conduct meteorological services in Liberia. Prior to commencement of the implementation phase, a capacity assessment of MoT will be conducted in order to inform and guide detailed implementation arrangements so that UNDP financial and fiduciary standards can be met. The management arrangements are shown in Figure 2 and detailed further below.

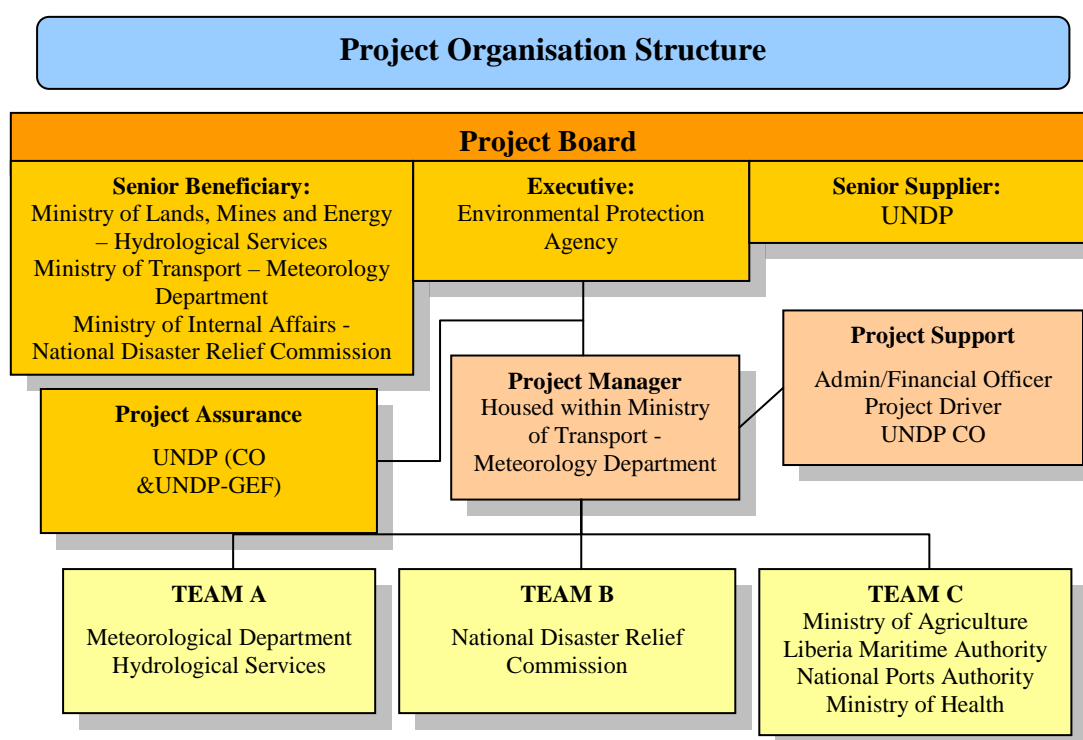


Figure 2: Management arrangements for the LDCF project.

160. The **Project Board** (also called the **Project Steering Committee**) will be responsible for making the management decisions of the LDCF project, and will guide the Project Manager. The Project Board plays a critical role in monitoring progress of implementation and ensuring that recommendations from annual and mid-term evaluations are adopted for performance improvement, ensuring accountability and adoption of lessons learnt. It ensures that required resources are committed and arbitrates on any conflicts within the project or negotiates a solution to any problems with external bodies. In addition, it approves the appointment and responsibilities of the Project Manager. Based on the approved Annual Work Plan, the Project Board will be kept informed of progress with the implementation of quarterly plans and also approve any essential deviations from the original plans.

²⁵Ministry of Planning and Economic Affairs (MoPEA) was asked by UNDP to intervene in and mediate the selection of the IP for the LDCF project. The MoPEA investigated the capacity and authority (mandate) of the MoT, MLME and EPA regard to the IP role for the LDCF project, and advised that the MoT should be the IP – see Annex 4.1 for official MoPEA decision.

161. Potential members of the Project Board are reviewed and recommended for approval during the PAC meeting. Representatives of other stakeholders can be included in the Project Board as appropriate. The Project Board contains three distinct roles, including:

- **An Executive** representing the project ownership to chair the group. The Executive for the LDCF project will be the Director of EPA.
- **Senior Supplier** representing the interests of the parties concerned which provide funding for specific cost sharing projects and/or technical expertise to the project. The Senior Supplier's primary function within the Board is to provide guidance regarding the technical feasibility of the project. The Senior Supplier of the LDCF project is UNDP. In order to ensure UNDP's ultimate accountability for the project results, Project Board decisions will be made in accordance to standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In cases where consensus cannot be reached within the Project Board, the final decision shall rest with UNDP in its role as the Senior Supplier.
- **Senior Beneficiaries** representing the interests of those who will ultimately benefit from the project, i.e. sector and communities vulnerable to the impacts of climate change. The Senior Beneficiaries' primary function within the Board is to ensure the realization of project results from the perspective of project beneficiaries. The Senior Beneficiaries for the LDCF project will be the Director of the Meteorology Department with MoT; Director of Hydrological Services within the MLME; and the Director of the NDRC within the MIA.

The Project Board will be supported by the following roles:

- The **Project Assurance** role supports the Project Board Executive by carrying out objective and independent project oversight and monitoring functions. UNDP-GEF and the UNDP Liberia CO will provide Project Assurance to the Project Board for the LDCF project.
- The **Project Manager** has the authority to run the project on a day-to-day basis within the constraints laid down by the Project Board. The Project Manager's prime responsibility is to ensure that the project produces the results specified in the Project Document, to the required standard of quality and within the specified constraints of time and cost. The Project Manager will be selected by the Project Board, and will have skills relevant to the project as a whole (i.e., not only meteorology). The Project Manager will be based within the MoT (Meteorological Division) until the NMA is established, and thereafter will be based within the NMA.
- The **Project Support** role provides project administration, management and technical support to the Project Manager. Project Support will be provided by an Administrative/Financial Assistant and Project Driver recruited through the LDCF project. The UNDP CO will provide further Project Support through a set of support services for the activities of the project (see UNDP Support Services, below).

162. The Project Manager will be supported by teams of Responsible Parties, including MLME, NDRC, MoA, LMA, NPA, MoH and MoPEA. The RPs and key responsibilities are shown per output in Section 2.9. The IP and RPs played a substantial role in designing the activities for the LDCF project and were involved in the consultations described in "Stakeholder baseline analysis" in Section 2.2. In particular, Project Manager will collaborate with the Project Managers of the other two LDCF projects being implemented in Liberia, to ensure that synergies are created.

163. The management structure will seek to establish a bridge between: i) national authorities responsible for formulating and integrating climate change policies; ii) national, regional and local authorities responsible for project implementation; and iii) on-the-ground practitioners of climate information management and disaster risk reduction. Continuous monitoring of project progress at all levels will ensure the project activities are always aligned with project goals.

Audit arrangements

164. Audits will be conducted in accordance with UNDP financial rules and regulations and applicable audit policies.

UNDP Support Services

165. UNDP has been requested by GoL (MoT) to provide support services for the project. These support services are considered to be beyond UNDP's role as a GEF IA. In accordance with UNDP policies and GEF Council requirements, the cost of anticipated DPS to be incurred by UNDP have been clearly identified and estimated in the Project Document (see section 4 above). Prior to project implementation and subsequent to the completion of the HACT assessment, DPCs will be finalised and a LOA between UNDP and MoT documenting the agreed DPSs and DPCs will be signed.

166. As per discussions with the GEF Secretariat, this initiative is part of a multi-country set of NIM projects supported by UNDP-GEF. In response to LDCF/SCCF Council requirement that a regional component would be included to enhance coordination, increase cost effectiveness and, most importantly, benefit from a regional network of technologies, a cohort of technical advisors and a project manager will be recruited to support each of the national level project teams. In particular they will support countries to develop robust adaptation plans and provide technical advice, training and support for accessing, processing and disseminating data for early warning and national/sectoral planning related purposes on a systematic basis. The cost of these project staff has been prorated across all country project budgets and recruitment of these posts will be undertaken by UNDP-GEF (HQ) in coordination with all UNDP Country Offices.

6. MONITORING FRAMEWORK AND EVALUATION

167. The project will be monitored through the following M& E activities. The M&E budget is provided in the table below. The M&E framework set out in the Project Results Framework in Part III of this project document is aligned with the AMAT and UNDP M&E frameworks.

168. **Project start:** A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and program advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan.

The **Inception Workshop** should address a number of key issues including:

- Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff *vis-à-vis* the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
- Finalise the first annual work plan based on the project results framework and the LDCF-related AMAT set out in the Project Results Framework in Section III of this project document. Review and agree on the indicators, targets and their means of verification, and re-check assumptions and risks.
- Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
- Discuss financial reporting procedures and obligations and arrangements for annual audit.
- Plan and schedule PB meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first PB meeting should be held within the first 12 months following the inception workshop.

169. An **Inception Workshop report** is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP/GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of ESCOs are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports can be generated in the Executive Snapshot.
- Other ATLAS logs will be used to monitor issues and lessons learned. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

170. **Annually:** Annual Project Review/Project Implementation Reports (APR/PIR). This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements.

171. The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes , including indicators, baseline data and end-of-project targets (cumulative);
- Project outputs delivered per project outcome (annual);
- Lesson learned/good practice;
- AWP and other expenditure reports;
- Risk and adaptive management; and
- ATLAS QPR.

172. **Periodic Monitoring** through site visits: UNDP CO and the UNDP-GEF region-based staff will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated to the project team and Project Board members no more than one month after the visit.

173. **Mid-term of project cycle:** The project will undergo an independent Mid-Term Review at the mid-point of project implementation. The Mid-Term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term review will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term review will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The LDFC/SCCF AMAT (as set out in the Project Results Framework in Section III of this project document) will also be completed during the mid-term evaluation cycle.

174. **End of Project:** An independent Terminal Evaluation will take place three months prior to the final PB meeting and will be undertaken in accordance with UNDP-GEF guidance. The terminal evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term review, if any such correction took place). The terminal evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The LDFC/SCCF AMAT as set out in the Project Results Framework in Section III of this project

document) will also be completed during the terminal evaluation cycle. The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response, which should be uploaded to PIMS and to the UNDP Evaluation Resource Center (ERC).

175. **Learning and knowledge sharing:** Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks which may be of benefit to project implementation through lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. There will be a two-way flow of information between this project and other projects of a similar focus.

Table 11: Project Monitoring and Evaluation.

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> ▪ Project Manager (MEE) ▪ PIU ▪ UNDP CO, UNDP GEF 	Indicative cost: 10,000	Within first two months of project start up
Measurement of Means of Verification of project results.	<ul style="list-style-type: none"> ▪ UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members. ▪ PIU, esp. M&E expert 	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on <i>output and implementation</i>	<ul style="list-style-type: none"> ▪ Oversight by Project Manager (MEE) ▪ PIU, esp. M&E expert ▪ Implementation teams 	To be determined as part of the Annual Work Plan's preparation. Indicative cost is 20,000	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	<ul style="list-style-type: none"> ▪ Project manager (MEE) ▪ PIU ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG 	None	Annually
Periodic status/progress reports	<ul style="list-style-type: none"> ▪ Project manager and team 	None	Quarterly
Mid-term Review	<ul style="list-style-type: none"> ▪ Project manager (MEE) ▪ PIU ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Indicative cost: 30,000	At the mid-point of project implementation.
Terminal Evaluation	<ul style="list-style-type: none"> ▪ Project manager (MEE) ▪ PIU ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team) 	Indicative cost : 45,000	At least three months before the end of project implementation
Audit	<ul style="list-style-type: none"> ▪ UNDP CO ▪ Project manager (MEE) ▪ PIU 	Indicative cost per year: 3,000 (12,000 total)	Yearly
Visits to field sites	<ul style="list-style-type: none"> ▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives 	For GEF supported projects, paid from IA fees and operational	Yearly for UNDP CO, as required by UNDP RCU

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
		budget	
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US\$ 117,000	

7. LEGAL CONTEXT

176. This document together with the CPAP signed by the GoL and UNDP which is incorporated by reference constitute together a Project Document as referred to in the Standard Basic Assistance Agreement (SBAA) and all CPAP provisions apply to this document.

177. Consistent with the Article III of the SBAA, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

178. The implementing partner shall:

- a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried; and
- b) assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

179. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

180. The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

8. ANNEXES

Annex 1: Stakeholder involvement in Project Preparatory Phase

The details provided below are for the missions of the International Consultant – stakeholder meetings of the National Consultant are not shown.

Mission 1: Inception workshop and consultations (24-28 September 2012)

The primary purpose of this mission was to support the UNDP CO to kick-start a process for the design of an initiative that seeks to strengthen the use of climate information and early warning systems (EWSs) in climate-resilient development, including planning. One of the key objectives of the mission was to engage stakeholders involved in EWS-related activities in Liberia, including those involved in the generation, dissemination and use of climate information. These consultations were critical to ensure that all relevant stakeholders were aware of the opportunity to mobilize finance for a project on climate information and EWSs and to solicit their input to inform the project design. An Inception Workshop (IW) was conducted to inform key stakeholders in Liberia about the opportunity to secure LDCF finance for a climate information/EWS-oriented project. The workshop informed all stakeholders of the current status of the Government of Liberia’s proposal, as well as what needs to be done in order to secure the finance. Thirty representatives attended the workshop, including those from government agencies with key roles to play in the LDCF project, as well as UN agencies and bilateral donors. The workshop was split into two sessions. The morning session was attended by ministry heads and the importance of the project to Liberia as a vulnerable nation was discussed. Technical representatives of the key ministries and agencies to be involved in the project remained for the afternoon session, when specifics and technical details regarding the project were discussed (see attendance register below). Following the IW, a series of bilateral consultations were held with various local and regional stakeholders (meeting schedules are detailed further below).

Meeting Schedule

(all meetings attended by Mike Jennings, Moses Massah/Boye Johnson and Anthony Kpadeh)

Organisation	Person	Title	Contact	Date and time
EPA	Anyaa Vohiri,	Executive Director	0886 514 013 vohiri@yahoo.com	23/09/12 18.00-19.00
	Nathaniel Blama	Technical Manager	natpolo2000@yahoo.com	
UNDP	Moses Massah	E&E Programme Specialist	0886 558 574 moses.massah@undp.org	24/09/2012 09.00-09.30
	Anthony Kpadeh	NC	088654303	
FAO	Joseph Boiwu	Assistant FAO Representative	0886 553 891 Joseph.Boiwu@fao.org	24/09/2012 10.00-10.45
	Augustine Laveleh	Program Assistant	0886 529 259 augustine.laveleh@fao.org	
USAID	Shawna Hirsch	Environmental Officer	shirsch@usaid.gov	24/09/2012 14.30-15.45
	Darlington Tuagben	Natural Resources Management	dtuagben@usaid.gov	
UNDP	Cleophas Torori	Deputy Res Rep of Programs	880 954 108 cleophas.torori@undp.org	24/09/2012 16.00-16.30
Inception Workshop	See Annex 1.			25/09/12 09.30-16.30
MLME	Geoff Wylie	Director of		26/09/12

		Hydrological Services		09.00-10.00
	SayeGwaikolo	Assistant to Ministry of Water		
	Fredrick Ziama	Head of Meteorology		
MoT	Charles Nelson	Deputy Minister for Lands & Rails	0886541211 mrcsnelson@yahoo.com	
	Arthur Gar-Glahn	Director of Meteorology and WMO Representative	0886565245 meteoliberia@yahoo.com agarglahn@yahoo.com	26/09/12 11.00-12.00
		Technician		
NPA	Nathaniel Gbaba	Deputy Managing Director for Ops	0886375100 natgbaba@hotmail.com	26/09/12
	BarnabusKasor	Director of Ports	0886511051 hilnay61@yahoo.com	14.30-15.30
AEDE	John Brownell		brownelljohn@hotmail.com	26/09/12
	Annie Demen		anniedemen@yahoo.com	16.30-17.00
LISGIS	Detailed required from Anthony Kpadeh			
	Thomas Davis	Director Geo-Information Services	0886550678 tomtdavis@yahoo.com Thomas.davis@lisgis.org	27/09/12 09.30-10.30
MIA/NDRC	SisiZedin (FAO consultant)			
	Cecelia Gould	Coordinator	0886513520 ceceliajgould@yahoo.com	27/09/12 11.00-12.00
	Ronney Jackson	Deputy Minister	0886522855 ronneyj@gmail.com	
MPW	Christian Herbert	Transport Economist	0886513111 cgherbert@msn.com	27/09/12
	WolobaKarwee	Director/CS	0886455530 govegowoloba@yahoo.com	13.00-14.00
RIA	Julius Dennis	General Manager	0886488379 jdennis@robertsinternationalairport.com	
	Paula Fares	Deputy General Manager Tech Services	0886514397 pfares@robertsinternationalairport.com	27/09/12 15.30-17.00
	AkoiVanyanbak	Manager Meteorology	0886913751 vanyanbakakoi@rocketmail.com	
EPA	AnyaaVohiri,	Executive Director	0886514013 vohiri@yahoo.com	28/09/12
	Jefferson Dahn	GIS Officer	0886942794 jefferson.dahn@yahoo.com	10.30-11.30
MoA	Paul Jallah	Assistant Minister Regional Development, Research & Extension	08866471166 paul.jallah@yahoo.com	28/09/12 12.30-13.30
	GertieSulunteh	Program Officer / RDRE	0886536776 suluntehg@yahoo.co.uk	

IW Attendance Register

Name	Organization	Position	Telephone	E-mail
Lawrence C Sackey	Liberia National Fire Service	Assist. Director/Administrator	0886244972	lawrencec.sackey@yahoo.com
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Moses Massah	UNDP	Program Manager	0886558574	moses.massah@undp.org
Mike Jennings	UNDP	International Consultant	0776713852	mike.jennings@c4es.co.za
Anyaa Vohiri	EPA	Executive Director	0886514013	vohiri@yahoo.com
Arthur Gar-Glahn	MoT	Director	0886565245	meteoliberia@yahoo.com
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Sieane Abdul-Baki	MoGD	Special Assistant Minister	0886566655	sieaneb@yahoo.com
Tolbert G Nyenswah	MoH&SW	Assistant Minister	0886558612	tgnyenswah74@yahoo.com
Anthony D Kpadeh	UNDP/MLME	Local Consultant	0886543034	kpadehanthony@yahoo.com
Eugene Gar-Glahn	MoT	Research Officer	0886560932	egarglahn@yahoo.com

Mission 2 (14 – 18 January 2013)

The objective of the second mission to Liberia was to continue dialogue with stakeholders to highlight and attempt to collect outstanding information, required to further understand the climate information and early warning needs of different sectors and societal groups.

A series of meetings were held with key stakeholders involved in the generation and use of climate information and Early Warnings (EWs) in Liberia. The first day of the mission was used for a workshop with the UNDP CO (Moses Massah) and NC (Anthony Kpadeh). The following was discussed: i) progress to date; ii) the Baseline Assessment Report drafted by the NC; iii) the PIF; iv) draft logframe, including indicative activities, responsible parties, baseline interactions and draft budget per activities; and the timeline for the project. The remainder of the week was for detailed discussions with the main stakeholders involved in the project (see meeting schedule below).

Meeting Schedule(all meetings attended by Moses Massah and Anthony Kpadeh)

Organisation	Person	Title	Contact	Date and time
UNDP	Moses Massah	E&E Programme Specialist	0886 558 574 moses.massah@undp.org	14/01/2013 10.00- 16.00
	Anthony Kpadeh	NC	088654303	
MoT	Arthur Gar-Glahn	Director of Meteorology and WMO Representative	0886565245 meteoliberia@yahoo.com agarglahn@yahoo.com	15/01/2013 10.00- 12.00
	Technicians x3			
MIA/NDRC	Ronney Jackson	Deputy Minister	0886522855 ronneyj@gmail.com	15/01/2013 13.00- 14.00
	Technicians x2			
MoPEA	Official attendance list circulated but could not be obtained. Meeting included representatives of MoPEA, MoT, MLME, EPA and UNDP			15/01/2013 16.30- 17.30
RIA	RicardZawiea	Assistant Weather Forecaster	richardo.zawiea@gmail.com	16/01/2013 11.00- 12.30
	Edward Larsala	Assistant Weather Forecaster	e.larsala@yahoo.com	
	Maxwell Jusu	Weather Observer	maxwelljusu@yahoo.com	
MLME	Geoff Wylie	Director of Hydrological Services	0886 855 802	16/01/2013 15.30- 17.30
	GregorPerzyna	Senior Advisor	jagp@nve.no; 0776 637 070	
MoPEA	Official attendance list circulated but could not be obtained. Meeting included representatives of MoPEA, EPA and UNDP			17/01/2013 09.30- 10.30
UNDP	John Walker	Assistant Resident Representative	john.walker@undp.org	17/01/2013 11.00- 11.30
EPA	Benjamin Karmorh	Coordinator, Climate Change Enabling Activities	benkarmorh@yahoo.com; 0886 518 928	17/01/2013 14.00- 16.00
	Nathaniel Blama	Technical Manager	natpolo2000@yahoo.com	

	Technicians x3			
MoA	Paul Jallah	Assistant Minister Regional Development, Research & Extension	08866471166 paul.jallah@yahoo.com	18/01/2013 10.00- 12.00
	Korboi Johnson	CARI technician		
UNDP	KumehAssuf	Climate Change Advisor	kumeh.assuf@undp.prg	18/01/2013 14.00- 15.00

Mission 3: 28 April – 3 May 2013

The third mission was undertaken to: i) update stakeholders on the project design; ii) solicit feedback on the project design; iii) agree upon changes to be made to the project design; and iv) validate the project. A validation work shop was held on 22 May 2013. The stakeholders at the workshop agreed that if the suggested changes are made, the project document could be considered validated. The comments report and an indication of how and where the suggested changes have been made, as well as the attendance register, are detailed below.

Validation Workshop Attendance Register

	Name	Organization and position	E-mail
1	Ranney B. Jackson	Deputy Minister, MIA	ranneyj@gmail.com
2	Fairnoh T. Gbilah	Technical Asst. NDRC	Fairnoh_gbilah@yahoo.com
3	Gboimah Genegbanyan	Senior Analyst, LMA	gboimahgenegbanyan@gmail.com
4	Morris Dukuly	MIA-Minister	Morrisdukuly04@gmail.com
5	John Brownell	Dep. Executive Dir., AEDE	brownelljohn@hotmail.com
6	Harry Barnes-Dabban	Consultant, NPA	hbarnesdabban@gmail.com
7	Othello Kruah	Environmental Manager, NPA	Othell.kruah@yahoo.com
8	Stephen B. Dorbor	DMP/MLME	sbdorbor@yahoo.com
9	J. KanieMerfee	FAO	kanie.merfee@fao.org
10	Philippe Martins	FAO/Cooperation Development officer	philippe.martins@fao.org
11	Jefferson W. Wylie	MLME/Director/LHS	jeffersonw.wylie@yahoo.com
12	Arthur Gar-Glahn	MOT	agarglahn@yahoo.com
13	Eugene V.S. Gar-Glahn	MOT/Research officer	egarglahn@yahoo.com
14	Nathaniel T. Blama, Sr	EPA/Technical Advisor	natpolo2000@yahoo.com
15	Mike Jennings	UNDP International Consultant	mike.jennings@c4es.co.za
16	Robert Dorliae	UNDP, Project Analyst	robert.dorliae@undp.org
17	Kumeh S. Assay	UNDP, E/E Unit	kumeh.assaf@undp.org
18	Rose Muchini	UNDP, DIM-NIM Project	rose.muchiri@undp.org
19	Benjamin Karmorh	EPA	benkarmoh@yahoo.com
20	Henry A. Simpson	MOT	hensimpson@yahoo.com
21	John Walker	UNDP	john.walker@undp.org
22	Samuel K.Boakai	UNDP/GEF	samuel.boakai@undp.org
23	Moses Massah	UNDP	moses.massah@undp.org
24	S. Tornorlah Varpilah	MOT/Minster	stvarpilah@yahoo.com
25	Roland L. Lepol	NPC, CCAAP, MOA	Rolandjlepol@yahoo.com
26	Lemuel T. Browne	MPEA	Lemuelbrowne2007@yahoo.com
27	Gboryonon B. Zarbupoo	UNOPS/UNDP-PA	gboryonon11@yahoo.com
28	Anthony D. Kpadeh	UNDP, National Consultant	kpadehanthony@yahoo.com
29	Vera N.Reeves	UNDP, Admin./Financial Assistant	vera.reeves@undp.org

Comments Report on LDCF project presentation from Validation Workshop 22 May 2013

Comment	Response (and where reflected in Draft 2 of the Project Document)
<p>Roland L. Lepol (MoA)</p> <ol style="list-style-type: none"> Alignment should be with PRS II not PRS I. Output 3.2 – should this not be part of Outcome 2? There should be collaboration between those involved in the three NAPA projects to strengthen activities among agencies, including to mainstream climate change concerns into policy. A “think-tank” of relevant stakeholders should be established to strengthen synergies. 	<ol style="list-style-type: none"> Reference to the PRS I has been replaced by the PRS II in Section 2.1.1 on page 9. The target policy(ies) that the LDCF project will integrate the climate information into need to be defined, as the LDCF project will end before the PRS II will be revised. The activities of Output 3.2 could fall under either Outcome 2 or 3. Alignment with the PIF has been retained, and the activities are included under Output 3.2. The activities are associated with other actions in Outcome 3. The proposed “think-tank” has been indicated in Section 2.3.1 on page 13 and in Section 5 (Management Arrangements) on page 61.
<p>Arthur Gar-Glahn (MoT)</p> <ol style="list-style-type: none"> Institutional support should be provided from all agencies to set up the NMC – collaboration will be an important part of the project. The presentations from the Validation workshop should be sent by e-mail to all participants. 	<ol style="list-style-type: none"> Co-financing from all institutions will be used to establish the National Meteorological Centre (NMC), not only from MoT. This is described under Output 1.3 on page 21. The presentations from the workshop were mailed to all participants by Moses Massah.
<p>Gboimah Genegbanyan (LMA)</p> <ol style="list-style-type: none"> There should be regional cooperation with hydro-meteorological centres that share borders with Liberia. For example, truck drivers traveling into Liberia should be able to receive warnings. 	<ol style="list-style-type: none"> Regional cooperation will be included in the communication strategy to share climate information and warnings across all levels, e.g. community-, district-, county-, national and regional-level (to neighbouring countries). This is described under Output 2.2 on page 26.
<p>Jefferson W. Wylie (MLME)</p> <ol style="list-style-type: none"> MoH and social welfare are key users of climate information and should be included in the project. Private sector companies regularly have climate monitoring equipment that they use and then abandon/transfer to government when they no longer require data to be generated – the maintenance of these additional infrastructure puts a burden on GoL resources. 	<ol style="list-style-type: none"> MoH has been added to the project as a key user of climate information, including in Activity 1.4 on page 23. Health has been added as one of the indicator sectors for which sector-specific, tailored climate information packages will be developed. A private sector consultative forum will be established through Output 3.4 (page 32). Through the forum the operation and maintenance of both private and public sector monitoring equipment will be discussed, with the ultimate goal of private sector funding to ensure a reliable supply of high quality meteorological and hydro-meteorological monitoring data.
<p>Robert Dorliae (UNDP)</p> <ol style="list-style-type: none"> Provision of electricity should be a factor in deciding on the location of the AWSs, and Cellcom and MTN should be approached to support the EWS. The Ministry of Information will be an important stakeholder when it comes to disseminating climate information. Co-financing will be an important factor in the success of the LDCF project, and all partners are urged to provide co-financing letters. 	<ol style="list-style-type: none"> Activity 1.1.1 will finalise the location of the AWSs, and electricity availability will be a key factor. Solar panels and battery packs will be provided where electricity cannot be sourced – security of this equipment will also be taken into consideration. Cellcom and MTN have been part of the PPG consultations, and were invited to the Validation workshop, but unfortunately could not attend. Activity 2.2.7 (page 27) will establish legal mandates for issuing warnings, including the role the Ministry of Information has to play in the LDCF project. Information and co-financing letters have been requested from the relevant

	partners, who are urged to please provide the required letters at their earliest convenience.
<p>Nathaniel T. Blama, Sr (EPA)</p> <ol style="list-style-type: none"> 1. The project should be integrated, and benefit all sectors, not the meteorology. 2. EPA is playing an active role in climate change policy revisions, and should lead the relevant activities. 3. The number of AWSs to be installed should be determined in country and not based on a WMO study. 	<ol style="list-style-type: none"> 1. The objective of the project is to build climate resilience in vulnerable sectors and communities, and therefore will benefit all sectors. The starting point, however, is generating climate information through an observational/monitoring network. The focus of Output 1 (meteorological and hydro-meteorological stations) and 2 (climate forecasting) is therefore MoT and MLME. However, all climate-sensitive institutions will benefit from the tailored forecasts generated through Output 1.4, and from the warnings generated and disseminated through Outcome 2. 2. The EPA is stated as the agency to lead the policy revisions (Output 3.3, page 31), and collaboration with the EPA and the LDCF project will be vital. Please provide further background on the policy work currently being undertaken by EPA. 3. The number of AWSs to be installed was directed by a WMO study undertaken specifically for Liberia, but the number and exact location of the station will be verified/determined through Activity 1.1.1 on page 20.
<p>Moses Massah (UNDP)</p> <ol style="list-style-type: none"> 1. The project should include PRS II not PRS I. 2. The National Meteorological Agency (NMA) should not be a deliverable of the LDCF project, but the LDCF project should support/facilitate its establishment 3. The list of key stakeholders in Activity 1.4 should be increased to include all users of climate information. 	<ol style="list-style-type: none"> 1. Reference to the PRS I has been replaced by the PRS II in Section 2.1.1 on page 9. The target policy(ies) that the LDCF project will integrate the climate information into need to be defined, as the LDCF project will end before the PRS II will be revised. 2. The importance of the NMA for sustainability of LDCF project interventions is described under the baseline scenario for Outcome 1 on page 18. It is stated that the establishment of the NMA is independent of, yet will benefit the LDCF project. 3. MoH, LMA, NPA and MoPEA have been added to the list of key climate information generators/users. The list now includes MoT, EPA, MLME, NDRC, MoA, MoH, LMA, NPA and MoPEA.
<p>Fairnoh T. Gbilah (NDRC)</p> <ol style="list-style-type: none"> 1. How does funding for the RPs work? 	<ol style="list-style-type: none"> 1. A micro (HACT) assessment of the MoT is currently being undertaken. In all likelihood UNDP will provide support services to MoT, which may include procurement of equipment and personnel upon direct payment request from MoT. Should direct cash transfers be applicable, MoT will received funds from UNDP, but only with consent from EPA. Equipment to be purchased for NDRC will therefore either be through UNDP or through MoT via EPA.
<p>Benjamin Karmorh (EPA)</p> <ol style="list-style-type: none"> 1. Does the National Meteorological Centre currently exist? The wording in the project document is not clear, and implies it does. 2. The NCCSC is already established, but need to be strengthened. 	<ol style="list-style-type: none"> 1. The National Meteorological Centre does not currently exist, and will be established when the LDCF project is initiated. GoL co-financing will be used to secure office space for the NMC, which will house meteorologists from all agencies/institutions involved in meteorology in Liberia, not just MoT. This is

<p>3. Will the project follow a DIM or NIM payment modality? The LDCF resources represent a sizeable investment and it is questionable whether MoT is able to manage the finances.</p> <p>4. The Steering Committee should include all institutions/agencies involved in the project.</p>	<p>stipulated under Output 1.3 on page 21.</p> <p>2. The wording of Activity 3.3.1 has been revised from “Establish the NCCSC” to “Strengthen the NCCSC” as suggested.</p> <p>3. The project will follow a NIM modality. A HACT assessment of MoT is currently being undertaken. This will determine what type of support services are required from UNDP, if any.</p> <p>4. It is common practice for only representatives of the key institutions to sit on the Steering Committee of LDCF projects. These representatives represent the wider stakeholder groups. EPA, MoT, MLME, NDRC and UNDP will be represented on the Steering Committee of this LDCF project, as outlined in Section 5 on page 60. Technical Working Groups will be established within the required sectors, as required.</p>
<p>Jefferson W. Wylie (MLME)</p> <p>1. What role will the MLME play in the project?</p>	<p>1. MLME will be a Responsible Party. As such MLME staff will benefit from training opportunities afforded through the LDCF project, and will be responsible for equipment relevant to the MLME mandate. MLME will also sit on the Steering Committee of the LDCF project, and will ensure that the intended outcomes of the project are achieved through the implemented activities.</p>
<p>J. KanieMerfee (FAO)</p> <p>1. Synergies should be maximised where possible, including as many stakeholders as possible. The educational sector, for example, should be included.</p>	<p>1. Collaboration with existing projects and with representatives of all climate user institutions is a very important part of the project. The education sector is not seen as a key end-user of climate information, but this information should be made available to students to use in projects and as part of the school/university curriculum. This has been added to Activity 1.4.5 on page 24.</p>
<p>GboimahGenegbanyan (LMA)</p> <p>1. Why other validation workshops earlier?</p>	<p>1. There have been numerous delays in the Liberia project, and much of the first two missions was focuses on establishing who the IP for the project would be. This delayed the provision of the required information and the drafting on the first draft of the project document. The IP issue has now been resolved and through the concerted effort of all stakeholders we were able to hold the validation workshop and are still aiming for submission prior to the next GEF Council meeting in June. This will require timely feedback from all stakeholders on the second draft of the PD.</p>
<p>Arthur Gar-Glahn (MoT)</p> <p>1. WMO is a key stakeholder in the project and should be mentioned in the project document.</p>	<p>1. WMO, through representation within MoT, will be a key stakeholder in the LDCF project. Activities will be aligned with the WMO’s Global Framework Climate Services (GFCS) initiative, as stated in the “Adaptation alternative” under Outcome 1 on page 18.</p>
<p>Fairnoh T. Gbilah (NDRC)</p> <p>1. Now that the IP issue has been resolved, we should move forward and focus on how to maximise the benefits the LDCF project can deliver. Activities should build on the work WFP is doing in Liberia.</p>	<p>1. Planned and accomplished WFP project achievements will form an important baseline from LDCF activities. However, further information on the WFP project is required, as stated in Section 2.3.1 on page 13, so that the projects can be properly integrated.</p>

<p>Jefferson W. Wylie (MLME)</p> <p>1. Synergies within NAPA projects will be very important, for example, the coastal project is procuring equipment and will be generating information that the EWS project should incorporate and use to generate warnings.</p>	<p>1. Collaboration between project managers of the three LDCF projects will be ensured through a proposed LDCF “think-tank”, as indicated in Section 2.3.1 on page 13 and in Section 5 (Management Arrangements) on page 61.</p>
<p>GboimahGenegbanyan (LMA)</p> <p>1. The Regional Maritime Rescue Co-ordination Centre should be included in the project, as a user and disseminator of information and warnings.</p>	<p>1. The Regional Maritime Rescue Co-ordination Centre will be included in the communication strategy to share climate information and warnings across all levels, e.g. community-, district-, county-, national and regional-level (to neighbouring countries). This is described under Output 2.2 on page 26.</p>
<p>Lemuel T. Browne (MoP)</p> <p>1. The project should be driven by the needs/wants of the vulnerable communities, and traditional EWSs should be included. Not all communities have televisions and mobile phones therefore other means of information dissemination should be included.</p>	<p>1. Traditional EWSs and indigenous knowledge will be a very important part of the LDCF project, as described in Output 2.3 on page 27. A range of communication strategies will be used, including community radio, word-of-mouth, print media, television, megaphones/town criers and a two-way, SMS-based alert system. This will be based on community surveys and vulnerability studies undertaken as part of Output 2.3. Cost-benefit analyses will also be undertaken to establish which communication channels are most effective.</p>

Annex 2: Key assessment reports– Inception Report

Executive summary:

A mission was undertaken to support the UNDP Liberia Country Office with the design of an Early Warning System (EWS) and climate information project to be financed by the LDCF. An interactive workshop and bilateral consultations involving the producers, operators and end-users of EWS as well as other key stakeholders were held between the 24th and 28th of September 2012. The primary tasks of the workshop and consultations were to: i) ensure that all relevant stakeholders were aware of the opportunity at hand to mobilize finance for a project on climate information and EWSs; ii) understand the role of the range of EWS actors in Liberia; and iii) solicit their input to inform the project design.

Key findings from the mission include:

- **Civil war.** More than a decade of civil war has resulted in: i) the lack of appropriately maintained hydro-meteorological equipment in Liberia (in terms of technical equipment, human resources and infrastructure); and ii) the limited technical capacity in the hydro-meteorological sector as a result of limited training opportunities.
- **Requirements.** Procuring equipment, capacity building and harmonizing current efforts to collect climate information were seen as key activities in resolving the current challenges.
- **Fragmentation.** Meteorological activities fragmented in Liberia because of a lack of an effective coordination mechanism overseeing all related activities.
- **Implementing Partner.** The issue of who the Implementing Partner (IP) for the project should be was discussed but not resolved. Several institutions felt they should be the IP. It was thus decided that the selection of the lead agency/IP should be decided at a high-level meeting involving the appropriate representatives of all relevant ministries/departments.
- **Focus.** There is a strong preference for a national EWS to be established through the LDCF project. There is currently very little dissemination of climate information of any kind. Both urban (primarily Monrovia) and rural communities would therefore benefit – urban communities from the simple provision of weather-related information (such as if it is likely to rain the following day), and rural communities primarily through forecasts related to subsistence agriculture, and warnings related to flooding.
- **Target areas.** Vulnerability maps highlighting potential areas of specific focus and data collection were not available. Specific sites were therefore not selected. However, as the project will have a national focus, all vulnerable communities will benefit.

A follow up mission is planned for January 2013, when the logframe, baseline projects and budget will be finalised.

1. Initial activities, workshop and consultations

An Inception Workshop (IW) was held on the 25th September 2012 at the UNDP Office, Mamba Point, Monrovia. The purpose of the IW was to engage stakeholders involved in EWS-related activities in Liberia, including those responsible for the generation, dissemination and use of climate information. The IW was critical to: i) ensure that all relevant stakeholders were aware of the opportunity at hand to mobilize finance for a project on climate information and EWSs; and ii) solicit their input to inform the project design.

Following the IW, individual stakeholder consultations took place with government department staff and representatives of bilateral donor agencies. The purpose of these meetings was to: i) inform the relevant institutions and departments of the scope of the proposed LDCF project; ii) understand the role of the EWS actors; and iii) elicit ideas on details that could be factored into the LDCF project during the design phase. These meetings were important to ensure that the LDCF project coordinates and complements other ongoing and planned initiatives.

1.1 Inception workshop

Thirty representatives attended the workshop, including those from government agencies with key roles to play in the LDCF project, as well as UN agencies and bi-lateral donors. The workshop was split into two sessions. The morning session was attended by ministry heads and the importance of the project to Liberia as a vulnerable nation was discussed. Technical representatives of the key ministries and agencies to be involved in the project remained for the afternoon session, when specifics and technical details regarding the project were discussed.

Mr Moses Massah, UNDP Programme Specialist, welcomed all after which the workshop was officially opened by Mr Cleophas Torori, UNDP Deputy Resident Representative. This was followed by opening remarks from:

- Mr Arthur Gar-Glahn, Director of Meteorology at the Ministry of Transport (MoT);
- Mr Ronney B. Jackson, Deputy Minister at the Ministry of Internal Affairs and member of the National Disaster Relief Commission;
- Mr Harrison S. Karnwea, Interim Managing Director of the Forestry Development Authority (FDA); and
- Madam Anyaa Vohiri (Key note address), Executive Director for the Environmental Protection Agency (EPA) and Global Environment Facility (GEF) Operational Focal Point for Liberia.

In the ‘technical sessions’, presentations were given by:

- Mr Edward Perry of the Ministry of Agriculture (MoA): Extension services provided to rural subsistence farmers and the ministry’s efforts to address climate change impacts. A discussion followed focusing on the National Policy on Agricultural Extension and Advisory Services (NPAEAS), as well as the two different training programs (1 Train-the-Trainer and 8 Roving Seminars) targeting MoA Extension Field Staff, with the support from MoT (the lead agency), Ministry of Lands, Mines & Energy (MLME), FAO-Liberia and the World Meteorological Organization (WMO).
- Mr Anthony Kpadeh, UNDP National Consultant and representative of the MLME: Meteorological services in Liberia, including the current state of observational infrastructure and the potential that exists for forecasting floods and droughts. The ensuing discussion highlighted that the meteorological equipment and expertise available in Liberia are **not being used to its full capacity**, largely as a result of the fragmented nature of meteorological services in the country.
- Mr Mike Jennings, UNDP International Consultant: Introduction to the gaps and need for an EWS in the African context, and LDCF project aims and outcomes.

During the post-lunch session a general discussion was facilitated by Mr Boye Johnson (UNDP) with the aim of understanding:

- Why are meteorological activities **fragmented**? The **lack of an effective coordination mechanism** overseeing all related activities was suggested as a reason for the fragmented nature of the current approach to collecting and using hydro/meteorological data. In this regard the National Meteorological Agency (NMA) was discussed as a possible solution, although the NMA is yet to be legislated. The EPA was also suggested as an appropriate leader/**Implementing Partner (IP)** of the project because of its autonomous role in environmental monitoring in Liberia. It was decided that the selection of the lead agency/implementing partner should be decided at a high-level meeting involving the appropriate representatives of all relevant ministries/departments.
- What could be done to **resolve the challenges**? The significant impact of more than a decade of civil war was discussed, in relation to: i) the lack of appropriately maintained hydro-meteorological equipment in Liberia (in terms of technical equipment, human resources and infrastructure); and ii) the limited technical capacity in the hydro-meteorological sector as a result of limited training opportunities. Procuring equipment (including automatic/manual weather stations and flow gauges), capacity building (of technicians, primarily within the MoT, MoA and MLME) and harmonizing current efforts to collect climate information (including providing the trained meteorologists in Liberia with access to the satellite and forecasting equipment at the Roberts International Airport; see below) were seen as key activities in resolving the current challenges.
- Who should the EWS **benefit**? There was a strong preference for a national EWS to be established through the LDCF project. There is currently very little dissemination of climate information of any kind. Both urban (primarily Monrovia) and rural communities would therefore benefit – urban communities from the simple provision of weather-related information (such as if it is likely to rain the following day), and rural communities primarily through forecasts related to subsistence agriculture, and warnings related to flooding.
- Where are these **communities/activities located**? Vulnerability maps highlighting potential areas of specific focus and data collection were not available. Specific **sites** were therefore not selected. However, as the project will have a national focus, all vulnerable communities will benefit.

1.2 Initial consultations

A series of meetings were held with key stakeholders involved in the generation and use of climate information and EWs in Liberia. See Table 1 for a meeting schedule and the text following the table for a brief description of each meeting.

Organisation	Person	Title	Contact	Date and time
EPA	AnyaaVohiri,	Executive Director	0886 514 013 vohiri@yahoo.com	23/09/12 18.00-19.00
	Nathaniel Blama	Technical Manager	natpolo2000@yahoo.com	
UNDP	Moses Massah	E&E Programme Specialist	0886 558 574 moses.massah@undp.org	24/09/2012 09.00-09.30
	Anthony Kpadeh	NC	088654303	
FAO	Joseph Boiwu	Assistant FAO Representative	0886 553 891 Joseph.Boiwu@fao.org	24/09/2012 10.00-10.45
	Augustine Laveleh	Program Assistant	0886 529 259 augustine.laveleh@fao.org	
USAID	Shawna Hirsch	Environmental Officer	shirsch@usaid.gov	24/09/2012 14.30-15.45
	Darlington Tuagben	Natural Resources Management	dtuagben@usaid.gov	
UNDP	CleophasTorori	Deputy Res Rep of Programs	880 954 108 cleophas.torori@undp.org	24/09/2012 16.00-16.30

Inception Workshop	See Annex 1			25/09/12 09.30-16.30
MLME	Geoff Wylie	Director of Hydrological Services		26/09/12 09.00-10.00
	SayeGwaikolo	Assistant to Ministry of Water		
	Fredrick Ziama	Head of Meteorology		
MoT	Charles Nelson	Deputy Minister for Lands & Rails	0886541211 mrdsnelson@yahoo.com	26/09/12 11.00-12.00
	Arthur Gar-Glahn	Director of Meteorology and WMO Representative	0886565245 meteoliberia@yahoo.com agarglahn@yahoo.com	
		Technician		
NPA	Nathaniel Gbaba	Deputy Managing Director for Ops	0886375100 natgbaba@hotmail.com	26/09/12 14.30-15.30
	BarnabusKasor	Director of Ports	0886511051 hilnay61@yahoo.com	
AEDE	John Brownell		brownelljohn@hotmail.com	26/09/12 16.30-17.00
	Annie Demen		anniedemen@yahoo.com	
LISGIS	Detailed required from Anthony Kpadeh			27/09/12 09.30-10.30
	Thomas Davis	Director Geo-Information Services	0886550678 tomtdavis@yahoo.com Thomas.davis@lisgis.org	
MIA/NDRC	SisiZedin (FAO consultant)			27/09/12 11.00-12.00
	Cecelia Gould	Coordinator	0886513520 ceceliajgould@yahoo.com	
	Ronney Jackson	Deputy Minister	0886522855 ronneyj@gmail.com	
MPW	Christian Herbert	Transport Economist	0886513111 cgherbert@msn.com	27/09/12 13.00-14.00
	WolobaKarwee	Director/CS	0886455530 govegowoloba@yahoo.com	
RIA	Julius Dennis	General Manager	0886488379 jdennis@robertsinternationalairport.com	27/09/12 15.30-17.00
	Paula Fares	Deputy General Manager Tech Services	0886514397 pfares@robertsinternationalairport.com	
	AkoiVanyanbak	Manager Meteorology	0886913751 vanyanbakakoi@rocketmail.com	
EPA	AnyaaVohiri,	Executive Director	0886514013 vohiri@yahoo.com	28/09/12 10.30-11.30
	Jefferson Dahn	GIS Officer	0886942794 jefferson.dahn@yahoo.com	
MoA	Paul Jallah	Assistant Minister Regional Development, Research	08866471166 paul.jallah@yahoo.com	28/09/12 12.30-13.30

		&Extension		
	GertieSulunteh	Program Officer / RDRE	0886536776 suluntehg@yahoo.co.uk	

A brief summary of the important points from each of the key meetings is presented below.

- **EPA** initiated the EWS project in Liberia, and felt they were well placed to act as the IP because of their autonomous role in environmental monitoring in Liberia.
- **MMLE** are responsible for hydrological monitoring of Liberia’s water resources, and collect and store flow and rainfall data.
- **MoT** is mandated with the collection of all climate data in Liberia, as well as climate monitoring and forecasting. Currently the Meteorology Department does not actively engage in climate-related activities (collection of climate data or forecasting). However, according to representatives of the ministry, the planned National Meteorological Agency is soon to be legislated, and should be the IP for the project.
- **National Ports Authority (NPA)** is responsible for all shipping and port-related activities in Liberia. Ships arriving at or disembarking the port at Monrovia have their own means of receiving weather and sea state forecasts, and communicate these forecasts with the port via the port receiving tower.
- **Liberia Institute of Statistics and Geo-Information Services (LISGIS)** has a database of physical and socio-economic GIS files that will be useful to the LDCF project planning and implementation.
- **Ministry of Internal Affairs (MIA)/National Disaster Relief Commission (NDRC)** are collaborating with UNDP in an EWS-related project. Close collaboration will be established in the PPG phase to establish synergies and avoid duplication of efforts.
- **Ministry of Public Works (MPW)** does not specifically collect climate-related information but would benefit from improved forecasting when carrying out its infrastructural (including roads) maintenance.
- **MoA** has a network of extension services which interact with subsistence farmers and could potentially be an effective means of communication climate-related information. The MoA is also implementing a number of potential baseline projects.
- **Roberts International Airport (RIA)** at present houses the only active trained meteorologists in Liberia. However, forecasts relate to the aeronautical sector only. Collaboration with trained meteorologists from other ministries is possible but logistically difficult because of the security sensitivities related to the airport and access to facilities. Dealing with the NMA would facilitate the necessary arrangements, as this agency would be mandated to use the equipment currently housed at RIA.

Individual meetings were also held with the following non-government stakeholders:

- **FAO**, who in collaboration with the MoA are implementing a number of projects that could benefit from the information provided by the LDCF project.
- **USAID** who, similar to FAO, has a number of development projects that would benefit from the LDCF project.
- **Agency for Economic Development and Empowerment (AEDE)** who is the in-country partner to the I.M. Support Group (IMSG). See below for further details.

The EPA encouraged the LDCF project formulation phase to take into account efforts by IMSG, who in March 2011 developed a proposal entitled “Environmental Solutions for Liberia”. A number of systems to manage environmental qualities to safeguard economic output were proposed. These systems include those to: i) forecast weather; ii) monitor the environment using satellite information monitoring; iii) establish and manage an environmental database; iv) establish and manage a climatological database; v) coastal zone management; and vi) climate change impact assessment. The LDCF project will integrate as far as possible with the work and planning undertaken by IMSG to date.

2. Project development

2.1 Baseline situation and proposed responses

More than a decade of civil war has had a severe impact on infrastructure in Liberia. Any hydro-meteorological equipment that was installed and functioning before the war has long since been destroyed, and very little equipment has been installed in recent times. There is consequently very little information and data available, and no continuous monitoring records. The National Consultant is currently compiling a Baseline and Gap Analysis (BGA) report. This will provide more information about what little data there is. However, the BGA report is due to be completed at the end of December 2012/early January 2013, and was therefore not available at the time of writing this Inception Report.

It is not clear to what extent the IMMSG proposal can be included in the UNDP project. The different components of the proposal are currently being assessed regarding their suitability for inclusion and alignment with the UNDP project. EPA has stated that it would like to see aspects of the IMMSG proposal incorporated into the UNDP project, but to what extent they can be directly included needs to be confirmed.

2.1.1 Current and past EWS-related activities

Currently there are no organized and coordinated programmes on meteorological, hydrological and climatic research and observation in Liberia. There are thus no EWS-related activities. RIA collected rainfall, temperature, pressure, wind and dew point data, but this is for aviation purposes only. Data from 1999 to date is available on paper form. Certain other institutions are planning on collecting data of various kinds (see Section 3.1.2), but this monitoring has not yet been initiated and no data is being generated. The Meteorological Department does not collect any weather-related data.

The data currently being collected, as well as the planned projects to increase data collection in Liberia, will be further outlined in BGA report.

2.1.2 Capacity and limitation of forecasts and existing systems

The current and planned hydro and meteorological equipment in Liberia, as well as the forecasting capacity, is listed below:

- Current meteorological observational network situation:
 - one semi-functioning **Automatic Weather Observation Station (AWOS)** at RIA; and another AWOS to be installed by MLME (location to be determined)
 - **Stevenson screen** with wet and dry bulb thermometers at RIA;
 - one **rain gauge** at RIA; one at MLME office and a further 15 to be installed (location to be determined); 160 rain gauges to be installed by MoA (some have been installed, although it is not known how many, or where these were installed); and one rain gauge to be installed by EPA (location to be determined);
 - one **anemometer** at RIA; and
 - one **digital barometer** at RIA.
- Current meteorological manpower situation:
 - **six** trained climate and weather technicians at MoT (not currently involved in meteorological activities);
 - **one** trained meteorologist at MLME (trained in operating PUMA SYNERGIE and AMESD systems);
 - **one** trained technician at MoA (at the Central Agricultural Research Institute (CARI) where AMESD station is not functioning); and
 - **one** weather forecaster, **five** meteorological observers, **three** assistants and **two** system administrators at RIA.

- Current meteorological forecasting products and facilities:
 - **PUMA (Preparation and Use of Meteosat in Africa)-SYENERGIE** satellite receiver and hard- and software at RIA (currently used for aeronautical purposes only); and
 - **African Monitoring of the Environment for Sustainable Development (AMESD)** or e-station satellite receiver and hard- and software at CARI (not functioning) and RIA (not utilized).
- Current hydro-meteorological situation.
 - **four** stations to be installed (on St John, St Paul and Lofa River).
- Current Early Warning situation
 - There are **no** EWSs in place at present.

A report on “Research, Systematic Observations and Early Warning Systems” written by the Meteorological Department (March 2011) identified several gaps to be addressed to improve the climate monitoring and forecasting capabilities in Liberia. These are listed below.

- No national institution/entity designated for monitoring and systematic observation of the atmosphere and the provision of weather and climate information and services.
- There has been no national development/strategic plan and/or project proposal for the development of the meteorological sector in the country until May 2010.
- Only two meteorological stations which are not measuring all the full suite of potential parameters.
- No data processing and forecasting facilities.
- No public weather service.
- No public education and awareness campaigns on weather and climate.
- No Early Warning Systems.
- No communication facilities/links.
- No IT/ICT facilities for data processing.
- Inadequately trained human resources.
- Liberia is not participating in the Global Climate Observing System (GCOS) programme of the World Meteorological Organization (WMO).
- No link to the Global Telecommunication System (GTS).
- Liberia is not participating in WMO Data Rescue DARE programme.
- No support for atmospheric research.
- No transfer of appropriate technologies.

To address the gaps/deficiencies in trained human resources caused by the prolonged civil war, the “Research, Systematic Observations and Early Warning Systems” report outlined the capacity building requirements shown in the table below.

Institution	Number of Individuals who require hydromet training
Ministry of Transport	70
Ministry of Agriculture	20
Ministry of Lands, Mines and Energy	25
Environmental Protection Agency	15
Roberts International Airport	20
Liberia Domestic Airports Agency	10
National Port Authority	10
Forestry Development Authority	10
Liberia Maritime Authority (formerly Bureau of Maritime Affairs)	10
TOTAL:	190

The gaps and capacity building requirements will be further outlined in BGA report.

2.1.3 Information access and dissemination

Very little information is being produced at present and none is being disseminated. RIA gathers information for aviation purposes, but this is not shared and the technicians from the Meteorology Department do not have access to the RIA facilities or to the data. The project will address this constraint to data flow by establishing a central archiving facility (see Section 3.1.6).

This current information access and dissemination situation will be further elaborated on in the BGA report

2.1.4 Locations for hydro-meteorological infrastructure

Locations for the equipment procured through the LDCF project have not yet been discussed. This will depend on the type of equipment purchased and the number of units afforded by the budget. This will be discussed with the technicians of RIA, MoT, MMLLE and MoA during the second mission. A potential problem is that the locations of the 160 rainfall gauges installed by the MoA are not known – a plan to identify the record the GPS locations of the stations will be detailed in the BGA report.

2.1.5 Potential private sector clients

The private sector was not represented at the IW. Those present welcomed the idea of private sector involvement, including purchasing of specifically tailored climate information. This concept will be detailed in the BGA report and will be further developed over the remainder of the PPG phase.

2.1.6 Outcomes and outputs

The development requirements of the hydro-meteorological sector in Liberia, according to the “Research, Systematic Observations and Early Warning Systems”, are listed below.

- Establishing, through policy/legal framework, a national institution/entity for the monitoring and systematic observation of the atmosphere and the provision of weather and climate information and services.
- Implementing the 5-year national development/strategic plan and 2-year project proposal prepared by the World Meteorological Organization (WMO) for the development of the meteorological sector in the country.
- Establishing and maintaining observational station network for continuous monitoring of weather, climate and environment.
- Establishing and maintaining data processing and forecasting facilities.
- Establishing public weather services.
- Establishing public education and awareness programmes on weather and climate.
- Establishing an effective Early Warning System).
- Establishing communication facilities/links (i.e. Global Telecommunication System-GTS).
- Developing IT/ICT facilities for data processing.
- Building technical capacity in the appropriate line ministries in weather forecasting and packaging into a format that is understandable to the end users.
- Participating in the Global Climate Observing System (GCOS) program of WMO.
- Participating in WMO Data Rescue (DARE) program.
- Supporting atmospheric research (i.e. weather/climate).

These development needs are largely met through the following proposed outcomes and outputs, as suggested in the PIF.

Outcome 1. Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.

1.1. Installation of hydro-meteorological weather and flow gauge stations in critical areas across the country with communications and (centralised) archiving technologies at the Meteorology Department and Hydrological service.

1.2 Technical capacity of staff in Meteorology Department developed to produce daily to seasonal, seasonal to annual, annual to multi-decadal, climate forecasts, using numerical weather prediction models, seasonal prediction models and internationally produced forecasts.

1.3 Installation of infrastructure for monitoring and assessing the changing state of the environment and the impact of current and future climate on key environmental variables for planning food security, water and land management.

1.4 Staff in MoT and MMLE (encompassing Meteorology and Hydrology) trained in the use of climate monitoring equipment, tailored forecasts of climate hazards and use of satellite monitoring for assessing crop production, water resources, wildfires etc.

2. Climate, environmental and socioeconomic data are tailored and combined to produce appropriate information which can be communicated to government entities and communities to enable informed decision making.

2.1 Systems and communication with the National Disaster Relief Commission are enabled to use the forecasts (from 1.2), environmental monitoring data (from 1.3), tailored forecasts (from 1.4) and current vulnerability assessments, to forecast where climate induced risks are high.

2.2 Communication channels for issuing warnings (through both governmental and non-governmental agencies) are enabled (e.g. radio, mobile phones, television), as well as the procedures and legal basis for the issuing of warnings.

2.3. Three applications of the early warning system (e.g. coastal, agriculture, floods, health) are identified and outputs from 2.1 and 2.2 are tested for their effectiveness.

3. Government, private sector and communities are aware of the major risks associated with climate change, and consider them when formulating development policies and strategies.

3.1 Regional climate change scenarios are developed for Liberia and used to enable the identification of 'hotspots' where climate change is expected to have high biophysical impacts

3.2 Adaptation options for the most vulnerable communities and livelihoods are made aware to communities in light of projected climate change and current vulnerabilities

3.3 A system for inter-ministerial dialogue on incorporating climate change considerations into government policies is established as well as a mechanism for discussing public and private financing of the EWS system.

3.4 Engagement of the private sector to develop paid-for services through the early warning system and climate change adaptation options.

2.2 Implications for the project budget and co-financing

The budget allocated in the PIF (\$3,415,000 for Outcome 1, \$2,250,00 for Outcome 2 and \$750,000 for Outcome 3) will most likely be sufficient. Detailed discussions with the various role players will be held over the course of the second mission (January 2013), to further clarify the outputs per outcome. Equipment requirements will be discussed, as will capacity requirements and the measures needed for coordination and sustainable financing. Current department budgets and their ability to sustain equipment, operations, maintenance and human resources will be investigated during the second mission. The co-financing sources identified in the PIF will be confirmed during the second mission.

During the first mission, budgets were not specifically discussed, aside from all representatives at the IW highlighting the important of embedding operational and maintenance costs for any equipment procured within government budgets. It was noted that current budgets are at present often insufficient to adequately maintain hydro-met equipment.

2.3 Institutional coordination and implementation

The following institutions expressed a willingness and desire to be the Implementing Partner for the project:

- EPA because of its autonomous role in environmental monitoring in Liberia;
- MoT, or more specifically, the planned National Meteorological Agency (NMA), because of the MoT's mandate to collect all climate related data in Liberia and monitor and forecast the weather; and
- MMLE because it currently has the longest running database (mostly in hardcopy) of flow and rainfall data in Liberia.

It was decided that the selection of the lead agency/Implementing Partner should be decided at a high-level meeting involving the appropriate representatives of all relevant ministries/departments. This was seen to be preferable than the technical stakeholders of each ministry/department making the decision on behalf of their senior staff. This high-level meeting was due to take place in 2012, but will now be scheduled for during the second mission. The institution selected, as well as potentially other institutions, will have to undergo a UNDP capacity assessment before it can be selected at the IP for the LDCF project. This assessment will be led by the National Consultant and will take place after the high-level meeting.

The main institutions involved will be the Meteorology Department within the MoT (which will be replaced by the NMA when it is legislated), MMLE, MoA, MIA/NDRC, RIA and EPA. New institutional links will be needed at all levels, from data generation and information dissemination and coordination of required activities.

2.4 Identified risks

The risks identified in the PIF remain relevant.

Risk	Level	Mitigation
Unavailability of requisite human resources and data	High	The issue of the unavailability of requisite human resources will be mitigated by recruitment of international consultants who will work closely with Liberian counterparts and by targeted capacity building activities. Training activities of local personnel will also be part of all aspects of the work and the Liberian government will be encouraged to expand the staff base if it is weak in particular areas.
Local IT and telecommunications infrastructure weak e.g. international bandwidth and local mobile telecommunications networks	Medium	Cost-effective solutions for each particular situation will be used e.g. satellite and/or radio communications. Where feasible automatic weather and hydrological stations reporting over the mobile telecoms network will be preferred.
Insufficient institutional support and political commitments (e.g. establishing the Meteorological agency)	Medium	The proposed project is strongly supported by the Government of Liberia and other key stakeholders and development partners. The project, in conjunction with UNDP, will therefore take advantage of this opportunity to seek substantial support from the Government and forge strong partnership with other development partners. Direct linkages to existing and planned baseline development activities implemented by government, securing of the necessary co-financing, as well as local buy-in will also minimize this risk. It will also be important to establish buy in from all government departments early as the project will utilize

Risk	Level	Mitigation
		data and information from a wide range of departments. As part of output 3.3 and starting with the PPG phase, the project will engage relevant ministries (including the ministry of Land, Mines and Water) to establish the current baseline financing of the Meteorology division, Hydrological service and NDRC. Increased budgets for additional staff and equipment (including maintenance etc.), developed through this project, will be estimated and a plan for financing developed in collaboration with government (including potential revenues from private clients).
Work progresses in a compartmentalized fashion and there is little integration e.g. government departments refuse to share data and information	Medium	This risk is always present in a project such as this. By ensuring that capacity is built across a range of departments and implementing 'quick win' measures early (developing products based on internationally available data), these issues can be mitigated.
Non-compliance by primary proponents for the successful implementation of this project	Medium	Ensuring that the project is designed and implemented in a participatory and inclusive manner, following established UNDP procedures, will mitigate the risk. Since the activities correspond to the urgent needs as expressed by the primary proponents the risk of non-compliance should be reduced
Climate shock occurring during the design and implementation phase of the project	Low to medium	There may be some delays as more urgent priorities may need to be addressed by some of the stakeholders but it is unlikely that this will derail the project.

Follow up activities – Timeline and Workplan

A timeline and workplan for the PPG phase is shown below. The required number of days for the International Consultant (IC, Mike Jennings) and National Consultant (NC, Anthony Kpadeh) are shown.

Month	Task	Days MJ	Days AK
Sep-12	Preparation and logistics for first mission	1	1
	First mission - Inception workshop and initial bilateral meetings	5	5
Oct-12	Write BTOR and Inception Report	3	
	Develop a preparation workplan	1	
	Contact stakeholders from MoT, MoA, MLME, EPA, MIA/NDRC, LISGIS, RIA and AEDE (INGS project) to request outstanding reports discussed in the first mission, and inform them of the meetings and working sessions scheduled for November 2012		2
Nov-12	Review and gather information on past, current and planned projects including disaster management and risk reduction activities. Help identify both successful and unsuccessful interventions.	3	3

	Meetings with current projects to determine baseline activities and potential for interaction, including MoT (NMA and RIA interaction), MoA (rain gauge installation, extension officers and LASIP baseline project), MLME (data inventory and flow gauge installation), EPA (co-ordination), MIA (NDRC/EWS plans), RIA (collaboration) and AEDE (INSG proposal)		5
	Working sessions with MoT, MoA, MLME, EPA, MIA/NDRC and RIA to determine the current state of the EWS, including equipment, telecommunications, databases, forecasting and monitoring products, advisories and communication of EWS messages		5
	Baseline Assessment Report - including a map of available stations and infrastructure, an organisation chart of the current EWS procedures and a needs assessment	3	5
	Project Logframe proposal, with indicators, tracking tools and activity based budget	8	4
Dec-12	Meetings with stakeholders on proposed logframe and preparation for second mission	1	1
	Second mission - bilateral meetings and workshop (10-12 December)	3	3
	Drafting of project documentation	8	8
Jan-13	Meetings with stakeholders to discuss proposed outline of first draft, obtain additional information and finalize cost estimates		7
	Revisions to project documentation, including cost predictions, tracking tools, results frameworks and indicators	3	9
Feb-13	Meetings with stakeholders to discuss/review of first draft, obtain additional information and finalize cost estimates		5
	Revisions to project documentation, including cost predictions, tracking tools, results frameworks and indicators	3	5
Mar-13	Stakeholder meetings in preparation for third mission		5
	Third mission - validation meeting	3	3
	Revisions to project documentation, including cost predictions, tracking tools, results frameworks and indicators	1	4
Apr-13	Obtain co-financing letters and endorsement letters		5
	Finalization of project document	2	5
Jun-13	Final revisions to the project document based on GEF review	8	10
TOTAL		56	100

Annex 1: Inception Workshop Agenda

MINUTES FOR THE INCEPTION MEETING ON THE UNDP-GEF EARLY WARNING AND CLIMATE INFORMATION SYSTEM PROJECT HELD ON 25TH SEPTEMBER 2012 AT UNDP OFFICES, MAMBA POINT, MONROVIA.

Objective of the Workshop:

1. To have a common understanding of the project.
2. To identify on-going programs in the early warning system area and the impact the project will have.
3. To identify the key players of the project.



Strengthening Climate Information And Early Warning Systems For Climate Resilient Development And Adaptation To Climate Change

Inception Workshop

Agenda

Venue: Jordan Ryan Conference Room, Bryant Building, UNDP Mamba Point
Date: Tuesday, 25 September 2012

09.00 Registration
09.30 Welcome/Introduction of Workshop/ Moses Massah (UNDP CO)
09.35 Opening remarks: *UNDP CO/ Cleophas Torori – Deputy Resident Rep/Programme, EPA Executive Director – Madam Anyaa Vohiri*
09.50 Self Introduction and Expectations – All Participants

10.00 Breakfast

Session 1 – Project background and ongoing activities

10.30 Presentation by Department of Agriculture on extension services and responses to climate hazards – Mr. Edward Perry
10.45 Discussions

11.00 Presentation on Meteorological services on current state of observational infrastructure, forecasting floods and droughts and EWS – Liberia as a Case by Anthony Kpadeh – UNDP Local Consultant.

11.30 Introduction to EWS in the African context, gaps, needs and outline of the project aims and outcomes – Mike Jennings, UNDP International Consultant.

12.00 *Discussion*

12.30 Lunch

Session 2 – Review of project design and planning key activities

13:30 Plenary Discussion Session to identify Hydro-met technical requirements and EWS

for disaster management and long term planning as well as identify key vulnerable populations, areas at risk, private sector interests, innovative communication channels

(Component review - develop key activities to achieve outcomes, and determine milestones, discuss stakeholders and implementation partners)

16:00 Tea/coffee break

16:30 Workshop close

IW attendance register

Name	Organization	Position	Telephone	E-mail
Lawrence C Sackey	Liberia National Fire Service	Assist. Director/Administrator	0886244972	lawrencec.sackey@yahoo.com
Edward B Perry	MoA	Director/Ext	0886455838	ediboqe@yahoo.com
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Anyaa Vohiri	EPA	Executive Director	0886514013	vohiri@yahoo.com
Arthur Gar-Glahn	MoT	Director	0886565245	meteoliberia@yahoo.com
Charles K Mulbah	Cuttington University	VP for Research	0886543049	ekmulbah@yahoo.com
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Tolbert G Nyenswah	MoH&SW	Assistant Minister	0886558612	tgnyenswah74@yahoo.com
Anthony D Kpadeh	UNDP/MLM E	Local Consultant	0886543034	kpadehanthony@yahoo.com
Eugene Gar-Glahn	MoT	Research Officer	0886560932	egarglahn@yahoo.com

Annex 3: Agreements

3.1. Letter of Lead Responsible Party Agreement: Ministry of Planning and Economic affairs and Ministry of Transport



REPUBLIC OF LIBERIA
MINISTRY OF PLANNING & ECONOMIC AFFAIRS
P.O. BOX 10-9016
1000 MONROVIA 10, LIBERIA



Hon. Eugene Nagbe
Minister
Ministry of Transport

March 14, 2013

Dear Minister Nagbe:

I wish to present my compliment and further inform you that your Ministry has been accepted by our panel to accommodate or host the Early Warning System (EWS) Project which will be funded by the Green Environment Fund (GEF) through the UNDP.

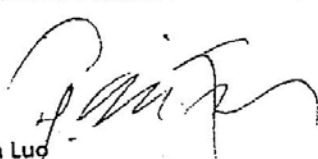
The Early Warning System (EWS) is a project within Liberia NAPA program that will provide meteorological observatory information to Liberia.

It can be recalled that couple of months ago, the Ministry of Planning and Economic Affairs was asked to intervene and mediate in an argument amongst few agencies of Government including your Ministry; the Ministry of Lands, Mines and Energy; and the Environment Protection Agency, about the entity that has the qualification to host the project.

Hence, we have thoroughly investigated each entity's capacity and authority and thus found that the Ministry of Transport deserves the opportunity to host the project (EWS); reasons being that your Ministry has the legal authority as enshrined in its legislative enactment to host and conduct meteorological service in Liberia.

Therefore, we ask all other parties and partners to cooperate with the Ministry of Transport in order to ensure the success of the Early Warning System (EWS) project.

Sincerely,


D. Harrison Luc
Acting Deputy Minister
Department of Sectoral and Regional Planning
Ministry of Planning and Economic Affairs

Cc: United Nations Development Programme (UNDP)
Environmental Protection Agency (EPA)
Ministry of Lands, Mines and Energy (MLME)

DIRECTOR OF MET
FOR YOUR INFO
[Signature]
RECEIVED
SIGNED: *[Signature]*
DATE: *March 18, 2013*
9:50 AM

3.2. Co-financing letter: Government of Liberia (GoL), Ministry of Transport (MoT) – Meteorology Department budget allocation; and MetAgri Project



Office of the Minister

REPUBLIC OF LIBERIA
MINISTRY OF TRANSPORT
PAEKER BUILDING
BROAD STREET
MONROVIA, LIBERIA



Ref.: STV/M-1/MOT/RL/033/'13

3 June 2013

Mr. Dominic Sam
Country Director
United Nations Development Programme – Liberia
Simpson Building
Sekou Toure Avenue, Mamba Point
1000 Monrovia

Subject: Ministry of Transport/Meteorological Division co-financing commitment to the LDCF project entitled “Strengthening Liberia’s capacity to provide climate information and services to enhance climate resilient development and adaptation to climate change”.

The activities of the Meteorological Division under the Ministry of Transport are well-aligned with and support the above-titled GEF LDCF project which intends to strengthen the climate monitoring capabilities, early warning systems and available information for responding to climate shocks and planning adaptation to climate change in Liberia.

The Meteorological Division is mandated to maintain meteorological services and provide weather and climate information and products. The annual government budget to carry out these activities is US\$ 64,480.00.

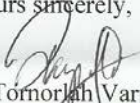
The Meteorological Division is also a joint implementing partner the MetAgri project, funded by the World Meteorological Organization (WMO). The other implementing partner is the UN Food and Agriculture Organization and Ministry of Agriculture. The project is providing training on weather and climate risk management to farmers through a series of roving seminars aimed at building capacity and self-reliance. The budget for this project for the period ending in 2014 is US\$ 691,200.00.

A handwritten signature in black ink, appearing to be 'D. Sam'.

This letter serves to confirm the Ministry of Transport/Meteorological Division's commitment of the following as co-financing to the GEF LDCF project for the period 2014-2017: i) US\$ 257,920.00 from its annual budget; and ii) US\$ 691,200.00 from the MetAgri project. The Ministry of Transport will also collaborate with other related ministries, including the Ministry of Agriculture and the Ministry of Lands, Mines and Energy, to secure a facility for the proposed National Meteorological Centre, to be established over the duration of the LDCF project. This collaboration will provide mutual benefits for meteorological activities in Liberia and for the LDCF project.

We look forward to your continued cooperation.

Yours sincerely,


S. Tornorlan Varpilah
MINISTER

3.3. Combined co-financing letter, signed by GEF Focal Point within EPA.



REPUBLIC OF LIBERIA
ENVIRONMENT PROTECTION AGENCY

P.O. Box 4024
 4th Street Sinkor, Tubman Boulevard,
 1000 Monrovia, 10 Liberia



ED/EPA-01/0723/13/RL

Ms. Adriana Dinu
 Officer-in-Charge and Deputy Executive Coordinator
 UNDP - Global Environment Facility
 United Nations Development Programme
 304 East 45th Street, 9th Floor
 New York, NY 10017 USA

21 June, 2013

Dear Ms Dinu,

Co-financing commitment to the LDCF project entitled “Strengthening Liberia’s capacity to provide climate information and services to enhance climate resilient development and adaptation to climate change”.

I have the honor to present my compliments and wish to submit to you, activities of the Government of Liberia Ministries/Agencies of the baseline projects listed below are well-aligned and support the above-titled GEF LDCF project which intends to strengthen the climate monitoring capabilities, early warning systems and available information for responding to climate shocks and planning adaptation to climate change in Liberia.

Co-financing sources	US\$
Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation – funded by Norwegian Water Resources and Energy Directorate (NVE) and implemented through Ministry of Lands, Mines and Energy	2,690,000.00
Agriculture Sector Rehabilitation Programme – funded by the African Development Bank and implemented through Ministry of Agriculture	2,313,072.00
Government of Liberia, Hydrological Services (within MLME) budget allocation (annual budget US\$ 276,877 x4 years)	1,107,508.00
Government of Liberia, National Disaster Relief Commission (within MIA) budget allocation (annual budget US\$ 50,000 x4 years)	200,000.00
Government of Liberia, Environmental Protection Agency budget allocation (annual budget US\$ 1,100,000 x4 years)	4,400,000.00
TOTAL	10,710,580.00

This letter serves to confirm the Government of Liberia’s commitment to providing the above total of US\$ 10,710,580 as co-financing to the GEF LDCF project for the period 2014-2017. This collaboration will provide mutual benefits for Ministries/Departments and baseline projects shown in the table above, as well as for the LDCF project.

Please accept the assurances of my highest esteem and your consideration as we work together for global environmental sustainability.

Kind regards,

ANYAA VOHIRI
 EXECUTIVE DIRECTOR/CEO
 GEF/OPERATION FOCAL POINT

Mobile: +231 886-656665/886-518635

E-mail: romell.admitter@gmail.com

3.4. Co-financing letter: UNDP Country Programme.

United Nations Development Programme



LIBERIA

16 July 2013

Letter No. : L#087
File Reference: ORG/122/GEN

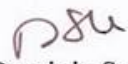
Dear: Mr. Glemarec,

Re: GEF LDCF Project “Strengthening Liberia’s Capability to Provide Climate Information and Services to Enhance Climate Resilient Development and Adaptation to Climate Change.

In line with the agreed work programme and project design documents, the UNDP Country programme is to provide direct financial support to the above-mentioned project.

The UNDP contribution will be part of the overall project budget and will provide support to activities across all objectives.

UNDP will contribute US\$ 200,000.00 in cash over the four years of the project life span.


Dominic Sam
Country Director

Mr. Yannick Glemarec
Executive Coordinator
UNDP/Global Environment Facility
UNDP HQ, New York, USA

3.5. Letter of Agreement: UNDP Country Office and Ministry of Transport

To be added

DPCs to be included in LoA:

Estimated year	UNIT PRICE /USD	Quantity	Total Amount
Staff Recruitment: Selection	\$813.53	5	\$4067.65
Recurring Personnel Management	\$717.71	5	\$3588.55
Staff Benefits Management	\$178.39	5	\$891.95
Consultant Recruitment	\$295.74	1	\$295.74
Procurement Process	\$628.11	5	\$3140.55
Ticket Request	\$35.78	10	\$357.80
Travel Authorization	\$29.22	8	\$233.76
Visa Requests	\$32.21	5	\$161.05
Vendor Profile Only (Atlas)	\$23.12	10	\$231.20
Shipment Arrangements	\$74.39	5	\$371.95
Vehicle Registration	\$33.25	3	\$99.75
Payments	\$22.11	15	\$331.65
Custom Clearance	\$66.95	5	\$334.75
Total:			\$14106.35

Estimated year	UNIT PRICE /USD	Quantity	Total Amount
Extension, promotion, entitlements	\$215.31	5	\$1076.55
Recurring Personnel Management	\$717.71	5	\$3588.55
Staff Benefits Management	\$178.39	5	\$891.95
Consultant Recruitment	\$295.74	1	\$295.74
Procurement Process	\$628.11	10	\$6281.10
Ticket Request	\$35.78	4	\$143.12
Travel Authorization	\$29.22	6	\$175.32
Visa Requests	\$32.21	3	\$96.63
Vendor Profile Only (Atlas)	\$23.12	3	\$69.36
Payments	\$22.11	12	\$265.32
Shipment Arrangements	\$74.39	5	\$371.95
Custom Clearance	\$66.95	5	\$334.75
Total:			\$13190.34

Estimated year	UNIT PRICE /USD	Quantity	Total Amount
Extension, promotion, entitlements	\$215.31	5	\$1076.55
Recurring Personnel Management	\$717.71	5	\$3588.55
Staff Benefits Management	\$178.39	5	\$891.95
Consultant Recruitment	\$295.74	1	\$295.74
Procurement Process	\$628.11	10	\$6281.10
Ticket Request	\$35.78	5	\$178.90
Travel Authorization	\$29.22	6	\$175.32
Visa Requests	\$32.21	6	\$193.26
Shipment Arrangements	\$74.39	10	\$743.90
Payments	\$22.11	16	\$353.76
Custom Clearance	\$66.95	10	\$669.50
Total:			\$14148.53

year%			
Description/Details	UNIT PRICE /USD	Quantity))	Total Amount
Extension,promotion,entitlements	\$215.31	5	\$1076.55
Recurring%Personnel%Management	\$717.71	5	\$3588.55
Staff%benefits%management	\$178.39	5	\$891.95
Consultant%recruitment	\$295.74	1	\$295.74
Procurement%process	\$628.11	3	\$1884.33
Ticket%request	\$35.78	2	\$71.56
Travel%authorization	\$29.22	3	\$87.66
Shipment%arrangements	\$74.39	10	\$743.90
Payments	\$22.11	8	\$176.88
Disposal%of%equipment	\$328.89	8	\$2631.12
Total:			\$11448.24
Total			\$53593.46

Annex 4: Project Risk Log

Project Title: Strengthening Liberia's capability to provide climate information and services to enhance climate resilient development and adaptation to climate change.	GEF Project ID:	00074351	Date: September 2013
	GEF Agency Project ID:	00086796	

#	Description of the risk	Potential consequence	Countermeasures/ Management Response	Type (Risk category)	Probability & Impact (1-5)	Owner	Submitted, updated by	Last Update	Status
1	Human, technical capacity within MoT particularly, as well as MLME, NDRC, MoA and EPA, including within extension service providers and decentralized offices, is insufficient to effectively implement the LDCF project.	Delayed implementation of the LDCF project; limited achievement of project outcomes.	LDCF funds will be dedicated to strengthening institutional and technical capacity for planning, designing and implementing the activities required to achieve the LDCF project outcomes. In particular, the capacity of technicians within MoT, MLME, NDRC, MoA and EPA is developed through training opportunities provided through the LDCF project.	Political and organizational	P = 3 I = 3				
2	Poor coordination between IP (EPA), RPs (MoT, MLME, NDRC, MoA and EPA) and UNDP CO results in institutional failure, compartmentalized progress and delayed implementation of the LDCF project.	Delayed implementation of the LDCF project; limited achievement of project outcomes.	Clear Project Management arrangements will be established, and validated by IP and RPs. This will include the implementation of a project organisation structure (see Section 5) which will comprise representation of EPA, MoT and MLME on the Project Board. These three institutions will steer the LDCF project and ensure that a coordinated approach	Political and organizational	P = 3 I = 3				

#	Description of the risk	Potential consequence	Countermeasures/ Management Response	Type (Risk category)	Probability & Impact (1-5)	Owner	Submitted, updated by	Last Update	Status
			is adopted.						
3	Insufficient institutional support and political commitments from the GoL leads to a decrease in the political will ensured during project design, ultimately destabilizing the LDCF project.	Sustainability of LDCF project endangered.	Continuous lobbying and sensitization of the key government officials will be undertaken based on evidence from the pilot sites to secure cooperation and commitment. Awareness-raising activities will be undertaken among decision-makers and strategic political focal points early in the project implementation phase i.e. before and at the inception workshop. In addition, support will be given to government to organise annual consultations on project progress to maintain government ownership and interest in the project.	Political and strategic	P = 2 I = 4				
4	The slow pace of policy modification means that identified development frameworks do not integrate climate change in a timely fashion.	Limited integration of the benefits of the LDCF project into identified development frameworks; limited achievement of project outcomes.	The LDCF project team, in collaboration with UNDP CO, will identify and work with champions for policy change in Liberia. Continuous lobbying and sensitization of the policy makers will be undertaken based on evidence from the pilot sites to secure cooperation and	Political and strategic	P = 3 I = 3				

#	Description of the risk	Potential consequence	Countermeasures/ Management Response	Type (Risk category)	Probability & Impact (1-5)	Owner	Submitted, updated by	Last Update	Status
			commitment. Research-based evidence and systematic feasibility assessment reports will be assembled to enhance lobbying capacity and speed up policy modification.						
5	Delayed implementation of baseline projects by the government and donors negatively affects LDCF project outcomes.	Limited integration of complementary, principally hydrological data into the climate monitoring framework for creating and disseminating information, established through the LDCF project.	The PM will work closely with the relevant persons responsible for the baseline projects to synergise activities and assist in facilitating the implementation of baseline projects where possible.	Political and operational	P = 2 I = 2				
6	Installed hydro-meteorological equipment fails because it is vandalised or not maintained.	Coverage and frequency of transmission of climate data is reduced, resulting in limited achievement of LDCF project outcomes.	Awareness raising activities will be undertaken in target communities to highlight the importance of the installed equipment. In addition, the equipment will be housed within a secure fence.	Political and operational	P = 3 I = 4				
7	Climate shocks occurring during the design and implementation phase of the LDCF project result in disruptions to installed equipment and severely affect communities, prior to the EWSs being established.	Coverage and frequency of transmission of climate data is reduced, resulting in limited achievement of LDCF project outcomes.	Disaster mitigation and response activities will be prioritized at the target communities whilst the EWS is being established.	Environmental	P = 2 I = 3				
8	Local information technology and telecommunications	Frequency of transmission of available climate data is reduced,	The LDCF project has been designed in accordance	Operational	P = 3				

#	Description of the risk	Potential consequence	Countermeasures/ Management Response	Type (Risk category)	Probability & Impact (1-5)	Owner	Submitted, updated by	Last Update	Status
	infrastructure restricts the transfer of data from installed equipment to necessary recipients, and restricts communication amongst key role players and end-users.	as is co-ordination between IP, RPs and data end-users, resulting in limited achievement of LDCF project outcomes.	with local conditions, taking, where applicable, the latest available international technology into account.		I = 4				
9	Procurement and installation of hydro-meteorological equipment, including hardware and software, is delayed because of complications with the release of funds and/or national procurement procedures.	Climate data is not collected, resulting in limited achievement of LDCF project outcomes.	Effective administrative planning will be undertaken, with support from UNDP CO, which will include procuring equipment at an early stage in the project implementation phase.	Political and strategic	P = 2 I = 4				
10	Lack of commitment from communities where EWS are established undermines the effectiveness of the LDCF project demonstrations.	Community-based EWSs are ineffective, as information is not used as intended, resulting in limited achievement of LDCF project outcomes.	The LDCF project will avoid a 'top down' approach and seek to create community ownership of the EWSs through community training and encouraging participation in project activities.	Political and operational	P = 1 I = 4				

Annex 5: Capacity Assessment Scorecard

PROJECT: Strengthening Liberia's capability to provide climate information and services to enhance climate resilient development and adaptation to climate change

This capacity assessment scorecard will be adapted and applied to:

1. Increased capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends.
2. Efficient and effective use of tailored climate, environmental and socio-economic data to produce appropriate information which can be communicated to government entities and communities to enable informed decision-making.
3. Increased awareness in government, private sector and local communities of the major risks associated with climate change, and use of available information when formulating development policies and strategies.

The scorecard is arranged according to functional capacities for agencies to both monitor and forecast climate-related hazard information, share and package such information with relevant agencies, disseminate both warnings and advisories based on such information and provide appropriate legal and procedural frameworks.

To establish the baseline capacity stakeholders are asked to score their understanding of the existing capacity, where they would like to move the capacity to in the project timeframe, and how they would prioritize each capacity.

The scoring can be adapted and locally defined. The standard scale is:

1. No evidence of capacity
2. Anecdotal evidence of capacity
3. Partially developed capacity
4. Widespread, but not comprehensive capacity
5. Fully developed capacity

CAPACITY OF AGENCIES TO PRODUCE INFORMATION							
Capacity Indicator	Baseline: Level of Existing Capacity					Target level of Capacity in the project timeframe	Priority of Capacity (h/m/l)
	1	2	3	4	5		
Capacity to service the observational infrastructure e.g. hydrological and meteorological stations, radar, upper air monitoring, satellite technology etc.	1					3	H
Capacity to generate weather/climate forecasts e.g. Numerical weather prediction (1-7 days), seasonal forecasts etc.	1					3	M
Capacity to utilize internationally and regionally available monitoring and forecast products		2				4	M
Capacity to send local observations to international centres		2				4	M
Capacity to record and use national/local observations for monitoring current meteorological and hydrological hazards in a timely manner	1					3	H
Capacity to record and use national/local observations to forecast future meteorological and hydrological hazards in a timely manner	1					3	H
Capacity to utilise satellite information for climate and environmental monitoring.		2				4	H
Capacity to form partnerships with key stakeholders to ensure effective delivery of agricultural/hydrological support services		2				4	H
Capacity to be able to monitor the cost of operations and maintenance of current equipment	1					3	H
Capacity to assess and understand key stakeholder's needs for climate information		2				4	H
Capacity to enable a free flow of information (e.g. generate, and provide access to data and information to partners and other users)	1					4	H
Capacity to plan cost recovery mechanisms	1					4	H
Capacity to sell products to the private sector	1					3	H

CAPACITY OF AGENCIES TO PACKAGE INFORMATION							
Capacity Indicator	Baseline: Level of Existing Capacity					Target level of Capacity in the project timeframe	Priority of Capacity (h/m/l)
	1	2	3	4	5		
Capacity to fully understand impacts of climate variability and change on food security (e.g. on fisheries , crop production, livestock, etc)			3			4	H
Capacity to fully understand impacts of climate variability and change on water resources and flooding (e.g. dam management and flood risk modelling)			3			4	H
Capacity to combine climate monitoring and forecast information with current agricultural assessments to provide agriculturally specific advisories	1					3	H
Capacity to combine climate monitoring and forecast information with current hydrological assessments to provide hydrologically specific advisories	1					3	H
Capacity to partner with national government structures and academic institutions to develop tailored, sectorally specific information and packaged products	1					4	H
Capacity to feed climate information into policy briefs and long-term strategies	1					4	H
Capacity to analyze relevant data/information for policy strategies such as agricultural production, infrastructure development, credit, insurance and marketing			3			4	M
Capacity to feed climate information, forecasts and tailored information to disaster risk management agencies and frameworks	1					4	H
Capacity of disaster risk management agencies to assess information in a timely manner		2				4	H

CAPACITY OF AGENCIES TO DISSEMINATE INFORMATION							
Capacity Indicator	Baseline: Level of Existing Capacity					Target level of Capacity in the project timeframe	Priority of Capacity (h/m/l)
	1	2	3	4	5		
Capacity to disseminate warnings and advisories in local languages		2				4	H
Capacity to disseminate warnings and advisories related to existing indigenous practices and technologies.		2				4	H
Capacity to disseminate alerts in a wide range of media (e.g., privileged telephone communication systems, CB radios, SMS alerts etc.)		2				4	H
Capacity for district and community focal points to understand the content of warnings and advisories	1					3	H
Capacity to establish and sustain mechanisms to raise awareness on the impacts of climate shocks and long-term change		2				4	M
Capacity to coordinate with government agencies to respond to warnings		2				4	H
Capacity to coordinate with CSOs to respond to warnings		2				4	M
Capacity to disseminate warnings and advisories to the district level or community focal points	1					4	H
Capacity of local populations to understand climate change and it's long term effects	1					4	H
Capacity to receive feedback on the usefulness of alerts from affected communities	1					3	H
CAPACITY OF LEGISLATIVE AND GOVERNANCE FRAMEWORK							
Capacity Indicator	Baseline: Level of Existing Capacity					Target level of Capacity in the project timeframe	Priority of Capacity (h/m/l)
	1	2	3	4	5		
Capacity for national coordination of emergency response activities		2				4	H
Capacity of standard operating procedures to guide the production, dissemination and response to warnings	1					4	H
Capacity of legislative system to mandate designated authorities e.g. which authority will disseminate warnings, which will produce warnings etc.		2				4	H
Capacity of multiple agencies to contribute to the issuing of warnings through national structures e.g. disaster management committees etc.		2				4	H

BASELINE: 57; TARGET: 134

Annex 6: Capacity assessment Implementing Partner of the LDCF project – macro and micro (HACT) assessment.

A macro and micro (HACT) assessment of MoT is currently underway.

Annex 7: Terms of Reference

7.1. Terms of Reference for Project Manager

A full-time **Project Manager** (PM) will be contracted for day-to-day management of the EWS project. The management role of the PM will be to ensure that the project is managed in a transparent and effective manner, and that it is in line with all budget and work plans in accordance with guidelines from both GEF and UNDP. The PM will liaise with representatives of the Project Board (PB) including the Implementing Partner (Environmental Protection Agency - EPA), Senior Beneficiaries (Ministry of Lands, Mines and Energy [MLME] – Hydrological Services, Ministry of Transport [MoT] – Meteorology Department and Ministry of Internal Affairs [MIA]– National Disaster Relief Commission [NDRC]), the Senior Supplier (UNDP) and baseline national project focal points. The PM will provide technical and implementation support to participating stakeholders including *inter alia* MoT, MLME, NDCR, Ministry of Agriculture (MoA), Liberia Maritime Authority (LMA), National Ports Authority (NPA) and Ministry of Health (MoH) as well as relevant Civil Society Organisations (CSOs) and private sector.

Responsibilities

The PM will be evaluated in accordance with the successful implementation of project activities.

The responsibilities of the PM will include:

- Oversee and manage project implementation, monitor work progress, and ensure timely delivery of outputs.
- Report to members of the Project Board (PB), including UNDP, GEF, EPA, MoT, MLME and NDRC regarding project progress.
- Develop and facilitate implementation of a comprehensive monitoring and reporting system.
- Ensure timely preparation of detailed annual work plans and budgets for by PB.
- Assist in the identification, selection and recruitment of staff, consultants and other experts as required.
- Supervise, coordinate and facilitate the work of the Administrative and Financial Officer (AFO) and contracted consultants.
- Control expenditures and assure adequate management of resources.
- Establish linkages and networks with on-going activities by other government and non-government agencies.
- Establish and maintain linkages with regional initiatives and institutions in order to realise cost-effective and efficient opportunities for training, information sharing and procurement.
- Provide input to management and technical reports and other documents as described in the M&E plan for the overall project. Reports should contain assessments of progress in implementing activities, including reasons for delays, if any, and recommendations on necessary improvements.
- Inform the PB, immediately, of any issue or risk which might jeopardise the success of the project.
- Liaise and coordinate with the UNDP on a regular basis and inform UNDP of any delays or difficulties faced during implementation.

Qualifications

- Master's degree in a relevant field such as natural resource management, agricultural development, climatology/meteorology, water resources management, environmental sciences, disaster management.
- A minimum of 10 years relevant work experience in climate change adaptation and natural resource management; disaster management and/or operational early warning systems, including implementation at national and decentralized levels.
- Demonstrated knowledge and experience in climate change adaptation, early warning systems, and the monitoring and forecasting of climate and weather.
- Experience in the public participation development process associated with the hydro-meteorology, climate change, disaster risk management and natural resources sectors is an asset.

- Experience in working and collaborating with governments is an asset.
- Excellent knowledge of English, including writing and communication skills, with analytic capacity and ability to synthesise project outputs and relevant findings for the preparation of quality project reports.
- Skill in negotiating effectively in sensitive situations

Reporting

The PM will report to the PB who will subsequently report to the relevant head of their respective organisations. The PM will work closely with the PB as well as provide implementation support to project personnel such as the AFO and TAs. The PM is responsible for ensuring regular reporting of information on progress and performance in the implementation of the project, including at quarterly and annual intervals as described in the Monitoring Framework and Evaluation.

7.2. Terms of Reference for Administrative and Financial Officer

Administrative and financial support for the project will be provided by an **Administrative and Financial Officer (AFO)** based in the PB. The AFO will report to the PM who will subsequently report to the PB.

Responsibilities

- Standardise the finance and accounting systems of the project while maintaining compatibility with government, GEF and UNDP financial accounting procedures.
- Prepare revisions of the budgets and assist in the preparation of the annual work plans.
- Comply and verify budget and accounting data by researching files, calculating costs, and estimating anticipated expenditures from readily available information sources.
- Prepare status reports, progress reports and other financial reports.
- Process all types of payments requests for settlement purposes including quarterly advances to the partners upon joint review.
- Prepare periodic accounting records by recording receipts, disbursements (ledgers, cash books, vouchers, etc.) and reconciling data for recurring or financial special reports and assist in preparation of annual procurement plans.
- Undertake project financial closure formalities including submission of terminal reports, transfer and disposal of equipment, processing of semi-final revisions, and support professional staff in preparing the terminal assessment reports.
- Assist in the timely issuance of contracts and assurance of other eligible entitlements of the project personnel, experts, and consultants by preparing annual recruitment plans.

Qualifications and competencies

- An appropriate qualification in accounting, book-keeping, administration, office management.
- Demonstrable experience in management and administration of multilateral funding.
- Demonstrable experience and familiarity with administration of funds using UNDP, GEF and government accounting procedures.
- Excellent spoken and written English, including report-writing and communication skills.

7.3. Terms of Reference for Project Steering Committee

181.

182. The **Project Board** (also called the **Project Steering Committee**) will be responsible for making the management decisions of the LDCF project, and will guide the Project Manager (PM). The PB plays a critical role in monitoring progress of implementation and ensuring that recommendations from annual and mid-term evaluations are adopted for performance improvement, ensuring accountability and adoption of lessons learnt. It ensures that required resources are committed and arbitrates on any conflicts within the project or negotiates a solution to any problems with external bodies. In addition, it approves the appointment and responsibilities of the PM. Based on the approved Annual Work Plan, the PB can also consider and approve the quarterly plans (if applicable) and also approve any essential deviations from the original plans.

183.

184. In order to ensure UNDP's ultimate accountability for the project results, PB decisions will be made in accordance to standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In cases where consensus cannot be reached within the PB, the final decision shall rest with UNDP in its role as the Senior Supplier.

185. Potential members of the PB are reviewed and recommended for approval during the PAC meeting. Representatives of other stakeholders can be included in the PB as appropriate. The PB contains three distinct roles, including:

- **An Executive** representing the project ownership to chair the group. The Executive for the LDCF project will be the Director of the Environmental Protection Agency (EPA).
- **Senior Supplier** representing the interests of the parties concerned which provide funding for specific cost sharing projects and/or technical expertise to the project. The Senior Supplier's primary function within the Board is to provide guidance regarding the technical feasibility of the project. The Senior Supplier of the LDCF project is UNDP. In order to ensure UNDP's ultimate accountability for the project results, Project Board decisions will be made in accordance to standards that shall ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. In cases where consensus cannot be reached within the Project Board, the final decision shall rest with UNDP in its role as the Senior Supplier.
- **Senior Beneficiary/ies** representing the interests of those who will ultimately benefit from the project, i.e. sector and communities vulnerable to the impacts of climate change. The Senior Beneficiaries' primary function within the Board is to ensure the realization of project results from the perspective of project beneficiaries. The Senior Beneficiaries for the LDCF project will be the Director of the Meteorology Department with Ministry of Transport (MoT); Director of Hydrological Services within the Ministry of Lands, Mines and Energy (MLME); and the Director of the National Disaster Relief Commission (NDRC) within the Ministry of Internal Affairs (MIA).

The PB will be supported by the following roles:

- The **Project Assurance** role supports the Project Board Executive by carrying out objective and independent project oversight and monitoring functions. UNDP-GEF and the UNDP Liberia CO will provide Project Assurance to the Project Board for the LDCF project.
- The **Project Manager** has the authority to run the project on a day-to-day basis within the constraints laid down by the Project Board. The Project Manager's prime responsibility is to ensure that the project produces the results specified in the Project Document, to the required standard of quality and within the specified constraints of time and cost. The Project Manager will be selected by the Project Board, and will have skills relevant to the project as a whole (i.e., not only meteorology). The Project Manager will be based within the MoT (Meteorological Division) until the National Meteorological Agency (NMA) is established, and thereafter will be based within the NMA.
- The **Project Support** role provides project administration, management and technical support to the Project Manager. Project Support will be provided by an Administrative/Financial Assistant

and Project Driver recruited through the LDCF project. The UNDP CO will provide further Project Support through a set of support services for the activities of the project.

7.4. Terms of Reference for other Consultants

Technical support for specialised tasks that cannot be undertaken by government staff, PM, AFO or TAs will be provided by consultants. International technical assistance will be sourced for specialised tasks where insufficient capacity is available among government staff or national consultants. Descriptions of consultant responsibilities are included in the budget notes and in the Project Document. The selection of international consultants will be guided by UNDP in conjunction with the PM and PB. Consultants will be hired to collect data, provide advice and monitor interventions.

The international consultants required by the LDCF project will include an international expert in Monitoring and Evaluation (M&E). Local expertise will be sourced where possible in place of international expertise to strengthen in-country capacity. National consultants will be hired by the LDCF project to collect data, provide advice and monitor interventions. The national consultants required by the project will include experts in hydrology; meteorology; adaptation, early warning systems and disaster management; climate change risk modelling and vulnerability assessment and mapping; GIS hazard mapping; agriculture; agricultural insurance; health; social and natural resource economics; institutional development and coordination; policy and strategy; public-private sector relations; and communications and ICT.

The international and national consultants must be experts in their field with an appropriate M.Sc. degree and a minimum of 5 years' experience or an appropriate bachelor's degree and 10 years' experience in their field of expertise. They should also have experience in technical capacity building and information development. The international consultants should have good knowledge and understanding of climate change threats in Liberia and the need for an improved hydro-meteorological monitoring and forecasting system and EWSs. Fluency in spoken and written English and excellent report-writing skills are important criteria for all consultants.

The hiring procedures to be followed for both international and national consultants must include a transparent and competitive process based on standard UNDP procedures.

Annex 8: UNDP Environmental and Social Screening results

See separate file.

Annex 9: Response report on council comments

United States Government Comments	
<p>Include detailed activities related to production of climate/hydrological information, communications and sustaining this work and retaining expertise, particularly under component 2.</p>	<p>Under Component 1, the production of climate/hydrological information will be enhanced through targeted investments in Liberia's meteorological and hydro-meteorological observation network and associated infrastructure, such as modern software and workstations. These workstations will provide the platform for MoT meteorologists to: i) visualize meteorological, environmental and oceanographic data; ii) produce standard and customized < 1 day severe weather nowcasts, 1-10 day weather forecasts, 1-6 month seasonal forecasts and > 6 month climate forecasts; and iii) edit and package weather and climate data and information into a suitable format for user-agencies and end-users.</p> <p>Under Component 2, the meteorological, hydro-meteorological and satellite-derived information produced through Component 1 will be analysed in conjunction with existing socio-economic information to assess current and predicted climate-related hazards. The end product of this will be a suite of information packages that convey early warning messages in an appropriate format for specific targeted end-users. Effective channels of communication, including mobile phones, radio and the traditional 'word of mouth' system will be identified and tested for different products and end-users. Feedback from end-users and lessons from pilot activities will be used to improve and develop the packages for pilot activities and to inform the development of other EWSs.</p> <p>A national weather and climate information and early warning system communication and coordination strategy will be developed to coordinate decision-makers in government, private sector, civil society and development partners in the communication of weather and climate alerts to vulnerable sectors and local communities. SOPs (including protocols and inter-ministerial agreements) for disseminating weather and climate information and early warnings will be developed. However, the dissemination of climate information will be distinct from the dissemination of early warnings, as directed by the mandates of the different institutions involved. The SOP will be complemented by a dissemination toolbox, which will include a trainer manual on the use of a range of national and local gender sensitive media for disseminating weather and climate information, as well as early warnings, to end-users.</p> <p>During the implementation phase, efforts will be made to ensure that expertise is retained by signing contracts with trainees binding them to remain in the institution for a specified period after the training program. Public personnel who benefit from training activities will be required to sign an agreement specifying a minimum term of service in order to retain skilled staff and ensure sustained benefits of capacity-building and training investments. A 'train the trainers' approach will be used to maximize the impact of LDCF funds. Lessons learned as the equipment is installed will be used to inform future installations, and capacity developed in government staff will be used to build in-house capacity of fellow staff members through a 'train the trainers' approach. Additionally agreements will be established with individuals trained to ensure that they remain in the relevant government departments for the minimum period after receiving the training. All capacity that is developed will also be linked to a deliverable, such as the production of maps or assessments, which will contribute to the implementation of the LDCF project.</p>
<p>Maintain close relationships and establish partnerships with relevant organizations working on climate and hydro-</p>	<p>Efforts to ensure that close relationships are established/maintained have been at the center of the PPG process. Lessons learned by other partners involved in similar activities have been reviewed and incorporated in the project proposal. The project aims to ensure partnerships are developed or strengthened with ACMAD, Africa Climate Policy Center and others. Partnerships will be formed through MoUs and formalized agreements. LDCF project activities will be aligned with the WMO's Global Framework Climate Services (GFCS) initiative. It is essential to build a strong synergy with the GFCS because this program focuses on Development of a framework of regional and national climate services, Rehabilitation and upgrading of the observation network, Demonstration projects focused on development and use of</p>

<p>meteorological services in the project region and make use of lessons learned from related efforts. This will strengthen capacity and connectivity within the broader region.</p>	<p>customised climate information products e.g. in the health sector.</p> <p>Communication strategies developed by the NDRC will include liaising with meteorological and hydro-meteorological centres in neighbouring countries – this will be important for cross-border flooding warnings and sharing information on cross border transport routes. The Regional Maritime Rescue Co-ordination Centre, under the LMA, will share coastal information with neighbouring countries.</p>
<p>Describe how the project will ensure that the production of information is driven by the needs of the users and delivered through appropriate user-friendly channels</p>	<p>Multi-stakeholder consultations were conducted to inform the design of the LDCF project. These included: i) an initial consultation mission (24-28 September 2012), including an inception workshop on 25 September 2012; ii) a series of stakeholder consultations from 14-18 January 2013; and iii) a validation mission and series of consultations (13-23 May 2013), including a validation workshop on 22 May 2013. Workshops were attended by national operational focal points and government departments responsible for generating and using climate information and early warning systems, as well as a number of development partners, NGOs and civil society organisations. Bi-lateral stakeholder consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi-lateral and multi-lateral organisations, government departments and NGOs, as well as private sector partners. All consultations were conducted by the international consultant and/or the national consultant with support from the UNDP Country Office (CO). The Implementing Partner (IP) and Responsible Partners (RPs) played a considerable role in determining the activities for the LDCF project and were involved in most of the consultations. Furthermore, the UNFCCC operational focal point was involved in the project design through emails and consultations.</p> <p>186.</p> <p>187. The communication channels developed in Output 2.2 will be implemented and tested in target districts of two counties in Liberia. An agricultural application of the EWS will be implemented in target districts in one of Grand Gedeh or Bong county, and a coastal application in target districts in one of Grand Cape Mount, Montserrado or Grand Bassa county. The former counties are those included in the LDCF agriculture project, where measures for increasing climate resilience of local agriculture are being tested, and the latter are those included in the LDCF costal project, where adaptation measures to protect against sea level rise, storms, sea-surges and costal flooding are being tested. The community sites where the EWSs will be implemented will be decided by the time of the LDCF project Inception Workshop – the decision will be made in collaboration with the LDCF agriculture and coastal project managers, as well as through a rapid vulnerability assessment of the districts. Communities in the selected districts will be engaged and trained to respond effectively to the weather and climate early warnings. This will ensure that indigenous knowledge is incorporated and that the communities are able to respond to the advisories issued. The range of communication channels developed through Output 2.1 will be tested, including the development of a two-way SMS colour-coded alert system for agriculture stress advisories, and costal storm/flooding warnings, as appropriate. The two-way system will provide: i) alerts to local communities at risk; ii) a communication channel to disseminate feedback on the usefulness and impact of the alert received as well as the current status of the particular weather or climate extreme being experienced. Furthermore, implementation simulation exercises for enhanced flood, storm and coastal surge preparedness in the selected districts will be conducted to complement the SMS-alert system and will be guided by the SoPs.</p> <p>188.</p> <p>Under output 3.1 and 3.2, appropriate guidelines and responses will be developed based on the identification of climate change hotspots. Scenarios and adaptation options can then be compared with other regions to identify the most appropriate activities to build climate change resilience. This information will be used by decision-makers, technical staff from relevant institutions, NGOs and farmers to explore the set of possible adaptation interventions for most vulnerable sectors and local communities, based on the ‘hotspots’ identified through Output 3.1.</p>

	<p>Identified options will need to be screened to ensure compatibility with national development frameworks and sectoral policies.</p>
<p>Include clear explanations of how local communities and women will be involved in shaping the project and describe how the project will benefit vulnerable populations and individuals.</p>	<p>The project preparation phase has focused on gender-sensitive approaches and has ensured and clearly explained in the project document how women and vulnerable populations will be involved in shaping the type of information needed. Women representatives participated in the national consultations, and processes to include local communities in the design of early warning products have been included in the project document.</p> <p>SOPs (including protocols and inter-ministerial agreements) for disseminating weather and climate information and early warnings will be complemented by a dissemination toolbox, which will include a trainer manual on the use of a range of national and local gender sensitive media for disseminating weather and climate information, as well as early warnings, to end-users.</p> <p>189.</p> <p>190. The NDRC will establish partnerships with local radio stations, television broadcasters, mobile phone service providers and county/district representatives in order to establish the most appropriate channels to communicate with communities in different districts across Liberia. A wide range of national communication channels will consequently be established. A mechanism to receive and evaluate feedback from end-users will also be established in order to allow the efficacy of the various communications channels and early warning information to be evaluated.</p> <p>The capacity of communities to respond to warning will be developed through undertaking an awareness campaign to provide information on how to react once warnings are issued. Superintendents from the 15 county and commissioners from the 68 districts will be trained through a series of county-level workshops. This will include the generation of pamphlets and manuals in local languages, informing community leaders on how to instruct communities to react once warnings are received.</p> <p>To ensure an effective early warning system is developed that includes all vulnerable persons in a community, project demonstration sites will be selected based on gender-sensitive assessments. This will be used to develop an early warning system dissemination toolbox, which will include a trainer manual on the use of a range of national and local gender sensitive media for disseminating weather and climate information alerts to end-users. Project benefits will therefore be realised in areas where women are among the most climate-vulnerable demographics.</p>
<p>Activities related to data stewardship should be expanded to include a plan for data sharing throughout the region and globally.</p>	<p>Data sharing is a key feature of this project and efforts during implementation to activate and maintain data sharing channels with regional and global climate institutions will be ensured. This LDCF project is being implemented as a component of a larger regional project which will include the appointment of regional technical advisors, which will strengthen the links between the Liberia LDCF project and related initiatives in other LDCF project countries as well as regional initiatives such as: i) African Center of Meteorological Application Development (ACMAD); ii) Group on Earth Observations' (GEO) AfriGEOSS initiative – and in particular African Monitoring of the Environment for Sustainable Development (AMESD) and Monitoring of Environment and Security in Africa (MESA); and iii) WMO's Global Framework Climate Services (GFCS) initiative.</p> <p>Under Output 2.2, a weather and climate information and early warning system communication and coordination strategy will be developed, which will include SOPs for disseminating weather and climate information and early warnings across all levels, including regional-level (to neighbouring countries). LDCF resources will also be used to develop the forecasting and monitoring capabilities of the currently installed PUMA/SYNERGIE and AMESD (e-station) satellite receivers.</p>
<p>Clearly articulate the</p>	<p>The largest benefits are expected from building capacity of the climate/environmental information production agencies to provide rapid alerts</p>

<p>sectors that will benefit from the project, and include considerations of the adaptation priorities and needs of local communities.</p>	<p>and tailor climate products to the needs of various socio-economic sectors. At the local level, early warnings and climate hazard mapping can provide economic benefits by reducing losses of agricultural produce, infrastructure (roads and bridges) and disruption to people's livelihoods. Communities will also immediately benefit from the Standard Operating Procedure to be implemented for alert communication. One of the aims of this initiative is to ensure that women are able to access climate information as easily as men – even if it is through differing mediums – otherwise there is the risk of the information either not being used at all or not being fully understood by women. In line with the National Adaptation Action Plan (NAPA), the proposed project will provide targeted support particularly to the agriculture sector. However, the proposed interventions will benefit other sectors such as forestry, health, coastal management and fisheries. The climate change vulnerabilities of these sectors are described in Section 1.</p>
<p>Given the similarity between all the PIFs, it is recommended to develop one regional PIF OR conduct more in-depth analysis of gaps and needs for each country.</p>	<p>The outputs for this LDCF project have been tailored to address the gaps and needs Liberia. The gaps and needs of these key early warning institutions and end-users of early warning system information have been identified through multi-stakeholder consultations including: i) an initial consultation mission (24-28 September 2012), including an inception workshop on 25 September 2012; ii) a series of stakeholder consultations from 14-18 January 2013; and iii) a validation mission and series of consultations (13-23 May 2013), including a validation workshop on 22 May 2013.</p> <p>191.</p> <p>192. Workshops were attended by national operational focal points and government departments responsible for generating and using climate information and early warning systems, as well as a number of development partners, NGOs and civil society organisations. Bi-lateral stakeholder consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi-lateral and multi-lateral organisations, government departments and NGOs, as well as private sector partners. All consultations were conducted by the international consultant and/or the national consultant with support from the UNDP Country Office (CO). The Implementing Partner (IP) and Responsible Partners (RPs) played a considerable role in determining the activities for the LDCF project and were involved in most of the consultations. Furthermore, the UNFCCC operational focal point was involved in the project design through emails and consultations.</p> <p>Details of stakeholder consultations – including reports, programmes and participant lists – are included in Annex 1. The Inception Report from the initial mission is included as Annex 2 Details of stakeholder involvement during the project implementation phase are provided in Section 2.9.</p>
<p>Long term data records require sustainability and therefore need more detail for output 2.5 (sustainable financing) and how it will overcome barriers.</p>	<p>The long-term sustainability of the EWS will be promoted under output 3.4 through engagement with the private sector and government, identifying paid-for services for different sectors, which in turn will maintain and sustain the EWS.</p> <p>The sustainability of the EWS will be assessed, taking cognizance of the current funding mechanisms and allocated ministerial budgets. A comprehensive needs assessment for climate services will be carried out, and the willingness and ability to pay for such services across a range of private sector stakeholders will be investigated. Activities will need active engagement with customers to determine user-specific needs in terms of product/service, frequency of update and form of delivery. A sector-specific marketing strategy and programme will be developed and implemented to capitalise on potential income streams. Potential paid-for applications of climate information include: i) weather index-based insurance products; ii) mobile phone platforms to disseminate site specific information; and iii) tailored forecasts for large scale agro-forestry plantations. Where suitable legal arrangements exist and where governments are willing, private companies will be approached to test their willingness to engage in a public-private partnership. This output will include a review of the business plans of MoT, MoA, MLME, NDRC and the NMA, once the latter agency is established. In addition, this output will develop a strategy to capitalize on potential income from the marketing of tailored climate information packages. Tailoring products to the private sector will serve as a way to recover costs.</p>

	<p>Significant capacity building regionally will be supported so that cross-sectoral weather/climate/hydrological products can be delivered. By making EWS/CI more useful to various sectors, this pushes the Government to include core budget lines to support monitoring equipment operation and maintenance due to the cross-sectoral importance of EWS/CI (e.g., health epidemics linking to temperature trends, agricultural advisories based on rain patterns). The envisioned National Climate Change Policy will engage government to ensure the medium- to long-term sustainability of the Meteorology Department within the MoT, hydrological service within the MLME, and NDRC. This sustainability will be achieved by ensuring adequate annual budget allocations to fund the operation and maintenance activities of the respective institutions involved in the generation and use of climate information and early warnings in Liberia.</p> <p>Long-term data records will be reinforced by establishing servers for data storage, including back-up methods. In order to ensure that data will continue to be collected, several design aspects to ensure project financial sustainability have been made (See Sustainability Section 2.7 for more details). Equipment procurement will be staggered so that enough technical support is available to continue operation and maintenance of existing equipment and to be trained on new equipment installations. This will prevent any interruptions in equipment operation/data collection.</p>
<p>Ensure that integration of hydro-met system, satellite, gauges and radars is considered. Radars are expensive to install and maintain and can exceed national budgets.</p>	<p>In some instances, investments in technologically advanced equipment and techniques e.g. repairing and installing radar technologies, were considered too expensive to be implemented through the LDCF project and have been disregarded in favour of investments in cost-effective and sustainable technologies. Where possible, the LDCF project has been aligned with existing, related projects in the meteorological and hydro-meteorological sectors. This approach of complementing existing, related projects is more cost-effective than the implementation of a separate initiative. Under Outputs 1.3 and 1.4, satellite observations will be integrated with newly enhanced hydromet monitoring network and staff in MLME, MoA, NDRC, EPA, MoH, LMA, NPA and MoPEA will be provided with training to use information from hydro-meteorological and satellite monitoring equipment to tailor forecasts for sector-specific climate-related hazards.</p>
<p>Projects will be challenged by a lack of IT infrastructure (bandwidth, etc.) to collect, analyse, exchange and archive data.</p>	<p>Significant IT equipment has been included in Component 1 for data downloading, data archive and exchange. LDCF resources will be used to procure and install the hardware and software needed to integrate, display, analyze and provide output of observed and model data as well as other graphical information. This will allow the capacity developed through Output 1.2 to be applied in Liberia once the weather and forecasting system has been transitioned to Liberia and hosted locally. While this transition is underway, the following will be procured and installed: i) a climate information database; ii) a GTS link; iii) forecasting workstations; iv) required equipment for the effective functioning of the PUMA/SYNERGE and AMESD satellite systems; and v) a Satellite Distribution System (SADIS) to provide proxy upper air monitoring ascent measurements. A National Meteorological Centre (NMC) will be established – such an NMC does not currently exist in Liberia. Office space for this NMC will be secured through funding from the GoL, including all organisation involved in meteorology i.e. MoT, MLME, NDRC, MoA and EPA. The office-based equipment procured through the LDCF project will be housed within the NMC.</p> <p>Activity 1.3.2 specifically addresses gaps in telecommunication infrastructure and will review and install appropriate telecommunication infrastructure to establish connectivity of the installed AWSs with MoT headquarters in Monrovia, as well as via the GTS.</p>
<p>There is a lack of workstations to make forecasts, access global products for downscaling etc.</p>	<p>193. LDCF resources will be used to procure and install the hardware and software needed to integrate, display, analyze and provide output of observed and model data as well as other graphical information. This will allow the capacity developed through Output 1.2 to be applied in Liberia once the weather and forecasting system has been transitioned to Liberia and hosted locally. While this transition is underway, the following will be procured and installed: i) a climate information database; ii) a GTS link; iii) forecasting workstations; iv) required equipment for the effective functioning of the PUMA/SYNERGE and AMESD satellite systems; and v) a Satellite Distribution</p>

	<p>System (SADIS) to provide proxy upper air monitoring ascent measurements. A National Meteorological Centre (NMC) will be established – such an NMC does not currently exist in Liberia. Office space for this NMC will be secured through funding from the GoL, including all organisation involved in meteorology i.e. MoT, MLME, NDRC, MoA and EPA. The office-based equipment procured through the LDCF project will be housed within the NMC.</p> <p>194.</p> <p>195. A GTS will be installed to link the AWSs, via GSM/GPRS, to the MoT headquarters in Monrovia, as well as to regional and international climate centres. Processing the data from the newly installed and connected AWSs will require an appropriate climate database and the use of sophisticated workstations (hardware and software). These workstations will provide the platform for MoT meteorologists to: i) visualize meteorological, environmental and oceanographic data; ii) produce standard and customized < 1 day severe weather nowcasts, 1-10 day weather forecasts, 1-6 month seasonal forecasts and > 6 month climate forecasts; and iii) edit and package weather and climate data and information into a suitable format for user-agencies and end-users. These workstations will provide the means to generate calibrated weather forecasts based on inter alia numerical weather prediction models, graphical imagery, surface observations and station-based forecasts.</p> <p>LDCF resources will be used to develop the forecasting and monitoring capabilities of the currently installed PUMA/SYNERGIE and AMESD (e-station) satellite receivers. The e-station at RIA is currently not used because of problems with security clearance, and therefore access to the RIA facilities. This will be resolved through a MoU between RIA and meteorologists from MoT and technicians from MLME, MoA, NDRC and EPA. Equipment requirements for the PUMA/SYNERGIE and AMESD (e-station) at RIA include reception cards, hard drives, a Universal Power Supply (UPS) tower, an ethernet switch, printers (colour and black & white) and a plotter. Use of the e-station at CARI is limited by an unreliable power supply and a lack of trained personnel. These problems will be resolved by installing the necessary solar panels and battery packs and through training provided in Output 1.4. Additional requirements at the CARI station include a printer, plotter and a GIS licence and software. Procuring and installing this equipment will enable processing of the required satellite data sets, and in turn, provide information to support management decisions for: i) agriculture; ii) maritime operations; iii) energy operations; iv) environmental protection; v) forestry; vi) fisheries; vii) wetland protection; viii) transportation; and ix) coastal zone management.</p>
<p>There is a lack of private capital to support the large costs of modernisation.</p>	<p>The long-term sustainability of the EWS will be promoted under output 3.4 through engagement with the private sector and government, identifying paid-for services for different sectors, which in turn will maintain and sustain the EWS.</p> <p>The sustainability of the EWS will be assessed, taking cognizance of the current funding mechanisms and allocated ministerial budgets. A comprehensive needs assessment for climate services will be carried out, and the willingness and ability to pay for such services across a range of private sector stakeholders will be investigated. Activities will need active engagement with customers to determine user-specific needs in terms of product/service, frequency of update and form of delivery. A sector-specific marketing strategy and programme will be developed and implemented to capitalise on potential income streams. Potential paid-for applications of climate information include: i) weather index-based insurance products; ii) mobile phone platforms to disseminate site specific information; and iii) tailored forecasts for large scale agro-forestry plantations. Where suitable legal arrangements exist and where governments are willing, private companies will be approached to test their willingness to engage in a public-private partnership. This output will include a review of the business plans of MoT, MoA, MLME, NDRC and the NMA, once the latter agency is established. In addition, this output will develop a strategy to capitalize on potential income from the marketing of tailored climate information packages. Tailoring products to the private sector will serve as a way to recover costs.</p>

	<p>By making EWS/CI more useful to various sectors, this pushes the Government to include core budget lines to support monitoring equipment operation and maintenance due to the cross-sectoral importance of EWS/CI (e.g., health epidemics linking to temperature trends, agricultural advisories based on rain patterns). The envisioned National Climate Change Policy will engage government to ensure the medium- to long-term sustainability of the Meteorology Division within the MoT, hydrological service within the MLME, and NDRC. This sustainability will be achieved by ensuring adequate annual budget allocations to fund the operation and maintenance activities of the respective institutions involved in the generation and use of climate information and early warnings in Liberia.</p>
<p>Specific details on which hazards are important and where should be included.</p>	<p>196. Climate change models for the Guinea Coast region are strongly divergent and fail to reproduce realistic inter-annual and inter-decadal simulations. However, the following climate changes are anticipated for Liberia²⁶:</p> <ul style="list-style-type: none"> • In urban and coastal Liberia, mean annual temperature is expected to increase at a rate of approximately 0.18 °C per decade and is projected to increase by 2-4 °C by 2100, relative to mean annual temperature in 1960. • Annually, projections indicate that ‘hot’ days will occur on 24-65% of days by the 2060s, and 29-65% of days by the 2090s²⁷. • Hot nights are projected to occur on 37-89% of nights by the 2060s and 49-97% of nights by the 2090s, relative to 1990-1999 records. • Projections of mean annual rainfall averaged over the country from different models show a wide range of changes in precipitation for Liberia, but tend towards overall increases, particularly for the periods July-September and October-December. Rainfall during these periods is expected to increase by up to 23% and 32%, respectively, by the 2090’s. • An increase in frequency and intensity of extreme weather events such as droughts, floods and severe storms. <p>197. The anticipated climate change impacts to different sectors are described below. In line with the National Adaptation Action Plan (NAPA), the proposed project will provide targeted support particularly to the agriculture sector. However, the proposed interventions will benefit other sectors such as forestry, health and coastal management.</p> <p>198. Anticipated impacts and climate change hazards in the agriculture sector will include increasingly unpredictable and onset of rainfall, increased vulnerability to flooding and erosion and increased heat stress. The northwest and central regions have already experienced lower cereal crop yields because of plant diseases, agricultural pests, soil degradation and lack of water for irrigation. As a result of changes in rainfall and temperature patterns, public health hazards are likely to include increased incidence of water-borne diseases e.g. cholera, dysentery, giardiasis, amebiasis, typhoid fever and malaria. The predictability of disease outbreaks depend on several climatic and non-climatic factors. Cholera can be predicted using remote sensing imagery to detect zooplankton blooms, and malaria – in areas where its occurrence is seasonal – can be predicted through monitoring of rainfall and temperature. The introduction of climate forecasts and increased satellite and climate observation capabilities will benefit the state of public health in Liberia by providing forewarning of where and when disease outbreaks are likely to occur.</p> <p>The impacts of climate change on fisheries and other coastal sectors are likely to be significant as over 20,000 Liberians are reliant on some form of fishing activity as a livelihood. Global forecasts for wind, waves and temperature are poor indicators for the climate of Liberia’s coastline and there is a need to develop locally applicable forecasts. Anticipated impacts on coastal management and fisheries resulting from the absence of local forecasts are likely to include increasing logistical difficulties and potential hazards experienced by small and large</p>

²⁶ Source: UNDP Climate Change Country Profiles (http://country_profiles.geog.ox.ac.uk)

²⁷ Hot days, or hot nights, are those exceeding the 90th percentile of temperature range recorded for that region and season.

	<p>vessels in Liberia’s territorial waters as a result of the absence of accurate wind and wave forecasts for the coastal zones.</p> <p>Sector-specific pilot EWS interventions will be implemented by the LDCF project, including an agricultural application in targeted districts in one of Grand Gedeh or Bong county, and a coastal application in targeted districts in one of Grand Cape Mount, Montserrado or Grand Bassa county. The selection of these pilot districts will be based on analysis of hazards and vulnerability during project implementation.</p>
<p>More analyses of climate needs to be included in determining where hydromet stations should be located.</p>	<p>With the assistance of a Communication on Instruments and Methods of Observation (CIMO) technician from the WMO, a systematic gap analysis will be undertaken to map the: i) required spatial distribution of the AWSs to adequately cover agro-meteorological, climatological, hydro-meteorological, synoptic and isohyet (rainfall variability) zones in the country; ii) required climate parameters to be monitored; and iii) required number of observation hours per station. The mapping will lead to an informed decision on exactly where to install new AWSs, how frequently these need to transmit data, and how to integrate them in the network being established through the NVE project. The AWSs will conform to (i.e. meet WMO standards) and be compatible with the already installed NVE AWS network to ensure ease of integration, installation and operation</p> <p>Under Output 1.1, the LDCF project will increase the capacity of MoT and MLME to generate meteorological and hydrological information, respectively. WMO have indicated that 9 AWSs will be sufficient to provide an adequate coverage of monitoring stations for Liberia. While 4 AWSs are being installed by the NVE investment project (including 1 mobile AWS), the location of these AWSs has not yet been decided. These AWSs, however, will be located with a focus on generating meteorological information linked to hydrological flow i.e. they will be located in the major river basins being monitored by MLME. Nine AWSs will therefore be procured and installed through the LDCF project. A further two AWSs will be located at the LDCF project demonstration sites under Output 2.3. Sector-specific pilot EWS interventions will be implemented by the LDCF project, including an agricultural application in a selected district in Grand Gedeh or Bong county, and a coastal application in one district in Grand Cape Mount, Montserrado or Grand Bassa county. The selection of these pilot districts and corresponding hydromet stations will be based on analysis of hazards, vulnerability and hydromet network gaps during project implementation.</p> <p>The RIA will house a twelfth AWS. This latter facility only monitors weather variables related to aviation but has a long-term data set of weather recordings which will be useful for analysis of long-term climate trends in Liberia. Therefore LDCF resources will also be used to rehabilitate the RIA AWS.</p>
<p>To ensure that the appropriate climate observations are recorded and applied, the following considerations should be included:</p>	
<p>Clear descriptions of the types of observations that are required and how they will feed into an EWS appropriately.</p>	<p>With the assistance of a Communication on Instruments and Methods of Observation (CIMO) technician from the WMO, a systematic gap analysis will be undertaken to map the: i) required spatial distribution of the AWSs to adequately cover agro-meteorological, climatological, hydro-meteorological, synoptic and isohyet (rainfall variability) zones in the country; ii) required climate parameters to be monitored; and iii) required number of observation hours per station. The mapping will lead to an informed decision on exactly where to install new AWSs, how frequently these need to transmit data, and how to integrate them in the network being established through the NVE project. The AWSs will conform to (i.e. meet WMO standards) and be compatible with the already installed NVE AWS network to ensure ease of integration, installation and operation.</p> <p>Types of observations that will be supported by LDCF project interventions will include weather station, hydrological / coastal monitoring equipment and SYNERGIE forecasting observations. Synoptic weather stations will measure temperature, rainfall, soil moisture, evapotranspiration and pressure variables on the surface or in the case of wind, 2 or 10 m above the surface each hour. Climate and agro-</p>

	meteorological stations will measure rainfall amount, maximum and minimum temperatures each day. Flow meters and water level meters will provide discharge measurements every hour. Coastal monitoring equipment will measure sea levels, sea surface temperatures and erosion rates daily. Combined, these observations will provide information to support daily weather forecast generation.
Provide data to world climatic data centres.	199. Data will be supplied to GTS (Global Telecommunication System) – the international system for meteorological data collection/analysis. Data will include that collected by the AWSs. The GTS is non-functioning at present, and will be restored through Output 1.2. 200. 201. The NDRC will establish multiple partnerships various stakeholders in order to establish the most appropriate channels to communicate weather and climate-related information. The communication strategy will include liaising with meteorological and hydro-meteorological centres in neighbouring countries – this will be important for cross-border flooding warnings and sharing information on cross bordertransportroues. The Regional Maritime Rescue Co-ordination Centre, under the LMA, will share coastal information with neighbouring countries.
Clearly distinguish between weather and climate observations and how they are used.	Weather and climate forecasts have been used based on their definitions and application in the climate change, meteorological and hydrological fields. In particular, the term weather is used for forecasts of 1-10 day, the term seasonal forecast is used for forecasts of 1-6 months and the term climate forecast is used for forecasts/predictions of greater than 6 months. Weather observations will be used in hydro-meteorological models to produce daily forecasts for predicting extreme and severe weather or for seasonal forecasts (timescale of up to 6 months in advance). Climate observations will be used for long-term predictions (on the order of years).
Details should be provided on whether additional funding for procurement of technology can be accessed.	The project document details the co-financing sources and baseline projects which have been used or will be used to procure equipment complementary to those planned in this project. LDCF project builds upon the following baseline projects which are also providing additional funding for the procurement of technology: i) Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation – funded by Norwegian Water Resources and Energy Directorate (NVE) and implemented through MLME; ii) Agriculture Sector Rehabilitation Programme – funded by the African Development Bank and implemented through MoA; iii) MetAgri (Roving seminars on Weather, Climate and farmers) - funded by the World Meteorological Organisation (WMO) and implemented jointly by UN Food and Agriculture Organisation (FAO), WMO and MoT; iv) GoL, Meteorological Division (within MoT) budget allocation; v) GoL, Hydrological Services (within MLME) budget allocation; vi) GoL, National Disaster Relief Commission (within MIA) budget allocation; and vii) GoL, Environmental Protection Agency budget allocation.
Project goals include mitigation of flood/drought losses but have insufficient hydrological modeling described in the PIF.	Hydrological modeling in Liberia is being strengthened through the NVE-funded Institutional Strengthening and Capacity Building of the Energy and Water Resources Cooperation baseline project. LDCF resources will therefore not be used to develop hydrological modeling capabilities. However, the improved climate information will assist the MLME with their hydrological forecasts.
Include considerations of how capacity of hydrological services (and agriculture) can be improved e.g. issue flood and drought monitoring	202. Under Outcome 1, the capacity of hydro-meteorological services and associated networks to monitor and predict extreme weather, climate-related hazards and climate trends will be improved. This will include building the capacity of technicians within the hydrological (MLME) and agriculture (MoA) sectors to use the meteorological information generated through Outputs 1.1, 1.2 and 1.3 to produce tailored, sector-specific forecasts. These forecasts will then be provided to NDRC to overlay with the climate risk and vulnerability maps to produce sector-specific early warnings, to be disseminated through the channels established through Output 2.2.

and early warnings.	
Address links and gaps between representatives of hydromet and agriculture e.g. will the meteorological data work with hydrological/agricultural models, or will it require manipulating?	As stated in the point above, the capacity of technicians within the hydrological (MLME) and agriculture (MoA) sectors to use the meteorological information generated through Outputs 1.1, 1.2 and 1.3 to produce tailored, sector-specific forecasts will be built. The meteorological data will therefore require manipulating before being processed by user-agencies, but this will be done in collaboration with the relevant technicians. Once the National Meteorological Centre is established, this will house the relevant technicians from all sectors.
In Component 2 there is a need to articulate the types of forecasts that will be produced.	<p>203. To assist with the transition from the currently under-developed Meteorological Department, to the fully functional NMA, international meteorological assistance will be provided through the LDCF project under Output 1.2. This international assistance will enable the production of weather and climate forecasts specific to Liberia in a relatively short time period (6 months) after initiation of the LDCF project. While the customized weather and climate forecasting system will therefore be hosted offshore initially, meteorologists from the Meteorological Department will be actively involved production and dissemination of forecasts and information. Additionally, a representative of the international organization will be based in Liberia until the end of the Year 2 of the LDCF project. This involvement will be part of capacitating the Meteorological Department, and ultimately the NMA. Capacity development will continue for the duration of the LDCF project, with the customized forecasting system taken over the by NMA during year 3 of the LDCF project (dependant on when the NMA is established).</p> <p>204.</p> <p>205. Global forecasts (111 km resolution at the equator) will be downscaled using higher-resolution regional models, with three levels of nesting at resolutions of 36km, 12 km and 4km (the latter centered over Liberia). Initially, the internationally hosted system will produce twice-daily operational weather forecasts from downscaled models, developed specifically for Liberia. Liberian meteorologists will access the forecasts via the internet, and in turn apply their own local interpretation, under the guidance of the international specialists, and issue forecasts to the public through the communication channels established in Output 2.2. Over the LDCF project duration, the downscaling and forecasting operations will be transferred to the NMA, once sufficient capacity has been developed. This will include the validation of model outputs, and the incorporation of data collected through the equipment installed through Activity 1.1.1.</p> <p>206.</p> <p>207. Under Output 1.3, a GTS will be installed to link the AWSs, via GSM/GPRS, to the MoT headquarters in Monrovia, as well as to regional and international climate centres. Processing the data from the newly installed and connected AWSs will require an appropriate climate database and the use of sophisticated workstations (hardware and software). These workstations will provide the platform for MoT meteorologists to: i) visualize meteorological, environmental and oceanographic data; ii) produce standard and customized < 1 day severe weather nowcasts, 1-10 day weather forecasts, 1-6 month seasonal forecasts and > 6 month climate forecasts; and iii) edit and package weather and climate data and information into a suitable format for user-agencies and end-users. These workstations will provide the means to generate calibrated weather forecasts based on inter alia numerical weather prediction models, graphical imagery, surface observations and station-based forecasts.</p>
The focus of the PIF tends to be on early warnings and does not	The focus of the LDCF project has been adapted to both enhancing early warning systems using monitoring data, weather forecasts and seasonal forecasts as well as enhancing adaptation planning using monitoring data and decadal/climate forecasts/projections. Outcome 3 will focus on mainstreaming and integrating weather and climate information into national policies, annual budgets and local development plans

<p>include long term changes to extreme weather events. Ensure that climate information can be integrated into development plans.</p>	<p>in Liberia. Improving monitoring data i.e. the improving the ability to detect (monitor) long-term trends/changes in climate will enhance both the development of early warning systems and the integration of climate information in development plans. Furthermore, enhancing weather forecasts and seasonal forecast components of early warning systems will also prepare Liberia for an increase in extreme weather events under future climate conditions. This is also considered an aspect of adaptation planning and will also be integrated into national policies, annual budgets and development plans i.e. for an increase in intensity and frequency of extreme weather events.</p>
<p>Hydromet products which are sold for a fee will limit uptake by vulnerable populations.</p>	<p>Hydromet products will be free for the general population such as the current situation. Fees will be obtained from the private sector who have the means to pay for tailored climate products for particular sectors and locations. Revenue from these fees will be used to tailor products for local end-users (e.g., subsistence farmers) who do not have financial means to pay. A comprehensive needs assessment for climate services will be carried out, and the willingness and ability to pay for such services across a range of private sector stakeholders will be investigated. Activities will need active engagement with customers to determine user-specific needs in terms of product/service, frequency of update and form of delivery. A sector-specific marketing strategy and programme will be developed and implemented to capitalise on potential income streams. Potential paid-for applications of climate information include: i) weather index-based insurance products; ii) mobile phone platforms to disseminate site specific information; and iii) tailored forecasts for large scale agro-forestry plantations. Where suitable legal arrangements exist and where governments are willing, private companies will be approached to test their willingness to engage in a public-private partnership. This output will include a review of the business plans of MoT, MoA, MLME, NDRC and the NMA, once the latter agency is established. In addition, this output will develop a strategy to capitalize on potential income from the marketing of tailored climate information package.</p>
<p>Include consideration of how the project will benefit women, noting that evidence suggests that women do not receive EW messages via radio.</p>	<p>The project preparation phase has focused on gender-sensitive approaches and has ensured and clearly explained in the project document how women and vulnerable populations will be involved in shaping the type of information needed. Women representatives participated in the national consultations, and processes to include local communities in the design of early warning products have been included in the project document.</p> <p>SOPs (including protocols and inter-ministerial agreements) for disseminating weather and climate information and early warnings will be complemented by a dissemination toolbox, which will include a trainer manual on the use of a range of national and local gender sensitive media for disseminating weather and climate information, as well as early warnings, to end-users. The NDRC will establish partnerships with local radio stations, television broadcasters, mobile phone service providers and county/district representatives in order to establish the most appropriate channels to communicate with communities in different districts across Liberia. A wide range of national communication channels will consequently be established. A mechanism to receive and evaluate feedback from end-users will also be established in order to allow the efficacy of the various communications channels and early warning information to be evaluated.</p> <p>Furthermore, this will be informed by a comprehensive assessment of best practices and gaps with regards to centralized and decentralized early warning systems – including gender disaggregated vulnerability and coping as well as appropriate dissemination mechanisms – in Liberia and internationally. To ensure an effective early warning system is developed that includes all vulnerable persons in a community, detailed information will be collected for men and women including elderly, disabled, children, youth and socio-economically disadvantaged. This will be used to develop an early warning system dissemination toolbox, which will include a trainer manual on the use of a range of national and local gender sensitive media for disseminating weather and climate information alerts to end-users.</p>
<p>ACMAD, GEO and AfriGEOSS are not</p>	<p>The LDCF project will link and coordinate with activities under the African Center of Meteorological Application Development (ACMAD) – particularly ViGiRiC project which is developing a regional EWS and vigilance systems to cope with climate risks in Africa; Group on Earth</p>

<p>mentioned despite coordinating earth observations and climate observations.</p>	<p>Observations' (GEO) AfriGEOSS initiative; the African Monitoring of the Environment for Sustainable Development (AMESD); the Monitoring of Environment and Security in Africa (MESA); and WMO 's Global Framework Climate Services (GFCS) initiative. These groups are included in the baseline situation analysis (Section 2.3), upon which the LDCF project will build, however, as they are not providing co-financing, they are not considered baseline projects.</p>
<p>There is a need to include WMO and the GFCS initiative.</p>	<p>The MetAgri (Roving seminars on Weather, Climate and farmers)training and capacity building programme is delivering a series of seminars to make farmers become more self-reliant in dealing with weather and climate issues that affect agricultural production on their farms and to increase the interaction between the farmers and the MoT. The MetAgri project is funded and jointly implemented by the WMO and will be one of the baseline projects supporting the LDCF project. Therefore this LDCF project will be closely linked and aligned to WMO initiatives in the country. The WMO focal point in Liberia is based in the MoT and therefore the LDCF project will be closely linked and aligned to WMO initiatives in the country. This will include the WMO's Global Framework Climate Services (GFCS) initiative to the extent that it will be active in Liberia and the region.</p> <p>Prior to all equipment purchases, an assessment of existing equipment will be made noting the manufacturer, whether it is still working and whether the MoT and MLME intend to continue using particular makes/models. The activities will be aligned with the WMO's GFCS initiative.</p>
<p>Clarify how it plans to promote coordination between ministries at both the national and provincial level. We appreciate the involvement of multiple government agencies and institutions as this EWS will not only require input from various sector experts but also produce information applicable to numerous ministries and institutions.</p>	<p>Component 2 will strengthen inter-agency coordination and communication by establishing cross-sectoral dialogue on early warnings. Weather and climate information will be mainstreamed into relevant national policies, workplans and development plans through Component 3.</p> <p>Management arrangements introduced by the LDCF project will address gaps in coordination between IP (EPA), RPs (MoT, MLME, NDRC, MoA, LMA, NPA MoH and MoPEA) and UNDP CO.</p> <p>Forecasts tailored to specific sectors such as agriculture and aviation will be produced by MoT in collaboration with the relevant line ministry, thereby strengthening communication and coordination between government departments.</p>
<p>Outline how users will be involved both in the design of the EWS and in deciding what information is produced from the EWS as well as how information will be</p>	<p>LDCF project activities will build on existing networks, achievements and planned actions by MoT and MLME and will work closely with existing NDRC projects (i.e. WFP project) to co-produce outputs.</p> <p>Multi-stakeholder consultations were conducted to inform the design of the LDCF project. These included: i) an initial consultation mission (24-28 September 2012), including an inception workshop on 25 September 2012; ii) a series of stakeholder consultations from 14-18 January 2013; and iii) a validation mission and series of consultations (13-23 May 2013), including a validation workshop on 22 May 2013.</p> <p>Workshops were attended by national operational focal points and government departments responsible for generating and using climate information and early warning systems, as well as a number of development partners, NGOs and civil society organisations. Bi-lateral</p>

<p>disseminated. Better results can be achieved by ensuring that climate information and early warning system products are user-driven and communicated to users through various innovative channels</p>	<p>stakeholder consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi-lateral and multi-lateral organisations, government departments and NGOs, as well as private sector partners. All consultations were conducted by the international consultant and/or the national consultant with support from the UNDP Country Office (CO). The Implementing Partner (IP) and Responsible Partners (RPs) played a considerable role in determining the activities for the LDCF project and were involved in most of the consultations. Furthermore, the UNFCCC operational focal point was involved in the project design through emails and consultations.</p>
<p>Clarify how it will communicate results, lessons learned and best practices identified throughout the project to the various stakeholders both during and after the project; and</p>	<p>Progress of the LDCF project will be monitored in the UNDP Enhanced Results Based Management Platform. Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Based on the information recorded in Atlas, Project Progress Reports (PPR) can be generated in the Executive Snapshot. Other ATLAS logs will be used to monitor issues and lessons learned. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.</p> <p>Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks which may be of benefit to project implementation through lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. There will be a two-way flow of information between this project and other projects of a similar focus.</p>
<p>Engage local stakeholders, including community-based organizations and environmental NGOs in both the development and implementation of the program</p>	<p>Multi-stakeholder consultations were conducted to inform the design of the LDCF project. These included: i) an initial consultation mission (24-28 September 2012), including an inception workshop on 25 September 2012; ii) a series of stakeholder consultations from 14-18 January 2013; and iii) a validation mission and series of consultations (13-23 May 2013), including a validation workshop on 22 May 2013. Workshops were attended by national operational focal points and government departments responsible for generating and using climate information and early warning systems, as well as a number of development partners, NGOs and civil society organisations. Bi-lateral stakeholder consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi-lateral and multi-lateral organisations, government departments and NGOs, as well as private sector partners. All consultations were conducted by the international consultant and/or the national consultant with support from the UNDP Country Office (CO). The Implementing Partner (IP) and Responsible Partners (RPs) played a considerable role in determining the activities for the LDCF project and were involved in most of the consultations. Furthermore, the UNFCCC operational focal point was involved in the project design through emails and consultations.</p>
<p>Germany comments on the PIF “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”</p>	
<p>A robust strategy to ensure sustainability of project, particularly with reference to investments in infrastructure and climate services, should include commitments</p>	<p>Assessments on climate and environmental observational infrastructure needs and capacity building requirements were undertaken by an international consultant and two national consultants based in country. Risks related to the sustainability of the investments were considered in the design of the LDCF project outputs and were included into the Risk Log.</p> <p>By making weather and climate information more useful to various stakeholders, will influence the amount of domestic, private as well as donor finance committed to monitoring extreme weather and climate change.</p>

<p>from partners as well as an assessment of risks related to the sustainability of investments.</p>	<p>A sector-specific marketing strategy and programme will be developed and implemented to capitalise on potential income streams. The marketing programme will aim to enhance revenue by demonstrating the value of improved meteorological services and products to the aviation sector as well as for other key economic sectors, namely agriculture, fisheries and marine transport.</p>
<p>As the proposed project requires very specialized technical expertise on meteorology (hardware and software), provide detailed information on how expertise and comparative advantages of partners is incorporated in the project</p>	<p>This project is unique in that it will have a regional component to enhance coordination, increase cost effectiveness and, most importantly, enable the participating EWS/CI countries to exploit specialized technical expertise. 10% of the budget is allotted to support regional experts in the fields of hydrology, meteorology/climatology forecasting and prediction, and communication systems.</p> <p>A pool of specialists with specific expertise in meteorology and EWS will be supporting the project implementation as well as local experts, drawing on external technical specialists where necessary. Locally partnerships with other agencies working in this field have been developed and the project will build on this baseline and work in close partnerships with other actors</p> <p>208. UNDP's comparative advantage in implementing this project is underpinned by: i) its Country Programme Document for the current and new cycle (2013-2017); ii) its overarching role of capacity development; and iii) the Energy and Environment Program Strategy. This strategy aims to mainstream environment and disaster prevention measures into national and local development policies, strategies and plans. Public service reform and institutional building is one of UNDP's flagship programming areas. The proposed capacity development activities in all three components of the LDCF project will benefit from UNDP's overarching and strategic role in this area, helping to ensure that related outcomes are sustainable in the long-term.</p>
<p>The additional cost reasoning should be outlined more clearly. Much of the investment is for the weather related observational network and brings considerable co-benefits for economic activities, logistics and transport. However, a baseline development of maintaining and upgrading of infrastructure is not described. Please elaborate on the climate and climate change related benefits in comparison to the business as usual</p>	<p>The additional cost reasoning is detailed under the adaptation alternative for each Outcome. In summary: the current climate information (including monitoring) and early warning systems in Liberia are insufficient for effectively supporting adaptive capacity of local communities and key sectors. This restricts long-term planning, management and early warning activities, as well as climate change impacts, in particular an increase in frequency and intensity of droughts, floods and severe storms. The current status of climate information and early warning systems in Liberia will significantly undermine social and economic development under a changing climate.</p> <p>The baseline development of maintaining and upgrading infrastructure as well as the baseline development situation for disaster management is described. A range of baseline donor support projects are also described which are providing additional support. The climate change related benefits in comparison to the business-as-usual investment is described in the adaptation alternative under Outcome 1, 2 and 3. This includes activities that aim to i) enhance the capacity of hydro-meteorological services and networks to monitor and predict weather and climate events and associate risk; ii) develop effective and efficient ways of packaging weather and climate information including contextualising with other environmental and socio-economic data to produce early warnings/alerts and advisories as well as to integrate into national policies, annual budgets and local development plans; and iii) support improved and timely preparedness and response to weather and climate information and early warnings, including efficient delivery mechanisms using radio and telecommunications networks.</p>

investment.	
An up to five percent fee for “National implementation” is mentioned. Strong partner involvement and ownership in the implementation of this project is important but should not be at the expense of overall project management fees. Please outline how the five percent fee relates to the agency fees.	The national implementation fees (also called Project Management Costs) are those costs of running the project within the National Implementing Partner. These costs are distinct from Agency fees which are to provide oversight and quality assurance of the project, which in this case is by UNDP (through its country office, region based staff and HQ-based staff).
Liberia:	
Regarding the ‘current’ vulnerability assessments mentioned in Output 2.1 - which information will be used and will it be generated through project activities or come from other projects or programmes?	Forecasts from Outputs 1.2, environmental products from Output 1.3, and tailored forecasts developed in Output 1.4 will be assimilated into a centralised risk and vulnerability database housed at NDRC. This database will be informed by climate vulnerability mapping exercise undertaken at a national level. The information needs of decision-making processes within the agriculture, forestry, water, health and transport sectors will be assessed and a set of information products will be designed. Climate monitoring information from Component 1 and existing social vulnerability data from the BCPR/WFP projects will be combined to identify regions where current climate risks are severe and expected to increase in the future. This information will be combined with agricultural (crop), flood risk or other sectoral models to develop climate change vulnerability maps. These maps will be housed at NDRC but available to all government agencies who require the information. Training on the use of these maps will be provided, primarily to NDRC staff. Further training and thematic workshops will be given to build the capacity of national and local government user agencies to use and interpret climate and vulnerability maps.
Recommend targeting the amount of people that should be reached through communication channels in sub-component 2.2 (quantification) and to make sure that the most vulnerable populations are reached.	Pilot EWS interventions implemented by the LDCF project will select pilot districts based on analysis of hazards and vulnerability during project implementation. Therefore the targeted number of people to be reached through project interventions will be quantified precisely during the implementation phase. Estimates of potential numbers of people are provided in Section 2.3.
It is recommended to explain the selection	Output 3.2 will be based on the climate change scenarios developed through output 3.1. This will identify “hotspot” particularly vulnerable to the predicted impacts based on the forecasted climate scenarios. The communities living within the “hotspots” will therefore be the most

<p>process i.e. definition of the “most vulnerable communities” in Output 3.2.</p>	<p>vulnerable.</p>
<p>The World Bank’s comments on LDCF EWS PIFs</p>	
<p>There is concern that approving these projects based on a template is at the expense of more robust proposals (perhaps more targeted) and could pose a reputational risk to the GEF.</p>	<p>The Liberian project has been designed and prepared to focus on Liberia-specific problems and solutions. This includes the contextualisation of information presented in the PIF, as captured in the project outputs. Project development has targeted EWS/CI specific to Liberia through multiple stakeholder consultations including: i) an initial consultation mission (24-28 September 2012), an inception workshop on 25 September 2012; ii) a series of stakeholder consultations from 14-18 January 2013; and iii) a validation mission and series of consultations (13-23 May 2013), including a validation workshop on 22 May 2013.</p> <p>209.</p> <p>210. Workshops were attended by national operational focal points and government departments responsible for generating and using climate information and early warning systems, as well as a number of development partners, NGOs and civil society organisations. Bi-lateral stakeholder consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi-lateral and multi-lateral organisations, government departments and NGOs, as well as private sector partners. All consultations were conducted by the international consultant and/or the national consultant with support from the UNDP Country Office (CO). The Implementing Partner (IP) and Responsible Partners (RPs) played a considerable role in determining the activities for the LDCF project and were involved in most of the consultations. Furthermore, the UNFCCC operational focal point was involved in the project design throughout project development.</p>
<p>There is insufficient assessment of current state of hydro-met sector, past failures and their causes.</p>	<p>The gaps and needs of these key early warning institutions and end-users of early warning system information have been identified through multi-stakeholder consultations as previously described. In this process a conclusion on detailed cost estimates for each activity and project activities focusing on establishing coordinated mechanisms for climate information and early warning system interpreting, packaging and disseminating were discussed and agreed on by all the stakeholders.</p> <p>Current hydro-meteorological infrastructure is not maintained and this is exacerbated by the fact that the equipment is antiquated. This failure is also related to inadequate placement of technology where equipment is impacted by weather risks or acts of vandalism. Equipment failure has also been caused by a lack of technical personnel to maintain and operate the equipment. This is now sufficiently considered in the design of the project, which will make significant investments in increasing the technical capacity of hydromet staff to operate and maintain an enhanced climate and weather observation network. Capacity will continue to be built to maintain and operate equipment throughout the project, transferring skills internally (e.g. from RIA) and from international centres where needed.</p>
<p>There is insufficient consideration of the limitations of current capacity, which currently prevents many of the proposed activities in some countries.</p>	<p>Outcome 1 is explicitly designed to address shortfalls in existing capacity in Liberia. This component will address the weaknesses in infrastructure and human resources that currently limit the effective collection of relevant climate-related information. The interventions of this component will improve the generation of climate information and the processing of collected data for risk analyses, thereby supporting the establishment of a functioning EWS in Liberia. The GoL will use LDCF resources to procure, install and rehabilitate hydro-meteorological monitoring stations that will generate weather and climate data in areas of Liberia that are currently not monitored. Technical capacity to develop appropriate sector-specific tailored forecasts will be built.</p> <p>While the NMA is being established, and because of the currently low capacity within the meteorological sector in Liberia with very few</p>

	<p>meteorologists employed, international assistance will be provided through the LDCF project to initiate the development of appropriate models to generate the required weather and climate forecasts. This will be part of a carefully coordinated phased approach where investments in infrastructure will <u>only</u> proceed when technical capacity to use the infrastructure exists.</p>
<p>Cost estimates are unrealistic and do not include variation between countries and O&M (operations & management) costs.</p>	<p>Costs have been revised and based on existing O&M budgets under the MLME, and developed in consultation with technicians within MoT. Cost estimates are also based on preferred models of equipment of Liberia, as directed by a WMO Communication on Instruments and Methods of Observation (CIMO) technician. The procurement of spare parts have been included and budgeted for.</p>

Annex 10: Key References

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Healy, A. and Malhotra, N. 2009. Myopic Voters and Natural Disaster Policy. *The American Political Science Review* 103 (3), 387-406.

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Tsirkunov, V. and Rogers, D. 2010. Costs and benefits of early warning systems. Global Assessment report on Disaster Risk Reduction. The World Bank.

UNDP Climate Change Country Profiles: Liberia. 2012. http://country_profiles.geog.ox.ac.uk.

UN. 2006. Global Survey of Early Warning Systems: An assessment of capacities, gaps and opportunities toward building a comprehensive global early warning system for all natural hazards. United Nations International Strategy for Disaster Reduction, Geneva, Switzerland.

9. SIGNATURE PAGE

Country: Liberia

Project Title: Strengthening Liberia's capability to provide climate information and services to enhance climate resilient development and adaptation to climate change.

UNDAF Outcome(s):

Outcome 2.1: Natural Resource and Food Security: Improved sustainable natural resource utilization and food security.

Expected CP Outcome(s):

Output 2.1.4) Utilization of Natural Resources (land, water and forest) improved; and Output 4.4.4) By 2016, National Disaster Risk Reduction (DRR) policy implemented and supported by a commission/agency with clearly defined mandates.

Executing Entity/Implementing Partner:

Environmental Protection Agency (EPA).

Implementing Entity/Responsible Partners:

Ministry of Transport (MoT) Meteorology Department; Ministry of Lands, Mines and Energy (MLME) Hydrological Services; Ministry of Internal Affairs (MIA) National Disaster Relief Commission (NDRC); Ministry of Agriculture (MoA); Liberia Maritime Authority (LMA); National Ports Authority (NPA); Ministry of Health (MoH) and Ministry of Planning and Economic Affairs (MoPEA).

Programme Period:	2013-2017	Total resources required:	US\$ 18,589,700
Atlas Award ID:	00074351	Total allocated resources:	US\$ 18,589,700
Project ID:	00086796	• Regular (GEF/LDCF)	US\$6,730,000
PIMS #	4858	• Other:	
Start date:	September 2013	○ Government	US\$ 5,965,428
End Date	September 2017	○ Other	US\$ 5,694,272
Management Arrangements	NIM	○ UNDP (Cash)	US\$ 200,000
PAC Meeting Date	3 July 2013		

Agreed by (Government):

Date/Month/Year

Agreed by (Executing Entity/Implementing Partner):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year