REQUEST FOR CEO ENDORSEMENT

PROJECT TYPE: Full-sized Project
TYPE OF TRUST FUND:LDCF

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PART I: PROJECT INFORMATION

Project Title: Strengthening climate information and early warning systems in Africa for climate resilient development and adaptation to climate change			
Country(ies):	Uganda	GEF Project ID:[1]	4993
GEF Agency(ies):	UNDP(select)(select)	GEF Agency Project ID:	5094
Other Executing Partner(s):	Ministry of Water and Environment (MWE)	Submission Date:	23 July 2013
GEF Focal Area (s):	Climate Change	Project Duration(Months)	48
Name of Parent Program (if applicable): ➢ For SFM/REDD+ ☐ ➢ For SGP ☐	n/a	Agency Fee ($):	400,000

A. FOCAL AREA STRATEGY FRAMEWORK[2]

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount ($)	Cofinancing ($)
CCA-2(select)	**Outcome 2.1** Increased knowledge and understanding of climate variability and change-induced risks at country level and in targeted vulnerable areas	**Output 2.1.2** Systems in place to disseminate timely risk information	LDCF	2,661,360	15,917,000
	Outcome 2.2 Strengthened adaptive capacity to reduce risks to climate-induced economic losses.	**Output 2.2.2** Targeted population groups covered by adequate risk reduction measures	LDCF	1,148,640	9,247,000
		Project Management Cost	LDCF	190,000	1,106,000
		Total project costs		4,000,000	26,270,000

B. PROJECT FRAMEWORK

Project Objective: To strengthen the weather, climate and hydrological monitoring capabilities, early warning systems and available information for responding to extreme weather and planning adaptation to climate change in Uganda.

Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount ($)	Confirmed Cofinancing ($)
Transfer of technologies for climate and environmental monitoring infrastructure.	Inv/TA	Enhanced capacity of the Department of Meteorology (DoM) and Department of Water Resource Management (DWRM) to monitor	1.1 16 Automatic Water Level Stations (AWLSs) installed and 40 manual hydro-meteorology stations and 5 AWLSs rehabilitated in the	LDCF	2,661,360	15,917,000

[1] Project ID number will be assigned by GEFSEC.
[2] Refer to the Focal Area/LDCF/SCCF Results Framework when completing Table A.

		and forecast extreme weather, hydrology and climate change.	Victoria, Kyoga, Albert and Upper Nile Water Management Zones (WMZs.). (INV: US$ 970,815) 1.2 25 Automatic Weather Stations (AWS) installed and 32 manual (12 synoptic, 10 agro-meteorological and 10 hydro-meteorological) and 32 AWSs rehabilitated in priority districts. (INV: US$ 1,187,095) 1.3Weather and climate forecasting facilities upgraded including an integrated hydro-meteorological data management and information system and an online web platform for operationalizing collaboration arrangements and procedures between DWRM and DoM.(INV: US$ 274,075) 1.4 Capacity developed for operating and maintaining observation networks and related infrastructure including training 9 meteorological and 10 hydrological trainers and 50 weather observers, raising local community awareness, developing an O&M toolbox, and establishing internal arrangements and procedures between DoM and DWRM. (TA: US$ 229,375)			
Climate information integrated into development plans and early warning systems.	Inv/TA	Efficient and effective use of hydro-meteorological and environmental information for making early warnings and long-term adaptation.	2.1 Technical capacity of DoM and DWRM is strengthened by training 16 forecasters – including 8 senior and 8 junior – to build in-house capacity for producing standard and	LDCF	1,148,640	9,247,000

			customized weather and climate forecasts and packaging hydro-meteorological data and information into a suitable format for user-agencies and local community end-users. (TA: US$ 198,375) 2.2 Tailored weather and climate information (including colour-coded alerts – advisories, watches and warnings – for flood, drought, severe weather and agricultural stresses, integrated cost-benefit analyses and sector-specific risk and vulnerability maps) made accessible to decision makers in government, private sector, civil society, development partners and local communities in the Teso and Mt Elgon sub-region. (INV: US$ 258,005) 2.3 Weather and climate information mainstreamed into national policies, annual workplans and local development including the National Policy for Disaster Preparedness and Management, and district and sub-county development plans in priority districts in the Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango sub-regions. (TA: US$ 211,435) 2.4 Governmental and non-governmental communication channels and procedures for issuing alerts including advisories, watches and warnings are strengthened at a national and local level			

			including the development of an early warning system dissemination national and local toolbox and mobile-based alert platforms in the Teso and Mt Elgon sub-regions. (INV:US$375,225) 2.5 Sustainable financing options – including appropriate government cost recovery arrangements, service level agreements and public-private partnerships – identified, developed and implemented for the operation and maintenance of the installed hydro-meteorological observation, forecasting and early warning system. (TA: US$ 105,600).			
Subtotal					3,810,000	25,164,000
Project management Cost (PMC)[3]				(select)	190,000	1,106,000
Total project costs					4,000,000	26,270,000

C. SOURCES OF CONFIRMED COFINANCING FOR THE PROJECT BY SOURCE AND BY NAME ($)

Please include letters confirming cofinancing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Cofinancing	Cofinancing Amount ($)
National Government	Ministry of Water and Environment (MWE)	In-kind	6,000,000
National Government	Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	In-kind	1,000,000
National Government	Office of the Prime Minister (OPM)	In-kind	1,500,000
National Government	Uganda Communications Commission	In-kind	300,000
National Government	Directorate of Water Resource Management (DWRM)	In-kind	2,800,000
Bilateral Agency (ies)	GIZ	Grant	3,870,000
Bilateral Agency (ies)	MWE, Joint Partnership Fund, Joint Water and Environment Sector Support Programme (JWESSP)	Grant	5,400,000

[3]PMC should be charged proportionately to focal areas based on focal area project grant amount in Table D below.

Multilateral Agency (ies)	MWE, World Bank (WB), Water Management and Development Project (WMDP)	Grant	1,100,000
CSO	Agency for Technical Cooperation and Development (ACTED)	Grant	400,000
GEF Agency	UNDP	Grant	3,900,000
Total Co-financing			26,270,000

D. TRUST FUND RESOURCES REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY1

GEF Agency	Type of Trust Fund	Focal Area	Country Name/ Global	(in $)		
				Grant Amount (a)	**Agency Fee** (b)[2]	**Total** c=a+b
UNDP	LDCF	Climate Change	Uganda	4,000,000	400,000	4,400,000
Total Grant Resources				4,000,000	400,000	4,400,000

[1] In case of a single focal area, single country, single GEF Agency project, and single trust fund project, no need to provide information for thistable. PMC amount from Table B should be included proportionately to the focal area amount in this table.

2 Indicate fees related to this project.

E. CONSULTANTS WORKING FOR TECHNICAL ASSISTANCE COMPONENTS:

Component	Grant Amount ($)	Cofinancing ($)	Project Total ($)
International Consultants	446,000	0	446,000
National/Local Consultants	129,890	0	129,890

F. DOES THE PROJECT INCLUDE A "NON-GRANT" INSTRUMENT? No

(If non-grant instruments are used, provide in Annex D an indicative calendar of expected reflows to your Agency and to the GEF/LDCF/SCCF/NPIF Trust Fund).

PART II: PROJECT JUSTIFICATION

A. DESCRIBE ANY CHANGES IN ALIGNMENT WITH THE PROJECT DESIGN OF THE ORIGINAL PIF[4]

1. No significant changes in alignment with the project design of the original PIF have been made. All outputs have been contextualized to fit Uganda's needs as articulated through the project preparatory and design phase. Output 1.3 and 1.4 of the original PIF has not been adopted because the preparatory and design phase found that the procurement of radar and upper air monitoring stations weretoo expensive and not identified as within the scope of the LDCF project by the Government of Uganda.

A.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.

NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.

2. The section from the PIF has been slightly adjusted to specifically fit the Uganda context. Please see Section 2.1 of the LDCF project document for further details.

A.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities.

NA

[4] For questions A.1 –A.7 in Part II, if there are no changes since PIF and if not specifically requested in the review sheet at PIF stage, then no need to respond, please enter "NA" after the respective question

A.3 The GEF Agency's comparative advantage:

3. The section from the PIF has been slightly adjusted to specifically fit the Uganda context. Please see Section 2.3.3 of the LDCF project document for further details.

A.4. The baseline project and the problem that it seeks to address:

4. Hydrological and climate monitoring is recognized by the GoU as a core public service provided to all economic sectors. As such this LDCF project is founded on a solid baseline of ongoing national programming that provides the existing infrastructure, staff and resources of the early warning network. This includes all programming deployed by the Department of Meteorology (DoM)/Ugandan National Meteorological Authority (UNMA), Department of Water Resource Management (DWRM), Department of Relief, Disaster Preparedness and Management (DRDPM)/Office of the Prime Minister (OPM), and Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) (see section 2.4of the project document).This project comes as an add-on to these ongoing initiatives to ensure that climate change dimensions are taken into account in the deployment of short-, medium- and long-term weather and climate services.

5. This LDCF project is focused on strengthening the capacity of national and sub-national entities to monitor climate change, generate reliable hydro-meteorological information (including forecasts) and to be able to combine this information with other environmental and socio-economic data to improve evidence-based decision-making for early warning and adaptation responses as well as planning. This includes coordinating with donor-supported water resource management and meteorological services baseline projects, community-based EWS and disaster risk reduction efforts in the country and strengthening the national framework for EWS implementation.

6. See detailed descriptions of baseline projects – including the linkages with the LDCF project – in Annex 2 as well as Section 2.3.1 and 2.4 in the LDCF project document.A summary per baseline project is presented below:

- **The Water Management and Development Project (WMDP) (2013 – 2018)** is funded by the WB and implemented by the MWE and National Water and Sewerage Corporation (NWSC). The objectives of WDMP are to improve water resource planning, management and development, as well as access to water and sanitation in priority areas. The total financing for the project is US$ 135 million, of which US$ 1.1 million has been allocated for flood and drought risk assessment, management and preparedness.
- **The Joint Water and Environment Sector Support Programme (JWESSP) (July 2013 - June 2018)** is a follow-up to the present Joint Water and Sanitation Sub-sector Support Programme (2007-June 2013) and being implemented by MWE.At present, the total funding for the implementation of activities under these components includes: i) donor partner funding of € 175 million from KfW (Germany), African Development Bank (AfDB), EU, Austria, and Denmark; and ii) GoU funding of € 195 million.
- **Reform of the Urban Water and Sanitation Sector (RUWASS) programme** (2002-2014) was established by GIZ in 2002 to provide advisory services to the MWE, including providing support to the Department of Water Development, National Water and Sewerage Corporation (NWSC), Directorate of Water Resource Management and the Department of Meteorology. The programme is currently in phase 4 (2011-2014), which includes building capacity of DWRM and DoM and funding weather and climate monitoring equipment and data management solutions.
- **UNDP's Strengthening Uganda's Disaster Preparedness and Management Capacities (2012-2014) project** is working towards addressing the needs for effective disaster risk reduction at a national and local level in Uganda with funding of US$ 3.9 million. This is a follow up project to the UNDP's "Support in Preparation of a National Disaster Management Policy" from 2006-2009 (US$ 4 million).
- **ACTED Drought Early Warning System (DEWS) in Karamoja**in cooperation with national and local government, has developed a DEWs for the Karamoja sub-region. The programme is funded by the European Commission (ECHO) and started in 2008. The DEWS provides drought warnings to communities in Karamoja through a monthly bulletin based on drought indicators gathered by community-based monitors and district officials and analysed by specially designed software.

- **The International Telecommunications Union and Uganda Communication Commission (ITU/UCC)** is implementing the project, "Natural Disaster Early Warning System Pilot in Uganda". The total funding for this pilot project is US$ 300,000 with the period yet to be confirmed. The focus of the ITU/UCC project on the dissemination of early flood warnings alerts via SMS is well-aligned with the activities of the LDCF project.
- **Agricultural Technology and Agribusiness Advisory Services (ATAAS)** (2010-2015) aims to increase agricultural productivity and household income of participating communities in Uganda by initiating improvements in agricultural technology and advisory services and undertaking agricultural research. The total project cost is US$ 665 million, financed primarily by the GoU (US$ 497 million) and World Bank (US$ 120 million loan), with support from the EU, IFAD and Danida. Component 2 (US$ 72.4 million) and 3(US$ 317.8 million) of the project are focused on enhancing partnerships between agricultural research, advisory services, and other stakeholders; and strengthening the national agricultural advisory services.
- **The Department of Meteorology (DoM)** within the DEA under MWE is the institution mandated with the responsibility for establishing and maintaining the weather and climate observation network in Uganda, including *inter alia* data collection, analyses and exchange as well as the production of weather and climate information and products. The DoM operates a weather and climate observation network, which includes 12 manual synoptic stations, 15 manual hydro-meteorological stations, 17 manual agro-meteorological stations, 150-300 manual rainfall stations, 33 automatic weather stations and 1 Meteosat Second Generation (MSG) satellite receiver. However, despite efforts made within the DoM, a sustainable operation and maintenance system for infrastructure and recovery of costs has not been implemented.Data obtained is frequently unreliable and of a poor quality for making management decisions related to climate change risks as well as for providing early warnings of climate hazards. There is a need for capacity building and adjustment and/or reformulation of operation and maintenance strategies and workplans in order to improve the functionality of facilities and infrastructure. The DoM has allocated US$ 6,000,000 towards baseline climate monitoring and developing early warning activities.
- The **Department of Water Resources Monitoring and Assessments (DWRM)** within the Directorate of Water Resource Management under MWE is the entity mandated with the responsibility for operating and maintaining a surface hydrological monitoring network of 80 hydrometric stations (rivers and lakes) and 10 automatic weatherstations. Hydrometric stations include manual as well as automatic water level recorders and data loggers for measuring water levels. Observers take manual readings twice a day and data is collected from data loggers only on a monthly basis. These manual flow meter measurements are then sent to the DWRM, either weekly or monthly via post or telephone, often resulting in critical delays, which reduces the effectiveness of these data for warnings of flood levels. At present, a number of the water resources management functions under the DWRM are in the process of being decentralised to regional levels. This is being achieved through the establishment and refinement of four Water Management Zones (WMZs), namely the Kyoga, Victoria, Albert and Upper Nile WMZs, under the DWRM's framework for Catchment-based Water Resources Management (CbWRM) that is at present being operationalized across Uganda. There are a number of factors which limit the capacity of the DWRM for water resource monitoring and assessment. Spatial coverage of the country's hydrological monitoring network has been reduced as a result of vandalism or poor maintenance of equipment. At present, automated real-time water level measurements are available for only the Kyoga WMZ, which limits the capacity of the DWRM to generate and disseminate rapid warnings for inundation and flash floods. The DWRM has allocated US$ 2,247,000 towards integrated and sustainable management of water resources, baseline water resource monitoring and flood risk management.
- The **Department of Relief, Disaster Preparedness and Management (DRDPM)** under the Office of the Prime Minister is the agency mandated with the responsibility for disaster preparedness and management in the country. Activities of the DRDPM include the coordination of risk reduction, prevention, preparedness, mitigation and response actions in the country in consultation with other line ministries, humanitarian and development partners, local government and the Private sector. It co-chairs the National Platform for Disaster Management Inter Agency Technical Committee, which includes members from MAAIF, DoM, DWRM and DRDPM. The DRDPM coordinates and houses the National Early Warning System Committee. However, there is poor coordination and communication between the DRDPM and Uganda's Hydrometeorological agencies, in addition to which there are multiple factors which limit the

ability of hydromet staff to monitor and forecast climate and weather-related information. As a result, the DRDPM has a limited capacity to implement appropriate timely responses to climate-related hazards. The DRDPM has allocated US$ 1,500,000 towards Risk and Vulnerability Assessments; Early Action; Education and Awareness; and National Disaster Information Sharing.

7. See Table 1 in Section 2.3.1 of the Project Document and below for indicative co-financing amounts associated with the above baseline projects upon which this LDCF project will build.

Table 1. Specific Baseline Projects and indicative co-financing amounts

Funding source	US $
Co-financing sources	
1. Government of Uganda (GoU), MWE, Department of Meteorology (DoM) budget allocation	6,000,000
2. GoU, MWE, Joint Partnership Fund, Joint Water and Environment Sector Support Programme (JWESSP)	5,400,000
3. UNDP Strengthening Uganda's Disaster Preparedness and Management Capacities (SUDPMC)	3,900,000
4. GoU, Directorate of Water Resource Management budget allocation	2,800,000
5. GoU, Department of Relief, Disaster Preparedness and Management (DRDMP)/Office of the Prime Minister (OPM) budget allocation	1,500,000
6. German Agency for International Cooperation (GIZ)	3,870,000
7. MWE, World Bank (WB), Water Management and Development Project (WMDP)	1,100,000
8. GoU, MAAIF, Agricultural Technology and Agribusiness Advisory Services Programme (ATAAS)	1,000,000
9. Humanitarian Aid and Civil Protection department of the European Commission (ECHO) - Agency for Technical Cooperation and Development (ACTED) Drought Early Warning System (DEWS)	400,000
10. The International Telecommunications Union and Uganda Communication Commission(ITU/UCC)	300,000
Total	26,270,000

A. 5. Incremental /Additional cost reasoning: *describe the incremental (GEF Trust Fund/NPIF) or additional (LDCF/SCCF) activities requested for GEF/LDCF/SCCF/NPIF financing and the associated global environmental benefits (GEF Trust Fund) or associated adaptation benefits (LDCF/SCCF) to be delivered by the project:*

Outcome 1: Enhanced capacity of the Department of Meteorology (DoM) and Department of Water Resource Management (DWRM) to monitor and forecast extreme weather, hydrology and climate change.

8. Through Outcome 1, LDCF resources will be used, in conjunction with other ongoing initiatives to assist the Government of Uganda (GoU) to address some of the fundamental barriers to the deployment of an operational and modernised (automated) weather, climate and hydrological monitoring system and forecasting extreme weather and longer-term climate variability. This will be achieved by increasing the coverage and automating the national weather and hydrological monitoring system and upgrading weather and climate forecasting facilities (see further details in Section 2.4, Outcome 1 of the project document). The baseline situation (without the LDCF project) and adaptation alternative (with the LDCF project) are detailed below for Outcome 1 (see Section 2.4, Outcome 1, Baseline situation and adaptation alternative in the LDCF project document for further details including indicative activities).

9. The overall budget for this outcome under the LDCF project is US $18,578,360. This includes US $ 2,661,360 LDCF project grant requested and US $ 15,917,000indicative co-financing.

Without LDCF Intervention (baseline):

10. The Department of Water Resources Monitoring and Assessments (DWRM) – in the Directorate of Water Resource Management under MWE – is responsible for operating and maintaining a surface

hydrological monitoring network of80hydrometricstations (rivers and lakes) and 10 automatic weather stations(see Table 2below and Annex8 in the project document for location and operational status of hydrological stations and automatic weather stations). This involves monitoring and assessing the variation of the quantity and quality of water resources as a result of human and climatic impacts and thus providing information for supporting various production and investment activities. Hydrometric stations include manual staff gauges as well as automatic water level recorders and data loggers for measuring water levels. Observers take manual readings twice a day and data is collected from data loggers only on a monthly basis. These manual flow meter measurements are then sent to the DWRM, either weekly or monthly via post or telephone, often resulting in critical delays, which reduces the effectiveness of these data for warnings of flood levels. The DWRM's operation and maintenance budget is ~US$ 450,000 per annum[5].

11. At present, a number of the water resources management functions under the DWRM are in the process of being decentralised to regional levels. This is being achieved through the establishment and refinement of four Water Management Zones (WMZs), namely the Kyoga, Victoria, Albert and Upper Nile WMZs, under the DWRM's framework for Catchment-based Water Resources Management (CbWRM) that is at present being operationalized across Uganda.

12. The main purpose of the CbWRM framework and the regional WMZs is to de-concentrate water resources management closer to where the activities are needed and to mobilise local community efforts and other stakeholders to participate in CbWRM. This includes the following DWRM IWRM functions: i) operation and maintenance of surface water, groundwater and water quality monitoring networks; ii) operation and maintenance of regional water quality laboratories; ii) water resources assessments; iii) water resources planning and allocation, iv) implementation of water and catchment management regulations and permitting systems; v) review of environmental impact assessment reports; vi) monitoring compliance to water laws, regulations and permit condition; and vii) raising awareness about the role and importance of water resources management.

13. CbWRM activities under the DWRM's framework are currently in the pilot phase. The WMZs have been formally established. These include WMZ offices with five staff members in each WMZ. These WMZ offices are, however, not yet fully operational and are in need of consolidation and operational strengthening. This will be an on-going process under the DWRM. In each WMZ, a water resources information system that includes a decision support system is being planned to capture all the data and information needed for water resources planning and allocation at WMZ and catchment level. One of the main areas of work for WMZ offices is the preparation of Water and Catchment Management Plans. These are in the process of being developed with effective stakeholder participation, in five priority catchments out of the eight identified hotspot catchments. A Stakeholders Forum, Catchment Management Committee, Catchment Technical Committee and Catchment Secretariat are being established to support these activities at the catchment level.

14. At present, a number of challenges limit the DWRM's water resource monitoring and assessment capacity. Coverage of the country was originally more extensive, but many of the manual staff gauges as well as automatic water level recorders and data loggers are damaged as a result of vandalism or poor maintenance. As a short-term intervention, DWRM has been conducting awareness campaigns at the local level and has procured sign boards that will be established at the monitoring stations to create awareness of the purpose and benefits of the stations. Automated, real-time water level measurements are available for only the KyogaWMZ. This prevents rapid warnings for inundation and flash floods from being generated and disseminated.

Table 2. Status of existing hydrological stations under the DWRM (see Annex 8in the project document for location and operation status of existing stations).

Station type	Existing	Fully operational
Surface hydrometric stations (rivers and lakes)	80 of which 16 in the Kyoga WMZ have been upgraded to telemetric status.	35

[5]The Republic of Uganda.2010.National Development Plan. International Monetary Fund, Washington, D.C.: 1-499.

Automatic Weather Stations (AWSs)	10	5
Acoustic Doppler Profile	0	0

15. The Water Management and Development Project (WMDP, 2013-2018) implemented by the MWE and funded by the World Bank aims to strengthen hydrological infrastructure, information management systems and training in the country to support DWRM address current capacity gaps. The total financing for the project is US$ 135 million, of which US$ 1.1 million has been allocated for flood and drought risk assessment, management and preparedness. The WMDP has planned two activities on flood and drought risk management and preparedness: i) strengthening, expanding and automating the existing hydro-meteorological monitoring network in the Kyoga and Upper Nile Water Management Zones; and ii) developing a comprehensive water resource information system for Uganda. In addition to the WB support, GIZ through the Reform of the Urban Water and Sanitation Sector (RUWASS, 2002-2014) programme has supported the DWRM in the installation of five AWLSs at the Manafwa, Namatala, Sipi, Simu and Soronko rivers in the Kyoga WMZ. These remotely send water levels to the DWRM data centre in Entebbe and provide alerts when water levels are beyond flood thresholds. The programme is currently in phase 4 (2011-2014), which includes building capacity of DWRM and DoM and funding weather and climate monitoring equipment and data management solutions.

16. The Department of Meteorology (DoM) within the DEA under MWE is responsible for establishing and maintaining the weather and climate observation network in Uganda. This includes data collection, analyses and exchange as well as the production of weather and climate information and products (including warnings) to support social and economic development. Specific sectors that the DoM aims to support include transport (mainly aviation), defence, agriculture, disaster preparedness, environmental and water resources management, tourism and the construction industry. The DoM's annual budget including operation and maintenance is ~US $ 1,500,000 per annum.

17. The DoM has four divisions: i) station network division, which is responsible for designing, establishing and monitoring the weather and climate observation network, including flow of data to collecting centres; ii) training and research division**,** which is responsible for developing research and training programmes in accordance with regional centres and WMO; iii) forecasting division, which is responsible for collecting and distributing real-time data to WMO and regional centres as well as analysing data and producing daily public and aviation forecasts[6]; and iv) data processing and applications division, which is responsible for collecting, processing and archiving all weather and climate data as well as producing ten-day forecasts – referred to as dekadal forecasts – designed specifically to meet the concerns and needs of the farming community including information for planning and marketing purposes.

18. The weather and climate observation network managed by the DoM includes 12 manual synoptic stations, 15 manual hydro-meteorological stations, 17 manual agro-meteorological stations, 150-300 manual rainfall stations, 33 automatic weather stations and 1 Meteosat Second Generation (MSG) satellite receiver. Observation stations are clustered around institutions for ease of access. Therefore, they do not cover the spatial variability of different zones, i.e. agro-meteorological, climatological, hydro-meteorological and isohyet (rainfall variability) zones that exist in the country. In addition to the poor spatial coverage, most existing stations are only partially functional or non-operational as a result of vandalism, limited spare parts and insufficient maintenance and calibration equipment (Table 3 below).

19. Most of the existing stations under the DoM are obsolete and in need of rehabilitation. Manual and automatic stations do not have the full complement of equipment and sensors required for efficient functioning. This includes – for manual stations – missing or non-functional thermometers, barometers, Stevenson screens, wind speed and direction masts, solar sensors, radiotelephones for communication and weather fences; and for automatic stations, missing or non-functional sensors, data loggers, GPRS modems, dry cells, computer servers and software, power supply, weather fences, solar panels, batteries, wind speed and direction masts. Furthermore, the DoM has no radar, lightning detection equipment, upper air and pilot balloon stations. The C-band radar located at the Entebbe Airport is non-functional. Rehabilitation of the radar

[6]including forecasts for all flights leaving or flying over Ugandan air space.

is not possible because spare parts are not available, as the manufacturer no longer operates. Because of this limited observational infrastructure, atmospheric parameters (beyond the surface) are only being observed through satellite observations.

Table 3. Status of existing meteorological observing equipment under the Department of Meteorology in Uganda.

Station type	Existing	Fully operational
Synoptic	12	0
Agro-meteorological	17	7
Hydro-meteorological	15	5
Rainfall stations	150-300	60
Automatic Weather Stations	33	1
Radar	1	0
Upper Air	0	0
Pilot Sounding	0	0
Satellite receiving stations	1	1

20. The DoM's National Meteorological Center (NMC), based at Entebbe, has a direct link to the MSG Low Rate Information Transfer (LRIT) Direct Dissemination Service. This link provides access to satellite and model data (UKMO and ECMWF numerical models) as well as observations, analyses and forecasts from Regional and Global meteorological centres. At present, the Station Key Unit (SKU) needs to be updated to obtain higher resolution satellite imagery. Computers also have insufficient speed, storage capacity and memory for basic modern meteorological tasks including satellite image and model data analysis and presentation[7].

21. Accurate prediction of weather and climate events requires national as well as regional data and information from other countries, namely through regional and global producing centres. To exchange data and information regionally and globally, Uganda is party to the Convention of the World Meteorological Organisation (WMO) and the International Civil Aviation Convention. Only ~30% of the required information and data from Uganda is transmitted internationally through the Global Telecommunications Network (GTS). This is as a result of the obsolete and inadequate status of meteorological infrastructure in the country[8]. Weather and climate observations from Uganda are therefore not being effectively incorporated into regional and global circulation models which decreases the accuracy of these models for the Ugandan context[9].

22. The significant shortage of weather and climate monitoring stations in Uganda negatively affects the country's ability to monitor, detect and predict climate variability and climate change. A combination of non-operational, poorly functioning and obsolete infrastructure as well as poor spatial station coverage is currently reducing the ability of the DoM to provide detailed and accurate weather and climate information and products (including <1 day nowcasts and 1-10 day weather, seasonal and climate forecasts) to support social and economic development**.** Obsolete and inadequate equipment limits the integration, display and analysis of weather and climate data and its use for forecasting purposes. There is a shortage of modern and/or automated monitoring stations. As a result, data is transmitted from existing agro-meteorological and hydrological stations once a month to once every two months and every hour daily from existing synoptic stations. This inhibits the use of hydro-meteorological information for making early warning systems and long-term development plans[10]. For example, at present monthly weather reviews and forecasts including agro-meteorological advisories are not issued and inadequate lead time is provided for seasonal forecasts.

[7]Heitkemper, L. Kirk-Davidoff, D and Haynes, C.S. MDA Information Systems LLC.(Draft-2013).A Modernization Plan for Uganda's Meteorological Services. Gaitherburg, US.
[8]The Republic of Uganda.2010.National Development Plan. International Monetary Fund, Washington, D.C.: 1-499.
[9]Heitkemper, L. Kirk-Davidoff, D and Haynes, C.S. MDA Information Systems LLC.(Draft-2013).A Modernization Plan for Uganda's Meteorological Services. Gaitherburg, US.
[10]The Republic of Uganda.2010.National Development Plan. International Monetary Fund, Washington, D.C.: 1-499.

23. GIZ, through the RUWASS, works in close collaboration with the DoM and DWRM providing organisational support where required[11]. In particular, GIZ is planning to provide support to the DoM for installing 25 AWSs in the Kyoga WMZ. This will include AWSs covering two districts in the central region, nine districts in the eastern region and two districts in the northern region (see Table 4 below). In addition to strengthening the meteorological and hydrological observation network, GIZ has been working closely with the DoM in digitising climatological data.

Table 4.Locations for the 25 AWSs planned for installation in the Kyoga WMZ under the RUWASS programme funded by GIZ.

Region	Sub-region	Catchment	Location for AWS - district
Central Region	Buganda	Mpogoloma	Kayunga
		Mpogoloma	Nakasongola
Eastern Region	Busoga	Mpogoloma	Buyende
		Mpogoloma	Kamuli
		Kyoga	Kaliro
	Bukedi	Kyoga	Palisa
	Teso	Mpogoloma/Karamoja	Soroti
		Sironko/Kyoga	Ngora
		Karamoja/Kyoga/Mpogoloma	Serere
		Mpogoloma	Kaberamaido
Northern Region	Lango	Mpogoloma/Kwaina	Amolatar
		Kwania	Dokolo
		Kwania	Apac

24. Despite the achievements of the GoU and the support of the associated baseline projects, infrastructure and knowledge for the implementation of modern weather, climate and hydrological forecasting is still required. Repair, maintenance and calibration have been neglected, especially in the case of electronic equipment such as AWSs. Some systems have been installed and after only a few years have been abandoned and removed from the DWRM's and DoM's inventory lists. No repair tools or manuals are available, in particular for automated equipment. Equipment such as automated rain gauges, anemometers and wind vanes that have been installed are thus in poor condition. This is sometimes because of simple routine servicing and maintenance reasons, such as not applying grease to anemometers and wind vanes, unblocking rain gauges, cutting grass around the weather fences and dusting instruments. Furthermore, despite investment in computer equipment through existing projects, limited training in relevant software has been provided to DoM and DWRM personnel. This prevents the development of modern weather forecasting and climate change modelling capabilities. A stable coordination mechanism between DoM and DWRM is crucial, especially with reference to flood and drought monitoring, forecasting and early warning. The development of appropriate structures for improved data exchange as a condition for successful IWRM and climate change adaptation is recommended but still not covered by the existing projects[12].

With LDCF Intervention (adaptation alternative)

25. The four outputs under Outcome 1 (see Section 2.4, Outcome 1, Adaptation alternative in the LDCF project document for indicative activities per project output) will build on the existing investments being made in the sector by the GoU (baseline operations and maintenance annual costs by DoM and DWRM described above), including projects supported by GIZ, World Bank and the JWESSP described above and further detailed in Section 2.3 and in Annex 2 of the LDCF project document.

[11]Heitkemper, L. Kirk-Davidoff, D and Haynes, C.S. MDA Information Systems LLC.(Draft-2013).A Modernization Plan for Uganda's Meteorological Services. Gaitherburg, US.

[12]Heitkemper, L. Kirk-Davidoff, D and Haynes, C.S. MDA Information Systems LLC.(Draft-2013).A Modernization Plan for Uganda's Meteorological Services. Gaitherburg, US.

- LDCF resources will be used to improve **DoM's and DWRM's** existing meteorological and hydrological observation network to ensure Uganda's monitoring of weather, climate and hydrology 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 installing AWLSs and AWSs as well as rehabilitating existing manual and automatic stations in priority districts and catchments. Capacity development will be undertaken to sustain the enhanced observation network during and beyond the lifetime of the LDCF project. The outcome will enhance the coverage of spatial variability that exists, especially for rainfall, to ensure that weather and climate data is collected within climate change vulnerable areas. This will assist accurate and region-specific weather, climate and hydrological modeling as well as provide a platform for generating early warnings for drought, floods and severe storms. LDCF will finance measures to enhance collaboration between the DoM and DWRM for the management and operations of automatic and manual stations, data collection, data analysis, data exchange, data processing and water-related assessments (in particular, flood risks).
- This LDCF project will build upon the flood and drought risk-related **WMDP** project activities at a national level as well as at the regional and local level in Kyoga WMZ. This will include strengthening the hydrological observation network in the Albert and Victoria WMZs as well as filling gaps in the network in the Kyoga and Upper Nile WMZs, not currently being filled by the WMDP. LDCF funds will be used to integrate the installed AWLSs into the water information system being developed under the WMDP. This will also include linking the DWRM system to the DoM data and information system. Additional AWLSs will be installed under Output 1.1 in the Kyogo WMZ under DWRM to fill gaps not being filled by the GIZ stations.LDCF funds will be used to integrate the data received from AWLSs installed under Output 1.1 into the existing water information system and decision support systems that are currently being enhanced through the WMDP project.
- The LDCF project will strengthen activities under the**GIZ RUWASS** project including building capacity of DWRM and DoM and funding weather and climate monitoring equipment and data management solutions. The LDCF project will further expand and strengthen the DoM and DWRM's observation networks by installing AWSs under Output 1.2, particularly to cover gaps in the northern, western and central regions through the Upper Nile, Albert and Lake Victoria WMZs of Uganda. The installation of AWLS will complement the support GIZ is providing to the DoM and DWRM in the eastern region of the country covering the Kyoga WMZ, including the 25 AWSs planned for installation in the Mpogoloma, Kyoga, Sironko and Kwania catchment areas (see Table 6 and Table 7 in the project document).Twenty of the AWSs under the LDCF project are planned to be installed in the eight priority catchments – Sironko, Kyoga, Albert Nile, Aswa, Albert, Semiliki, Edward and Rwizi – covering all four WMZs. Output 1.3 will link closely to work being undertaken by GIZ with regards to digitisation of the weather and climate data.
- The LDCF project will build on **JWESSP** themes and related outcomes under three of the JWESSP components: i) water resources management; ii) water management zones; and iii) environment and natural resources management. This includes building upon the coordination and calibration aspects between subsectors and departments under the JWESSP.The Modernization Plan for the DoM – which is linked to the JWESSP's theme of facilitating the establishment of the UNMA – has and will be used as a basis for directing LDCF project activities. In this plan, the importance of efficient automated observation station network, modernised meteorological forecasting facilities including workstations (computers, storage and networking) and importance of operation and maintenance facilities and related training for the DoM is highlighted. This is the focus of output 1.3 and 1.4. Activities under these outputs will build upon the modernisation of the DoM into a semi-autonomous agency – the Uganda National Meteorological Authority – supported through the JWESSP.

Outcome 2: Efficient and effective use of hydro-meteorological and environmental information for making early warnings and long-term development plans.

26. Through outcome 2, LDCF funding will be used to build human technical capacity to use data collected from the strengthened and modernised weather and hydrological monitoring system and increasing the proportion of the local population that has access to adequate climate information, both for early warning purposes and for long-term planning. This will be achieved by training DoM and DWRM in up-to-date

forecasting methodologies and meteorological workstation software. SOPs for disseminating and responding to weather and climate forecasts – including warnings for floods, droughts and severe weather – will be developed and demonstrated in the Teso and Mt. Elgon sub-regions in the Kyoga WMZ. National systems will be linked to existing community-based systems and decentralised observation networks. It is expected that this will show the socio-economic benefits of adequate climate services that will support the upscaling, operation and maintenance of the system in the long term (see further details in Section 2.4, Outcome 2 of the project document). The baseline situation (without the LDCF project) and adaptation alternative (with the LDCF project) are detailed below for Outcome 2 (see Section 2.4, Outcome 2, Baseline situation and adaptation alternative in the LDCF project document for further details including indicative activities).

27. The overall budget for this outcome under the LDCF project is US $ 10,395,640. This includes a US $ 1,148,640 LDCF project grant and US $ 9,247,000 indicative co-financing.

Without LDCF/SCCF Intervention (baseline):

28. The DoM produces weather and climate information and products (including warnings) to support social and economic development in a range of sectors, namely transport (notably aviation), defence, agriculture, disaster preparedness, environmental and water resources management, tourism and construction (see Table 5below).

29. Meteorologists in the forecasting, data processing and applied divisions at the DoM's NMC in Entebbe prepare one terminal area forecast[13] for the Entebbe Airport and one daily weather forecast for the public. Forecasts are not updated as the day progresses and are only issued for particular cities. Ten-day (dekad) weather forecasts and monthly weather bulletins customised for the farming community and including information for planning and marketing purposes are also produced. Seasonal forecasts are issued twice a year, based on seasonal precipitation forecasts generated for East Africa at the Greater Horn of Africa Climate Outlook Forum (GHACOF) regional meeting conducted twice a year by representatives of East African states (see Table 5below).

Table5.A description of the services and products generated at the DoM. Many of the services are provided in an ad hoc manner and are generally delayed. Ten-day and monthly weather and agro-meteorological bulletins are currently not issued.

DoM services	Description	Communication channel	Users
Daily public forecasts	Weather for the current day (including daily readings for rainfall, temperatures, humidity, wind and sunshine) and next 24 hours	National radio, email, television, print media, internet websites	General public
Aviation forecasts	Air route and terminal airdrome forecasts	Email, internet, telephone, radio	Flight operators
Monthly weather bulletins	Climatological statistics including comparison of current month and long-term averages.	Email, national workshops and internet websites	General public, hydrologists, agriculturists, climatologists, sector specific strategic planners
Ten-day (dekad) and monthly agro-meteorological bulletins	Weather summary for the last ten days Ten, twenty and thirty day rainfall and temperature analysis Advisories to agriculture sector Seasonal rainfall accumulated from beginning of year to most current dekad.	Email, national workshops and internet websites	MAAIF including extension offices and local farmers.
Seasonal 1-6 month forecasts	Seasonal precipitation forecasts generated for East Africa	Email, regional and national workshops and internet websites	General public, hydrologists, agriculturists,

[13]Terminal Area Forecasts are official forecasts of aviation activity in Uganda. These forecasts are prepared for use of flight operators.

			climatologists, sector specific strategic planners
Warnings for extreme weather	Press releases Severe weather (strong winds and storms) alerts for areas adjacent to Lake Victoria	Radio (national and local), email and internet websites and SMS-alerts.	General public, policy and decision makers, DRDPM Fishermen on Lake Victoria

30. Daily weather forecasts are released to a standard email list – including agriculture, civil aviation, water resources and disaster risk reduction authorities – and are disseminated by radio and television stations, and print media at a national level. This includes press releases for extreme weather warnings. The primary medium used for daily weather forecasts and warnings is radio.

31. Uganda sends 10-day precipitation and temperature data to Intergovernmental Authority on Development (IGAD) Climate Prediction and Application Centre ICPAC[14] in Djibouti – WMO nominated Eastern Africa[15] regional centre for ACMAD[16]. Furthermore, the DoM participates in the IGAD ICPAC's Greater Horn of Africa Climate Outlook Forum (GHACOF), which brings together national, regional and international climate experts, on anoperational basis, to produce regional climate outlooks based on input from NMHSs, regionalinstitutions, Regional Climate Centres (RCCs) and global producers of climate predictions.By bringing together countries with comparable climates, the forumsensure consistency in the access to and interpretation of climate information.Throughinteraction with sectoral users, extension agencies and policy makers, GHACOFs assess the likely implications of the outlooks on relevant socio-economic sectors in the Greater Horn of Africa and explore the ways in which these outlooks could be made more user-friendly. After the GHACOF additional workshops are held – mostly in an ad hoc manner and sometimes not at all – in Uganda to downscale climate outlooks and risk information including alerts to for decision makers and the public.

32. The authoritative Early Warning institutions in Uganda are the DoM, DWRM, MAAIF, FEWSNet, and WFP VAM. There is a linkage between the Meteorology Department and Early Warning and AgriculturalStatistics Unit in MAAIF and DWRM. MAAIF uses data from Meteorology to advise farmers on what toplant basing on the critical minimums for each of the production processes right from plantingto harvesting. MAAIF and DWRM receive ten-day and monthly weather and seasonal forecasts from DoM on an *ad hoc* basis through email and, in certain cases, through national workshops. Agronomists and agro-meteorologists at MAAIF use weather and seasonal forecasts to prepare advice for farmers regarding appropriate crops for the expected conditions as well as on the occurrence of seasonal dry-to-wet and wet-to-dry transitions for informing planting and harvesting times. Hydrologists at DWRM use the weather and seasonal forecasts for the implementation of catchment-based IWRM including flood risk assessment and warnings. Weather and seasonal forecasts are also made available to regional agricultural and hydrological research institutions and stations for further dissemination to local farmers.

33. Although this system exists in theory and seems quite efficient and adequate'on paper', at present the accuracy and timeliness of forecasts provided by DoM are limited. Uganda generally experiences two seasonal rainfall peaks which become more pronounced towards the equator. The first peak or "Long-rains" season occurs from March – May (MAM) while the "Short-rains" season occurs from September- November (SON). The two rainy seasons are separated by two dry periods from December - February and June - August.Seasonal forecasts are currently issued by the DoM in the first to second week of March and September i.e. these are issued after the season has started and generally provide farmers with insufficient lead

[14] IGAD continues assisting its member states with coordination of regional and national workshops (IGAD – website: www.igad.net). With regard to climate issues, the IGAD Secretariat in Djibouti covers policy issues while ICPAC covers technical aspects. ICPAC evolved in 2007 from the Drought Monitoring Centre (DMC) under the auspices of the WMO and UNDP to the IGAD Climate Prediction and Application Centre (ICPAC). It is also nominated by the WMO to be a regional centre for ACMAD (WHO, 2010).The ICPAC – website is: www.icpac.net.

[15] Djibouti, DR Congo, Ethiopia, Kenya, Rwanda, Tanzania and Uganda

[16] ACMAD.2012. Assessment and Analysis of the state of the art of Warning Systems and vigilance products in Eastern Africa Region. Niamey, Niger

time to plan activities. Furthermore, monthly weather reviews and forecasts and agro-met advisories are generally not issued at all or are too late for the farmers to use the information. For example, climate information may only reach farmers once rains have already commenced and they are unable to plan their farming practises accordingly. Farmers would benefit from information relating to the date of onset, distribution and cessation of rain. This needs to be further broken down into recommended actions for a relevant region, district and/or crop type.

34. DoMcurrently uses WINSURFER to map rainfall anomalies but access to other software such as ArcView/ArcGIS and IDRISI is needed, as well as training on GIS. At present,DoM collaborates with the WFP mapping unit and the Uganda National Data Center (UNDC)for mapping services. Thematic data that might be needed for spatial applications in the development sectors are mainly available in the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), and population statistics in the Bureau of Statistics (UBOS). The DoM website is poorly developed and updated infrequently[17].

35. The DoM and WMO, together with Ericsson Communications, MTN Mobile and the National Lake Rescue Institute, piloted a three-month SMS-alert system (known as the Mobile Weather Alert pilot project) in Kalangala District in south-western Uganda in May 2011. This was built upon the DoM's existing severe weather alerts system for fishermen in Lake Victoria, which used local radio stations in areas adjacent to the lake to disseminate warnings of strong winds and storm surges. This system has been successful, and has resulted in active responses to alerts. The Uganda DoM links to MTN Mobile through an application developed by Ericsson, which ensures forecasts are captured in an appropriate way and delivered through the SMS platform to the fishermen in the islands. Since the piloting of the SMS-based alerts, one thousand fishermen from various communities in the Ssese Islands have registered for the mobile weather service. An important part of Mobile Weather Alert project is the establishment of an interchange between the pilot communities and service providers in order to collect feedback on the service. The National Lake Rescue Institute plays a key role in this as they have a long history of interaction with the fishing communities.

36. In February 2012, the DoM launched an agricultural component of the Mobile Weather Alert pilot project in Kasese District in close collaboration with the Grameen Foundation and WMO. The project focused on delivering agricultural advisories in conjunction with 10-day, monthly and seasonal forecasts directly to farmers in Kasese District through 'Community Knowledge Workers' established under the Grameen Foundation – an organization that assists local microfinance institutions to become more effective and that provides innovative mobile phone-based solutions to individuals living in poverty. The Kasese pilot project was completed at the end of 2012. The Grameen Foundation based in Kampala provided farmers and 'Community Knowledge Workers' with smart phones and trained them on accessing a range of valuable agricultural information including market prices across different regions in Uganda and practical information regarding managing disease and pest outbreaks. The foundation provides a platform between the farmer and DoM.The service provider, MTN, works with several partners to ensure that the information the farmer receives is up-to-date as possible.

37. As a result of the success of the above SMS-based pilots, the International Telecommunications Union and the Uganda Communication Commission is implementing the project "Natural Disaster Early Warning System Pilot in Uganda" which will design and deploy a pilot SMS-based public alert system to assist authorities with the dissemination of weather and climate information to targeted communities. The focus of the ITU/UCC project on the dissemination of early flood warnings and will primarily benefit communities in the Eastern Region and in particular the Mt. Elgon sub-region of Uganda. Specific districts are yet to be determined.

38. The DDPMR in OPM coordinates disaster risk reduction, prevention, preparedness, mitigation and response actions in Uganda. At district and community level, Technical Planning Committees (TPC), District, and Sub-county Disaster Management Committees (DDMCs/SDMCs) are responsible for disaster risk

[17]ACMAD.2012. Assessment and Analysis of the state of the art of Warning Systems and vigilance products in Eastern Africa Region. Niamey, Niger

reduction[18], prevention, preparedness, mitigation and response actions. This includes the dissemination of weather and climate forecasts including early warnings and building capacity of local communities to respond to these warnings. At present DDMCs are functional in 35 districts with more than 30 additionally planned to be established and operationalized by the end of June 2013.

39. Even with the provision of improved weather and climate information data, any alert generated will not be of value unless effectively disseminated to targeted end-users. For example, communities in the Karamoja, Teso and Mt. Elgon sub-regions are particularly vulnerable to climate impacts are in need of flood and/or drought early warnings as well as tailored weather and climate forecasts for farmers. At present, donor- and NGO-supported initiatives, namely: i) Uganda Red Cross Society Programme (URCS); ii) ACTED Drought Early Warning System (ACTED DEWs); and iii) Agricultural Technology and Agribusiness Advisory Services (ATAAS), aim to strengthen the DDMC/SDMCs disaster risk reduction and early warning system activities in certain priority regions, particularly the Karamoja sub-region.

40. ATAAS (2010-2015) aims to increase agricultural productivity and household income of participating communities in Uganda by initiating improvements in agricultural technology and advisory services and undertaking agricultural research. This includes enhancing partnerships between agricultural research, advisory services, and other stakeholders, strengthening the national agricultural advisory services, and supporting agribusiness services and market linkages.

41. ACTED DEWs provides drought warning information to communities within the Karamoja sub-region by making use of community and market indicators. The project assists DDMC/SDMCs use local radio, school and community-based drama groups, fliers, newsletters, and meetings to disseminate particularly drought early warnings and information. The DEWS provides drought warnings to communities in Karamoja through a monthly bulletin based on drought indicators gathered by community-based monitors and district officials and analysed by specially designed software. The indicators are gathered monthly by district officials, and are transmitted via a district early warning focal person by means of a mobile phone data-gathering system. These data are automatically aggregated by a software system, and are analysed at local government district level. The bulletin is then used by DDMCs to make action plans and issue warnings if necessary. Information dissemination back to the communities is carried out through several different routes, including community drama and radio bulletins. These current initiatives are project-based, however, activities will be integrated into the district MWE and MAAIF annual workplans for the Karamoja sub-region over the next two years[19].

42. URCS works on community-based flood warning systems focussed in the Karamoja, Teso and Mt. Elgon sub-regions. Basic river gauges have been installed in the Karamoja region and are read by trained community members. In the event that river level rises beyond a critical threshold height, warnings of impending flood are disseminated to local communities. These warnings are typically delivered by individuals on bicycles riding from house to house. In some areas, warnings are communicated with drums. Communities have been trained to use the refuges and evacuation routes established by the URCS programme. One shortcoming of these early warning mechanisms is that during extreme rainfall events, when monitoring is most critical, people are typically indoors avoiding the rain.

43. Except where NGOs are present in the area, most local DDMCs/SDMCs have limited capacity and do not have trained personnel to provide support for disseminating early warnings and ensuring the appropriate community response to warnings. Furthermore, there is a limited practical capacity at the community level regarding appropriate responses to weather and climate forecasts including early warnings. There is currently no networking or coordination body for NGOs and CSOs working on environment and natural resources issues and climate change.

[18]The Republic of Uganda. 2009. United Nations Development Assistance Framework, 2010 to 2014. United NationsSystem in Uganda: 1-66.

[19]The Republic of Uganda. 2009. United Nations Development Assistance Framework, 2010 to 2014. United Nations System in Uganda: 1-66.

44. Although community-based drought and flood early warning systems have been established in certain priority areas e.g. theKaramoja sub-region, there is currently little coordination between existing, decentralised early warning systems. There are also many gaps in the existing community-based networks established in terms of geographic coverage – most are focused in the Karamoja sub-region – and hazard specificity –many are only focused on either drought and flood and do not consider multiple hazards in one alert system. The Teso and Mt. Elgon regions are also extremely vulnerable to flooding and drought and therefore future efforts should aim to build on lessons learned from the initiatives implemented in the Karamoja sub-region as well as expand successful approaches in sub-regions currently not covered by existing projects.

45. The DoM is entirely funded by the GoU. As a result, it suffers from operational funding shortages, which has prevented sufficient investments in improving weather and climate observation and information systems. This has in turn resulted in some sub-optimal strategic implementation practices. In the absence of other sources of funding, most of the DoM's funding requirements are administered by Government within the context of the performance of the economy and are therefore subject to national budgetary priorities and limitations. The Uganda National Meteorological Bill was passed by Parliament in April 2012. The anticipated impact of the Bill will be the transformation of the Department of Meteorology into an Authority (an autonomous body). Quality Policy, Quality Objectives, Quality Procedures and other Quality Manuals for Quality Management System (QMS) Certification have already been developed and approved. The process of attaining ISO 9001:2008certificationhas not yet been finalised.

46. The Modernization Plan (funded by USTDA) for the DoM was recently completed in March 2013 and the MWE Business Plan for UNMA/DoMwill be used to direct the JWESSP support for the establishment of UNMA over the next five to 15 years. The formation of the Uganda National Meteorological Authority is intended to help overcome this limitation as it may now carry out its operations with a certain level of autonomy, including a higher level of involvement with the Ministry of Finance. The reorganization of the DoM into the Uganda National Meteorological Authority (UNMA) will serve to enhance the ability to modernize its meteorological observing, forecasting and warning technology and expand its services, including access to higher levels of funding for capital investment, maintenance and staff training.

47. At present, only Civil Aviation pays for meteorological services provided (~115,000/annum). The money is, however, paid into the central treasury and so it is not necessarily used to offset the DoM expenses incurred to the aviation sector. Once DoM becomes an independent agency, the Government is expected to continue meeting the cost of the public good provided by DoM/UNMA while additional resource requirements will be met by way of fees and charges for services. DoM/UNMA will collect funds as cost recovery from other users to cover part of operational costs in addition to donations, grants and loans among other revenue sources. The DoM/UNMA will also deliver services such as advice, training, information on a contracted basis, and develop stronger links with other environmental and socio-economic organizations. DoM/UNMA will provide the aforementioned and other consultancy services at a cost. Oil exploration and extraction will require weather forecasts on a regular basis and these services will be used to generate revenue for DoM/UNMA. A Policy, Legal and Institutional Framework will be put in place and under such a Framework, those institutions which will by mandate require the use of weather and Climate information will be listed in a specific Schedule. To assist DoM transform into UNMA a business plan/model (MWE), Modernisation Plan and capital investment plan (USTDA 2013) have been developed.

48. The major revenue sources for DoM/UNMA are government direct-billing, the private sector and government reimbursements. To capitalise on these earnings, comprehensive studies will be needed to establish the viability of the different sources of revenues and demonstrating the value of improved meteorological services and products, in particular to the Civil Aviation Authority which is a primary user of the data. Since the DoM is one of the government departments that are chronically under-funded, there is a need to explore ways of generating revenue streams from the services it provides.

49. Domestic and international air traffic activities – along with other key sectors – in Uganda are expected to increase appreciably because of continued economic growth. The improvement of forecasting and other services and products provided by DoM in conjunction with the growth of banks, insurance companies,

oil and gas sector, tourism and other elements of the private sector can increase the potential revenue stream that could be generated by DoM.

50. Despite the achievements of the GoU and the support of the baseline projects outlined previously, additional support is required to: i) increase the accuracy, timeliness and applicability of weather and climate forecasts; ii) enhance awareness at all levels on the impacts of climate change on socio-economic development and the importance of weather and climate information to assist local communities and sectors to adapt to these impacts; and iii) strengthen coordination procedures and communication channels for sharing and disseminating weather and climate information to decision-makers in government, private sector, civil society, development partners and local communities. This will make the work of DoM, DWRM and DDPMR more visible and better appreciated by other government ministries and local communities.

With LDCF/SCCF Intervention (adaptation alternative)

51. The five outputs under Outcome 2 (see Section 2.4, Outcome 2, Adaptation alternative in the LDCF project document for indicative activities per project output) will build on the existing investments being made in the sector by the GoU (baseline operation annual costs by DoM, DWRM and DDPMR described above), including projects supported by UNDP, ACTED, ITU/UCC and MAAIF/WBdescribed in Section 2.3.1 and in Annex 2 of the LDCF project document.

- LDCF resources will be used to strengthen the **DoM's and DWRM's** existing weather and climate forecasts including severe weather alerts (Output 2.1). Furthermore, these resources will provide support for weather and climate information sharing and research that is required to enhance the profile of the hydro-meteorological services. This will include increasing the availability of: i) weather and climate information and related products, including sector-specific risk and vulnerability maps; ii) tailored flood, drought, severe weather and agricultural stress alerts including colour-coded advisories, watches and warnings; and iii) integrated economic evaluation of the costs and benefits of efficient and effective use of weather and climate information (Output 2.2-2.4). This will support and guide adjustments to policies and domestic budgets (Output 2.3).
- Weather and climate information will be mainstreamed into national policies, annual budgets and local development plans including the National Policy for Disaster Preparedness and Management and district and sub-county development plans in priority districts in the Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango sub-regions. This will be achieved by building weather and climate information into **DDMPR's** national disaster risk reduction activities as well as local activities undertaken through the DDMC/SDDMCs (Output 2.2 and 2.3).
- Protocols and agreements developed and implemented for efficiently and effectively exchanging, processing and analysing data and information among DoM, DWRM, MAAIF, DRDPM, CCU and related institutions for making early warnings and long-term development plans will build on existing MoUs and agreements between the departments (Output 2.2-2.4).
- The Teso and Mt. Elgon sub-regions have been identified as extremely vulnerable to floods and drought. The use of mobile platforms have proved to be successful in two DoM pilot projects which focused on farmers in the Kasese district and fishers surrounding Lake Victoria, respectively. The LDCF project will expand these systems into the Teso and Mt. Elgon regions as well as integrate the use of two-way radios to assist community members and farmers with no mobile phone or who are using a different mobile service provider. This will be achieved by building on the public alerting system being developed and employed by **ITU** in collaboration with **UCC** for authorities to disseminate weather and climate information to local communities (Output 2.3 and 2.4).
- Innovative financing options – including appropriate government cost recovery arrangements, service level agreements and public-private partnerships – will build upon activities under the **JWESSP** in particular with regards to "facilitating establishment of the Uganda National Meteorological Authority". This includes aligning with the MWE Business Plan and the Modernisation Plan for the UNMA/DoM (Output 2.5).

A.6 Risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and measures that address these risks*:*

52. Risks, mitigation/reduction measures and assumptions to the LDCF project are summarised below, and assigned to indicators in the Project Results Framework (see Section 3 of the LDCF project). The risks are further detailed in the Risk Log in Annex 6 of the project document.

#	Risk	Mitigation/reduction measure	Assumption
1	Delayed implementation of baseline projects by the government and donors negatively affects LDCF project outcomes.	Continuous lobbying and sensitization of the policy makers based on evidence from the pilot sites to secure cooperation and commitment.	Baseline projects are implemented according to the timeline identified in the design phase of the LDCF project, and achieve the desired outcomes and objectives.
2	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.
3	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.
4	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.
5	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.
6	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.
7	Alerts and warnings required by communities are not feasible to produce due to scientific or technological failure.	The LDCF project will ensure that the training provided is based on the most up to date scientific and technical advances in the fields of hydrology and meteorology. A regional team of experts will be available on a full-time basis to provide support to work towards ensuring state-of-the-art technology and scientific methodology – suitable to the local context – is used.	The most up to date technology and scientific approaches and advances are feasible and appropriate for meeting the LDCF project needs. The level of error for forecasting is within the minimum thresholds appropriate for the LDCF project activities.

A.7. Coordination with other relevant GEF financed initiatives

53. To ensure that the LDCF funds are used in a strategic manner, the LDCF project aims to coordinate withthe climate change GEF LDCFfinanced project, "Building Resilience to Climate Change in the Water and Sanitation Sector ($8,370,000)", which aims to build resilience in flood- and drought-prone regions of Uganda through the water and sanitation sector and will be implemented by the Climate Change Unit, MWE. Furthermore, the LDCF project will link and coordinate with activities under the: i) African Center of Meteorological Application Development (ACMAD) – including those involving ICPAC and the GHACOF process (see Annex 3 in the LDCF project document for further details); 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); iii)WMO's Global Framework Climate Services (GFCS) initiative; and iv) the Uganda Red Cross Society.

54. Uganda Red Cross Society programme implements disaster risk reduction and early warning activities in vulnerable areas of Uganda including the Karamoja, Teso and Mt Elgon sub-regions. Activities are funded by several international Red Cross organisations (including Danish, German, British, andSwedish Red Cross). River gauges have been installed in key vulnerable areas and are read by trained community members. In the event that river level rises beyond a critical threshold height, warnings of impending flood are disseminated to local communities. These warnings are typically delivered by individuals on bicycles riding from house to house. In some areas, warnings are communicated with drums. Communities have been trained to use the refuges and evacuation routes established by the URCS programme. One shortcoming of these early warning mechanisms is that during extreme rainfall events, when monitoring is most important, people are typically indoors avoiding the rain.

55. This LDCF project is not a standalone project; it is part of a wider 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). Synergies between these projects will be used to enhance the cost-effective hiring of specialized technical staff, coordination of data and information (including inter-country sharing where feasible), training (operations & maintenance of equipment; forecasting techniques; tailored advisories and warnings), and effective use of communications and standard operating procedures.

56. In all project countries, upgrades and rehabilitation of the hydrometeorological monitoring network will be complemented by providing local stakeholders with training and capacity-building in operation and maintenance of the improved infrastructure (Outputs 1.1 and 1.2). In addition, project countries will be provided with training and capacity-building for modelling and forecasting climate and weather, as well as generating tailored climate information packages and sector-specific Early Warnings (Outputs 1.4, 2.1 and 2.2). 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, which will result in an increase in the cost-effectiveness of LDCF project investments.

57. All 10 LDCF African EWS projects will include activities, which will 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 2.3 and 2.4). The appointment of suitably qualified technical staff to provide technical support to all project countries, including Uganda, will reduce the budget and time allocated to hiring and training and 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 junior and senior hydrologists and meteorologists to produce forecasts and develop tailored hydro-meteorological information can be undertaken through regional workshops, which will allow all project countries to share costs such as workshop facilities and accommodation, hiring technically skilled trainers and purchasing/developing appropriate training materials.

58. All of the abovementioned African climate and Early Warning Systems projects will include an output that will develop a sustainable financing strategy for ongoing operation and maintenance of the newly enhanced hydrometeorological networks, which may include leveraging financing and logistic support from private sector companies and relevant socio-economic sectors, notably aviation and

telecommunications(Output 2.5). Wherever possible coordination of activities, which include public-private partnerships between various project countries, will assist participating private sector companies to engage efficiently and cost-effectively with the LDCF projects, and will simultaneously improve the negotiating position of each individual government. Further details on the cost-effectiveness benefits of this approach are provided in section B.3.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

B.1 Describe how the stakeholders will be engaged in project implementation.

59. The lead institution for all project outputs is the Ministry of Water and Environment. The implementation strategy for the project is dependent on comprehensive stakeholder participation. Participating stakeholders and their key responsibilities are detailed in Table 6 below.

Table 6. Relevant partners and stakeholders identified for engagement by project outcome/output.

Outcome	Output	Lead Institution	Key Partners	Key Responsibilities
Outcome 1 Enhanced capacity of the DoM and DWRM to monitor and forecast extreme weather, hydrology and climate change.	**Output 1.1** 16 Automatic Water Level Stations (AWLSs) installed and 40 manual hydro-meteorology stations and 5 AWLSs rehabilitated in the Victoria, Kyoga, Albert and Upper Nile Water Management Zones (WMZs.)	MWE (DWRM)	DoM, DLGs	Undertake systematic analysis. Procure and install AWLSs. Undertake repairs. Procure spare parts. Integrate AWLSs into existing DWRM network.
	Output 1.225 Automatic Weather Stations (AWS) installed and 32 manual (12 synoptic, 10 agro-meteorological and 10 hydro-meteorological) and 32 AWSs rehabilitated in priority districts.	MWE (DoM)	DWRM, DLGs	Undertake systematic analysis. Procure and install AWSs. Upgrade existing stations. Procure spare parts. Integrate AWSs into existing DoM network.
	Output 1.3 Weather and climate forecasting facilities upgraded including an integrated hydro-meteorological data management and information system and an online web platform for operationalizing collaboration arrangements and procedures between DWRM and DoM.	MWE (DoM)	DWRM, DRDPM, CCU, MAAIF, DLGs	Procure and install equipment. Upgrade and update the national DoM database and information management system. Undertake data rescue and digitization. Develop and implement a data protocol. Develop and establish an online web platform.
	Output 1.4 Capacity developed for operating and maintaining observation networks and related infrastructure including training 9 meteorological and 10 hydrological trainers and 50 weather observers, raising local community	MWE (DoM)	DWRM	Develop an observation network quality control and maintenance toolbox. Develop and implement a management protocol. Train five meteorological and six hydrological technicians. Establish operation and maintenance training

	awareness, developing an O&M toolbox, and establishing internal arrangements and procedures between DoM and DWRM.			facilities. Assist trained meteorologists and hydrologists to conduct training workshops. Assist 5 trainers to conduct training of 50 weather observers.
Outcome 2 Efficient and effective use of hydro-meteorological and environmental information for making early warnings and long-term development plans.	**Output 2.1**Technical capacity of DoM and DWRM is strengthened by training 16 forecasters – including 8 senior and 8 junior – to build in-house capacity for producing standard and customised weather and climate forecasts and packaging hydro-meteorological data and information into a suitable format for user-agencies and local community end-users.	MWE (DoM)	DWRM	Conduct training of 4 senior meteorologists and 4 junior meteorologists. Conduct training of 4 senior hydrologists and 4 junior hydrologists. Develop training packages and toolkits. Support 2 hydro-meteorological internships.
	Output 2.2 Tailored weather and climate information (including colour-coded alerts – advisories, watches and warnings – for flood, drought, severe weather and agricultural stresses, integrated cost-benefit analyses and sector-specific risk and vulnerability maps) made accessible to decision makers in government, private sector, civil society, development partners and local communities in the Teso and Mt Elgon sub-region.	MWE (DoM)	DWRM, DRDPM, MAAIF, DLGs	Undertake a comprehensive assessment of existing centralized and decentralized early warning systems. Develop and promote general climate information online platform. Train 4personnel from MAAIF, DRDPM, DoM and DWRM. Develop and implement protocols and agreements for data and information exchange. Develop tailored weather and climate alerts. Develop handbooks and policy briefs.
	Output 2.3 Weather and climate information mainstreamed into national policies, annual workplans and local development including the National Policy for Disaster Preparedness and Management, and district and sub-county development plans in priority districts in the Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango sub-regions.	OPM (DRDPM)	MWE (DoM, DWRM, CCU), NPA, MAAIF, MoFPED, MoH, DLGs	Identify, review and propose revisions to sectoral policies, strategies, investment plans and annual budgets. Develop the capacity of Sub-County and District DMCs. Develop a national weather and climate information and early warning system communication and coordination strategy.

	Output 2.4 Governmental and non-governmental communication channels and procedures for issuing alerts including advisories, watches and warnings are strengthened at a national and local level including the development of an early warning system dissemination national and local toolbox and mobile-based alert platforms in the Teso and Mt Elgon sub-regions.	OPM (DRDPM)	MWE (DoM, DWRM, CCU), MAAIF, MLG, CSOs, UCC, private sector.	Develop SoPs. Develop an early warning system dissemination national and local toolbox. Equip and facilitate DRDPM and DDMCs to support the dissemination of weather and climate information. Develop a SMS-based alert system.
	Output 2.5 Sustainable financing options – including appropriate government cost recovery arrangements, service level agreements and public-private partnerships – identified, developed and implemented for the operation and maintenance of the installed hydro-meteorological observation, forecasting and early warning system.	MWE (DoM)	DWRM, MoFPED, UCC, private sector, DLGs, UWA, CCU	Conduct a comprehensive study to establish the viability of different sources of revenues – rated as mixed good/commercial as well as public good. Develop and implement sector-specific marketing strategy and program. Review and propose revisions to the current cost recovery arrangements/government reimbursements. Develop service-level agreements for government organizations and private companies requiring specific customized meteorological services.

B.2 Describe the socioeconomic benefits to be delivered by the Project at the national and local levels, including consideration of gender dimensions, and how these will support the achievement of global environment benefits (GEF Trust Fund/NPIF) or adaptation benefits (LDCF/SCCF):

60. Climate information and EWS will benefit both the poorer segments of society which do not necessarily benefit from large protective infrastructure projects[20]; and the hydro-meteorological services and other user-agencies e.g. extension services, which utilise weather and climate information.

61. The LDCF project will introduce new infrastructure – including weather stations and forecasting facilities – while building upon, and being integrated into, the existing DoM and DWRM infrastructure and capacity. LDCF project activities will complement existing meteorological and hydrological support programmes being funded by WB and GIZ. This will benefit national hydro-meteorological infrastructure for the effective and efficient use of information for making early warnings and long-term development plans.

62. The LDCF project will also benefit the DWRM and DoM by developing human technical capacity in order to maintain and operate meteorological and hydrological observation networks and systems. Training

[20]World Bank. 2010. Natural hazards, Unnatural disasters: Effective prevention through an economic lens. World Bank and United Nations.231 pp.

will be provided to 16 Forecasters, 5 meteorological and 5 hydrological technicians inDoM and DWRM, thereby building technical capacity in weather and climate forecasting as well as hydro-meteorological data handling. This will directly benefit these Government departments with associated benefits filtering down to community end-users at the local level.

63. At a national level, all regions will benefit from the placement of Automatic Weather Stations (AWSs) and Automatic Water Level Stations (AWLSs) which will extend the geographical coverage of Uganda's weather, climate and hydrological observation network. This will particularly address gaps in the observation network in the Western and Northern Regions of the country as well as build on activities in the Eastern Region of Uganda supported by WB and GIZ.

64. Tailored weather and climate information will be made accessible to decision-makers in government, private sector, civil society, development partners and local communities. This information will be mainstreamed into national policies as well as work and development plans. Government and non-government communication alert channels, including advisories, watches and warnings will be strengthened at the local and national levels.

65. Innovative financing options – including appropriate government cost recovery arrangements, service level agreements and potentially public-private partnerships – will be developed to provide sustainable finance for the operation and maintenance of the installed hydro-meteorological observation, forecasting and early warning systems. These financing options will benefit existing governmental financing structures by increasing financial sustainability and relieving existing financial pressure. Potentially the most significant economic benefits are associated with improved transport planning, notably within the aviation section, which can take advantage of improved local forecasts and monitoring. This sector and commercial agriculture represents some of the largest private clients prepared to pay for early warning services and tailored forecasts.

66. At a local level, the Kyoga Water Management Zone (WMZ) – which includes the Teso and Mt. Elgon sub-regions – will benefit from the LDCF project.

67. The Kyoga WMZ covers approximately 58,000 km^2, which mostly comprises relatively flat terrain between 900 and 1,150 m above sea level and includes the Teso and Elgon sub-regions. Mean annual precipitation exceeds 1,200 mm. There is considerable potential for the large-scale development of hydro-electricity production in the region[21]. The population of the Kyoga WMZ is estimated to be 9.3 million and the primary livelihood activity is agriculture[22]. Flood risk is very high throughout the WMZ while drought risk ranges from moderate to very high[23]. This zone includes the following catchments: Karamoja (Kapiri), Sironko, Lake Kyoga sub-catchment, Mpologoma and Kwania.

68. The Teso and Mt. Elgon sub-regions will benefit from tailored weather and climate information, specifically for flood, drought, severe weather and agricultural stresses, integrated cost-benefit analyses and sector-specific risk and vulnerability maps. The Teso sub-region – containing eight districts – is negatively impacted by cyclical floods, droughts, famine, conflicts and cattle-raiding and is consequently vulnerable to periodic food insecurity. Local governments and humanitarian parties endeavour to address issues of food security while disaster risk reduction activities are currently insufficient[24]. The Elgon sub-region – also containing eight districts – is susceptible to floods and landslides and is characterised by high levels of poverty as well as poor infrastructure and service delivery access[25].These sub-regions will also benefit from the development of mobile-based alert platforms**.** One of the aims of this initiative is to ensure that at least 50% of mobile phone users are women**.** It is essential that this goal is reached, as women in these regions are often the worst affected by the impacts of climate change, due to their predominantly agriculture-based

[21]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.
[22]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.
[23]The Republic of Uganda.2010. Operationalisation of Catchment-based Water Resources Management. Ministry of Water and Environment, Directorate of Water Resources Management: 1-135.
[24]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.
[25]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.

livelihoods[26]. Women need to be 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[27].

69. Priority sub-regions of Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango will also benefit from the mainstreaming of weather and climate information into *inter alia* the National Policy for Disaster Preparedness and Management, as well as district and sub-county development plans.

Criteria for project site selection

70. The criteria used to determine high priority regions – developed by key stakeholders in-country, included that the region: i) should lie in the cattle corridor; and ii) should be identified at a Water Management Zone level as well as sub-region level (Annex 11 and 11.2 in the project document).

71. Based on a simple multi criteria analysis of stakeholder feedback, which involved scoring sub-regions based on a ranked score, the Karamoja sub-region scored the highest for the implementation of community-based weather/climate information and early warning system outputs and activities. However, after presenting these results to stakeholders in-country, Karamoja was removed as a priority as, while Karamoja is prone to hazards and in particular drought hazards, many EWS interventions have already been implemented and are planned for this sub-region. Stakeholders reached the consensus that the Kyoga WMZ, which includes the Teso and Mt. Elgon sub-regions which received the second and third highest scores, should be prioritised.

B.3. Explain how cost-effectiveness is reflected in the project design:

72. Quantifying the cost effectiveness of improved climate information and early warning system investments is acknowledged to be difficult, and is therefore not regularly undertaken[28]. 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 relief[29]. 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)[30]. 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 the: i) population of the country; ii) level of climate-related risk; and iii) exposure to weather due to the state of infrastructure. It is estimated that, for all developing countries, the benefits of improved hydro-meteorological information, production of early warnings and associated capacity building/development will be[31].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.

73. 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. Various approaches could be adopted to achieve this objective. The proposed outputs and

[26]Tall, A. and Chouwdhury, M. 2012. Who gets the information? Gender, Power and Equity considerations in Climate Services Provision - Lessons from Climate Service Provision to Women Farmers in Kaffrine (Senegal), 2011-12. Working Paper. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): 1-60.
[27]Tall, A. and Chouwdhury, M. 2012. Who gets the information? Gender, Power and Equity considerations in Climate Services Provision - Lessons from Climate Service Provision to Women Farmers in Kaffrine (Senegal), 2011-12. Working Paper. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): 1-60.
[28]Tsirkunov, V. and Rogers, D. 2010.Costs and benefits of early warning systems. Global Assessment report on Disaster Risk Reduction. The World Bank.
[29]Healy, A. and Malhotra, N. 2009.Myopic Voters and Natural Disaster Policy. *The American Political Science Review* 103(3): 387-406.
[30]Tsirkunov, V. and Rogers, D. 2010.Costs and benefits of early warning systems. Global Assessment report on Disaster Risk Reduction. The World Bank.
[31]Hallegatte, S. 2012. A Cost Effective Solution to Reduce Disaster Losses in Developing Countries: Hydro-Meteorological Services, Early Warning, and Evacuation. Policy Research Working paper 6058. The World Bank.

procurement purchases of the LDCF project were assessed, in collaboration with government stakeholders, for cost-effectiveness and sustainability of investments (based on available government support) 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.

74. The approach taken to ensure cost-effectiveness of the LDCF project's outcomes is detailed further below.

Outcome 1: Enhanced capacity of the DoM and DWRM to monitor and forecast extreme weather, hydrology and climate change.

75. LDCF project activities will build on existing networks, achievements and planned actions by DoM and DWRM. This will allow institutional capacity to be built cost-effectively, ultimately assisting in planning and implementing the early warning system. 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 rather than creating new systems, which would result in additional start-up and opportunity costs. Additionally this approach builds local capacity and maximises the baseline EWS on which future investments can build. The LDCF project will also work closely with existing DoM and DWRM projects to co-produce outputs. This will promote cost-sharing with these other projects, reducing overheads and enhancing cost-effectiveness. The LDCF project will develop sustainable financing mechanisms to support the operation and maintenance of the improved hydro-meteorological network. In particular, there is potential for improved early warning services and tailored forecasts to generate revenue from the aviation and commercial agriculture sectors. Income generation will greatly enhance the cost-effectiveness of the project as costs will be partially offset through increased revenue.

76. Equipment purchases and repairs to existing infrastructure were evaluated for cost-effectiveness. In order to maximise the geographic coverage of the hydro-meteorological network, a large proportion of existing infrastructure will be rehabilitated in addition to the procurement of new AWSs. Rehabilitating existing equipment is more cost-effective than procuring new equipment, as there is a lower unit cost. Stakeholders within the DWRM and DoM were consulted extensively on the likely extent of training that would be required for personnel to operate various equipment types in order to ensure that training was included in cost-effectiveness considerations.

Outcome 2: Efficient and effective use of hydro-meteorological and environmental information for making early warnings and long-term development plans.

77. 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 meteorologists; ii) internships in national meteorological hydrological services; iii) a weather and climate information online platform; and iv) 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.

78. 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. Proposed outputs are considered cost-effective relative to the alternative approaches considered to address project barriers, as shown in the table7 below.

79. This LDCF project is not a standalone project; it is part of a wider 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). Synergies between these projects will be used to enhance the cost-effective hiring of specialized technical staff, coordination of data and information (including inter-country sharing where feasible), training (operations & maintenance of equipment; forecasting techniques; tailored advisories and warnings), and effective use of communications and standard operating procedures.

80. Surveying the technical support needs for each country a set of common specialized technical staff were identified, each with particular skills related to the development of hydroclimatic observing systems, the effective design and implementation of standard operating procedures and tailored warnings/advisories, as well as the communication of advisories/warnings. Hiring 3-4 full-time technical staff, which can provide the needed support for all countries, will be more cost effective than hiring the same staff as 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 who will support all countries in this multi-country programme.

81. Training and capacity building for operations and maintenance of the hydromet infrastructure and for modeling and forecasting (Outputs 1.1, 1.2 and 1.4) can also be done at a regional level, bringing together participants from all countries to encourage knowledge sharing and the development of collective skills. This has several advantages, namely: i) promoting the sharing of information and learning between countries; ii) encouraging discussions of best practices i.e. what works, reasons for failure etc; and iii) increasing the effective pool of skilled resources which each country can draw upon (increasing the potential for future trainings to be conducted by experts within the region). Such activities will be closely coordinated with other regional and international partners/centres e.g. WMO/GFCS, ACMAD, ICPAC etc.

82. Regional support will also be used to help strengthen the development of standard operating procedures (both the procedures themselves and their legal basis), for the development, issuing and communication of warnings/advisories (Outputs 2.1, 2.2 and 2.3), where possible incorporating warnings issued by neighbouring countries e.g. in the case of shared watersheds. This will allow all project countries to benefit from shared information, lessons learned and best-practices. For example, the training of junior and senior hydrologists and meteorologists to produce forecasts and develop tailored hydro-meteorological information can be undertaken through regional workshops, which will allow all project countries to share costs such as workshop facilities and accommodation, hiring technically skilled trainers and purchasing/developing appropriate training materials.

83. All projects under this programme will develop a sustainable financing strategy for ongoing operation and maintenance of the newly enhanced hydrometeorological networks, which may include leveraging financing and logistic support from private sector companies and relevant sectors, notably aviation and telecommunications. Where private sector engagement (Output 2.4 and 2.5) includes multi-national corporations, regional support will assist engaging head offices in multiple countries, increasing the total effective services being offered and hence bargaining position of each government. In the case of mobile (cellular) communications (which may be used for both disseminating alerts and the collection of data used to generate alerts), the regional support programme will leverage collective negotiations for data services, as well as engaging with corporate social responsibility programmes to enhance services where possible.

Table 7. Alternatives considered for the project.

Output	Barrier Addressed	Alternatives Considered
Output 1.1 16 Automatic Water Level Stations (AWLSs) installed and 40 manual hydro-meteorology stations and 5 AWLSs rehabilitated in the Victoria, Kyoga, Albert and Upper Nile Water Management Zones (WMZs.).	Obsolete and inadequate weather, climate and hydrological monitoring infrastructure, which limits data collection, analysis and provision of meteorological services. Limited knowledge and capacity to effectively predict future climate events as a result of an acute shortage of technology and skilled human resources.	**Alternative 1:** Expansion of the hydrological monitoring network through only procurement of new Automatic and Manual Stations. However, the costs and technical challenges of maintain a dramatically expanded automated monitoring system is unlikely to be sustainable given the limited availability of maintenance funding and suitable qualified technicians. Therefore an emphasis on rehabilitation of existing infrastructure, as well as procurement of new equipment and associated training, has been adopted **Alternative 2:** Various sources of equipment could be used. However, budgets were developed based on existing models that are used in the country as well as endorsed by the relevant stakeholders. Local stakeholders indicated that they preferred to use particular models as they already have experience with these models. At times these models were more costly, however, stakeholders indicated that these were most suitable for the local context and easier to maintain. This is more cost-effective in the long-term. Using different models would increase the training and maintenance costs.
Output 1.2 25 Automatic Weather Stations (AWS) installed and 32 manual (12 synoptic, 10 agro-meteorological and 10 hydro-meteorological) and 32 AWSs rehabilitated in priority districts.	Obsolete and inadequate weather, climate and hydrological monitoring infrastructure, which limits data collection, analysis and provision of meteorological services. Limited knowledge and capacity to effectively predict future climate events as a result of an acute shortage of technology and skilled human resources.	**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. **Alternative 2:** Expansion of the meteorological monitoring network through only procurement of new Automatic and Manual Stations. However, the costs and technical challenges of maintain a dramatically expanded automated monitoring system is unlikely to be sustainable given the limited availability of maintenance funding and suitable qualified technicians. Therefore, an emphasis on rehabilitation of existing infrastructure, as well as procurement of new equipment, has been adopted. **Alternative 3:** Lighting 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 given the project timeframe and budget. It is important to note that lightning detection cannot be considered as an alternative to an automatic observation network. This is because it essentially measures different variables that have their own

		usefulness (especially for short-term flood forecasting) for which there is no better alternative than radar technology. Based on a thorough investigation of the costs and benefits of these technologies for Uganda, certain detectors can be installed including supporting data loggers, GSM modems, database and visualization software. This, however, is beyond the scope of the LDCF project and therefore will need to be covered by additional donor and/or budget lines in future. **Alternative 4:** 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, as a result of the high costs and extensive technical capacity requirements for operation and maintenance of these technologies, radar was not considered an option for this LDCF project. The GoU recommended that investments in simpler, more fundamental skills and technologies would be more sustainable and appropriate to the local context.
Output 1.3 Weather and climate forecasting facilities upgraded including an integrated hydro-meteorological data management and information system and an online web platform for operationalizing collaboration arrangements and procedures between DWRM and DoM.	Limited knowledge and capacity to effectively predict future climate events as a result of an acute shortage of technology and skilled human resources. No systematic process for packaging, translating and disseminating weather/climate information and warnings – including different information sources across – and within country borders.	**Alternative 1:** 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. **Alternative 2:** Forecasting and data management capacity is sourced offshore. However this is not popular with GoU as this places data (which is considered a national asset) offshore and does not build local human and technical capacities.
Output 1.4 Capacity developed for operating and maintaining observation networks and related infrastructure including training 9 meteorological and 10 hydrological trainers and 50 weather observers, raising local community awareness, developing an O&M toolbox, and establishing internal arrangements and procedures between DoM and DWRM.	Long-term sustainability of observational infrastructure and technically skilled human resources.	**Alternative 1:** All operation and maintenance can be outsourced to a private company through a PPP (public private partnership) to enable the company time to train information production personnel over a longer period of time. However, local stakeholders are already experienced with the equipment that will be used in the rehabilitated monitoring network and can make use of previous experience in training personnel.
Output 2.1 Technical capacity of DoM and DWRM is strengthened by training 16 forecasters – including 8 senior and 8 junior – to build in-house capacity for producing standard and customised weather and climate forecasts and packaging hydro-meteorological data and information into a suitable format for user-agencies and local	Limited knowledge and capacity to effectively predict future climate events as a result of an acute shortage of technology and skilled human resources. No systematic process for packaging, translating and disseminating weather/climate information and warnings –	**Alternative 1:** Technical capacity of forecasters could be built purely through regional and international training centers. However this option may be less cost-effective because it does not capitalize on the existing internal forecasting and training expertise within DoM and DWRM and will reduce the upscaling of technical capacity within these departments through the LDCF project. **Alternative 2:** Only regional and international products are used. This would reduce their applicability and usefulness within the districts and sectors

community end-users.	including different information sources across – and within country borders.	targeted in Uganda
Output 2.2 Tailored weather and climate information (including colour-coded alerts – advisories, watches and warnings – for flood, drought, severe weather and agricultural stresses, integrated cost-benefit analyses and sector-specific risk and vulnerability maps) made accessible to decision makers in government, private sector, civil society, development partners and local communities in the Teso and Mt Elgon sub-region.	No systematic process for packaging, translating and disseminating weather/climate information and warnings – including different information sources across – and within country borders. Poor community level usage of climate information as a result of limited consolidation of effective dissemination channels including physical mechanisms and limited trust in warnings received.	**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 to clarify disaster prevention strategies. Also, there would be no standards applied to the generation and packaging of 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. The decision-maker will not have access to sector-specific information that would guide planning and budgeting. This will result in sub-optimal delivery of DRR and other services.
Output 2.3 Weather and climate information mainstreamed into national policies, annual workplans and local development including the National Policy for Disaster Preparedness and Management, and district and sub-county development plans in priority districts in the Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango sub-regions.	No systematic process for packaging, translating and disseminating weather/climate information and warnings – including different information sources across – and within country borders. Poor community level usage of climate information as a result of limited consolidation of effective dissemination channels including physical mechanisms and limited trust in warnings received.	**Alternative 1**: Allow national, district and local policy-making and planning to continue under present *modus operandi*. 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 2.4 Governmental and non-governmental communication channels and procedures for issuing alerts including advisories, watches and warnings are strengthened at a national and local level including the development of an early warning system dissemination national and local toolbox and mobile-based alert platforms in the Teso and Mt Elgon sub-regions.	No systematic process for packaging, translating and disseminating weather/climate information and warnings – including different information sources across – and within country borders. Poor community level usage of climate information as a result of limited consolidation of effective dissemination channels including physical mechanisms and limited trust in warnings received.	**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 *inter alia* 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. Have separate data portals for each agency to ensure security: however, this would prohibit the easy use of data across agencies and a potential means to share data internationally.
Output 2.5 Sustainable financing options –	Long-term sustainability of observational	**Alternative 1:** Operation and maintenance of upgraded hydro-meteorological

including appropriate government cost recovery arrangements, service level agreements and public-private partnerships – identified, developed and implemented for the operation and maintenance of the installed hydro-meteorological observation, forecasting and early warning system.	infrastructure and technically skilled human resources.	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 valuable services. Furthermore, the limited availability of funding from DoM and DWRM budgets is likely to affect the efficacy and sustainability of the LDCF project's investments.

C. DESCRIBE THE BUDGETED M &E PLAN:

84. The project will be monitored through the following M& E activities. The M&E budget is provided in Table 8below. 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.

85. **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.

86. 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.
- Based on the project results framework and the LDCF related AMAT set out in the Project Results Framework in Section 3 of this project document, and finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck 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.

87. 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.

88. **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 (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs will be used to monitor issues, lessons learned. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

89. **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.

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

- Progress made toward project objective and project outcomes - each with 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
- ATLAS QPR

91. 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 no less than one month after the visit to the project team and Project Board members.

92. **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 3 of this project document) will also be completed during the mid-term evaluation cycle.

93. **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 3 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 Office Evaluation Resource Center (ERC).

94. **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 though 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.

95. Audit: Project will be audited in accordance with UNDP Financial Regulations and Rules and applicable audit policies.

Table 82.Project Monitoring and Evaluation

Type of M&E activity	**Responsible Parties**	**Budget US$** *Excluding project team staff time*	**Time frame**
Inception Workshop and Report	▪ 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.	▪ 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 *output and*	▪ Oversight by Project Manager (MEE) ▪ PIU, esp. M&E expert ▪ Implementation teams	To be determined as part of the Annual Work Plan's	Annually prior to ARR/PIR and to the definition of annual work plans

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time frame
implementation		preparation. Indicative cost is 20,000	
ARR/PIR	▪ Project manager (MEE) ▪ PIU ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually
Periodic status/ progress reports	▪ Project manager and team	None	Quarterly
Mid-term Review	▪ 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	▪ 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	▪ UNDP CO ▪ Project manager (MEE) ▪ PIU	Indicative cost per year: 3,000 (12,000 total)	Yearly
Visits to field sites	▪ UNDP CO ▪ UNDP RCU (as appropriate) ▪ Government representatives	For GEF supported projects, paid from IA fees and operational budget	Yearly for UNDP CO, as required by UNDP RCU
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US$ 117,000	

PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. Record of Endorsement of GEF Operational Focal Point(s) on Behalf of the Government(s):(Please attach theOperational Focal Point endorsement letter(s) with this form. For SGP, use this OFP endorsement letter).

NAME	POSITION	MINISTRY	DATE*(MM/dd/yyyy)*
Keith Muhakanizi	Deputy Secretary to the Treasury	Ministry of Finance, Planning and Economic Development, Uganda	04/24/2012

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for CEO endorsement/approval of project.

Agency Coordinator, Agency Name	Signature	Date *(Month, day, year)*	Project Contact Person	Telephone	Email Address
Adriana Dinu, Officer-in-Charge, and Deputy Executive Coordinator, UNDP/ GEF		July 23, 2013	Mark Tadross Technical advisor, GLECRDS	+27216502884	mark.tadross@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: Natural and Energy resources are used and managed in a manner that is sustainable and contributing to growth and poverty reduction.					
Country Programme Outcome Indicators: i) number of institutions integrating environment, climate change and energy access in development plans (disaggregated by level i.e. national/ Local government); ii) % of targeted Environment, natural resources management and Climate change adaptation/ mitigation pilot initiatives (innovative practices) implemented %; and iii) number of policies and strategies reviewed/ developed to draft stage.					
Primary applicable Key Environment and Sustainable Development Key Result Area: 3. Promote climate change adaptation					
Applicable SOF (e.g. GEF) Strategic Objective and Program: Climate Change Adaptation Objective 2 **"**Increase adaptive capacity to respond to the impact of climate change, including variability, at local, national, regional and global level"					
Applicable SOF (e.g. 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."					
Applicable SOF (e.g. .GEF) Outcome Indicators: • Relevant risk information disseminated to stakeholders; • Type and scope of monitoring systems in place; and • % of population covered by climate change risk reduction measures.					
	Indicator	**Baseline**	**Targets End of Project**	**Source of verification**	**Risks and Assumptions**
Project Objective[32]**:** To strengthen the weather, climate and hydrological monitoring capabilities, early warning systems and available information for responding to extreme weather and planning adaptation to climate change in Uganda.	1. Capacity as per capacity assessment scorecard (see Annex 7 in the project document). 2. Domestic finance committed to DoM, DWRM and other relevant institutions to monitor extreme weather and climate change.	1. Average capacity scorecard rating of **77** across men and women (Annex 7 in the project document). 2. Annual budget of **US$1,500,000** and **$ 450,000** allocated to DoM and DWRM respectively to monitor extreme weather and climate change.	1. CCA capacity scorecard rating is increased to an average of**143** for both men and women (Annex 7 in the project document). 2. **>20%** increase in domestic financing committed to DoM, DWRM and other relevant institutions to monitor extreme weather and climate change (including equipment operation and maintenance)[33].	1. Capacity assessment scores based on focus group interviews with climate monitoring and EWS-related stakeholders; consultant reports. 2. Review of DoM and DWRMannual budget.	Risk: Delayed implementation of baseline projects by the government and donors negatively affects LDCF project outcomes. Assumption: Baseline projects are implemented according to the timeline identified in the PPG phase of the LDCF project, and achieve the desired outcomes and objective. Risk: Installed hydro-meteorological equipment fails because it is vandalised or not maintained. Assumption: 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. Risk: 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. Assumption: 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. Risk: Local information technology and telecommunications infrastructure restricts the transfer of data from installed

[32] *Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR*

[33] To be confirmed and finalized during the inception phase.

					equipment to necessary recipients, and restricts communication amongst key role players and end-users. Assumption: 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 information. Risk: 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. Assumption: UNDP CO and HQ will co-ordinate with the IP to ensure effective administrative planning meaning the equipment is procured and installed in a timely manner.

Outcome 1[34]**:** Enhanced capacity of the DoM and DWRM to monitor and forecast extreme weather, hydrology and climate change.	1. % of national coverage of climate/weather and hydrological infrastructure.	1. DoM [35]–**10%** national coverage of operational manual (**9 %**) and automatic (**1%**) weather (synoptic, agro/hydro-meteorological) stations (Annex 8 in the project document). 1.DWRM**– 28%** national coverage of operational surface hydrometric stations (**24%**) and automatic weather stations (**4%**) (Annex 8 in the project document)[36]. 1.Number and Type (operational stations): Automatic weather stations: 6 Manual synoptic, agro/hydro-meteorological stations: 12 Surface hydrometric stations: 35	1. DoM[37] –**47%** national coverage of operational manual (**26%**) and automatic (**33%**) weather (synoptic, agro-/hydro-meteorological) stations[38] (Annex 8 in the project document). 1.DWRM[39] – **50%** national coverage of operational surface hydrometric stations (**50%**) and automatic weather and water level stations (**19%**)[40] (Annex 8 in the project document). 1.Number and Type (operation stations) Automatic weather stations: 36 Manual synoptic, agro/hydro-meteorological stations: 44 Surface hydrometric stations: 75	1. Field inspection of AWS sites; review of climate monitoring database.	Risk: Delayed implementation of baseline projects by the government and donors negatively affects LDCF project outcomes. Assumption: Baseline projects are implemented according to the timeline identified in the PPG phase of the LDCF project, and achieve the desired outcomes and objective. Risk: Installed hydro-meteorological equipment fails because it is vandalised or not maintained. Assumption: 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. Risk: 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. Assumption: 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. Risk: 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. Assumption: 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

[34]All outcomes monitored annually in the APR/PIR.

[35]Manual stations are operational in 11 out of 121 districts, which equates to **9.1%** coverage. Automatic stations are operational in 1 out of 121 districts, which equates to **1%** coverage. Manual and automatic stations are operational stations in 14 out of 121 districts, which equates to **10%** (Annex 8 in the project document).

[36]Surface hydrometric stations areoperational in 29 districts out of 121, which equates to **24%**. Automatic weather stations are operational in 5 districts out of 121, which equates to **4.1%**. Surface hydrometric stations and automatic weather stations are operational in 34 districts out of 121, which equates to **28.1**% coverage.
(Annex 8 in the project document)

[37] This includes 25 Automatic Weather Stations (AWS) installed and 32 manual (12 synoptic, 10 agro-meteorological and 10 hydro-meteorological) and 32 AWSs rehabilitated in priority districts.

[38]Manual stations are operational in 32 districts out of 121, which equates to **26%** coverage. Automatic stations are operational in 40 districts out of 121, which equates to **33%** coverage. Manual and automatic stations are operational in 57 districts out of 121, which equates to **47%** (Annex 8 in the project document**).**

[39]This includes 16 Automatic Water Level Stations (AWLSs) installed and 40 manual hydro-meteorology stations and 5 AWSs rehabilitated in the Victoria, Kyoga, Albert and Upper Nile Water Management Zones (WMZs.)

[40]*Manual stations are* operational in 61 districts out of 121, which equates to **50.4%**. *Automatic weather stations* are operational in 24 districts out of 121, which equates to **19.8%**. *Manual and automatic stations* are operational in 61 districts out of 121, which equates to **50.4%** coverage (Annex 8 in the project document)

	2. Frequency and timeliness of climate-related data availability.	Automatic water level stations: 0 2. **DoM– >Hourly** for synoptic stations. ; and**>Once a month** for agro- and hydro-meteorological stations. Seasonal forecasts have a lead-time of 0-2 weeks. Monthly weather reviews and forecasts are not issued at present. Agro-met monthly advisories are not issued at present. 2. **DWRM –** weekly to monthly.	Automatic water level stations: 16 2. **DoM – Hourly** for synoptic stations; and **dekadal**(every ten-days) for agro- and hydrometeorological stations. Seasonal forecasts have a lead-time of 2 weeks. Once a month a monthly weather review and forecasts is issued. Once a month an agro-met advisory is issued. 2. **DWRM – 6 hourly**; and **2-4 hourly** for flood prone sub-regions.	2. Review of weather, hydrological and climate monitoring databases.	of information. Risk: 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. Assumption: UNDP CO and HQ will co-ordinate with the IP to ensure effective administrative planning meaning the equipment is procured and installed in a timely manner. Risk: Alerts and warnings required by communities are not feasible to produce due to scientific or technological barriers. Assumption: The most up to date technology and scientific approaches and advances are feasible and appropriate for meeting the LDCF project needs. The level of error for forecasting is within the minimum thresholds appropriate for the LDCF project activities.
Outcome 2 Efficient and effective use of hydro-meteorological and environmental information for making early warnings and long-term development plans.	1. % of population with access to improved climate information and drought, flood and severe storm warnings (disaggregated by gender). 2. Sector-specific policies, annual budgets and development plans that integrate	1. 3% of men and 3% women with access to improved climate information and flood, drought and severe weather warnings (*to be confirmed during project inception)*. Male: 920,000 Female: 1,010,000[41] 2. **0**	1. 12% of men and 12% women with access to improved climate information and flood, drought and severe weather warnings*(to be confirmed during project inception).* Male: 3,300,000 Female: 3,700,000[42] 2. **3** sector specific policies (including the National Policy for Disaster Preparedness and Management),	1. Gender-sensitive field surveys undertaken within identified priority sites, representative the Ugandan population; consultant reports. 2.Review of policies, annual budgets and development plans to validate	Risk: Lack of commitment from communities where EWS are established undermines the effectiveness of the LDCF project demonstrations. Assumption: 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. Risk: 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. Assumption: 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 information.

[41] Based on estimates of the population in districts covered by ACTED DEWS (Abim, Amudat, Kaabong, Kotido, Moroto, Nakapirip, Npak) and 2000 individuals in the Kalangala and Kasese Districts covered by mobile alert platforms under the DMO pilot projects described in the baseline situation. The sex ratio in Uganda was used to determine population estimates for males and females in each of the districts.
[42]Based on population estimates in the Teso and Mt Elgon sub-regions which will benefit from colour-coded alerts – advisories, watches and warnings – for flood, drought, severe weather and agricultural stresses and mainstreaming of climate information and EWS into local development plans as well as districts in the Bukedi, Busoga, Acholi, and Lango sub-regions which will benefit from mainstreaming of climate information and EWS into local development plans.

	climate information (type and level of development plans).		investment plans and annual budgets and **10** district development plans.	incorporation of risk, weather and/or climate information.	

ANNEX B: RESPONSES TO PROJECT REVIEWS (from GEF Secretariat and GEF Agencies, and Responses to Comments from Council at work program inclusion and the Convention Secretariat and STAP at PIF).

Council Comment (USG)	UNDP Response
1. Include detailed activities related to production of climate/hydrological information, communications and sustaining this work and retaining expertise, particularly under component 2.	Detailed activities related to production of climate/hydrology information have been included under Output 2.2 and 2.4. For example developing tailored weather and climate alerts including colour-coded advisories, watches and warnings for flood, drought, severe weather and agricultural stresses by integrating and customising standard forecasts, e.g. daily, ten-day and monthly agro-meteorological bulletins, seasonal forecasts, based on sector specific and end-user needs and in collaboration with DWRMA, MAAIF and DRDPM. This will include field visits and stakeholder consultations 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. SOPs (including protocols and agreements between relevant MDAs) for disseminating weather, climate and hydrological information including alerts across all levels will be developed. This will be complemented by 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 alerts to end-users. The DRDPM and local DDMCs will be facilitated and equipped in the Teso and Mt. Elgon sub-regions to apply SOPs and disseminate warnings. 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.
2. Maintain close relationships and establish partnerships with relevant organizations working on climate and hydrometeorological services in the project region and make use of lessons learned from related efforts. This will strengthen capacity and connectivity within the broader region.	Efforts to ensure that close relationships are established/maintained has 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, Eumetsat, ICPAC and others. Partnerships will be formed through MoUs and formalized agreements.
3. 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	Both providers (DoM and DWRM) and users (DRDPM, MAAIF) of climate and environmental information have been consulted to ensure that the project is driven by the needs of the users. See annex 11 Key Assessment Report in the project document for detail of inputs from stakeholders. During project implementation, a comprehensive assessment of existing centralised and decentralised early warning systems – including existing weather and climate information exchange mechanisms, communication channels and dissemination mechanisms between DoM, user agencies and end-users – will be conducted to establish best practices and gaps suitable for implementation for the Teso and Mt Elgon sub-regions in Uganda. This will include household surveys of targeted users of climate information to understand the social and economic costs and benefits of using advisories and warnings for *ex-ante* risk management in agriculture and

	water management. User-friendly channels for delivery of information such as SMS and Radio have been identified and will be used during project implementation. Outputs 1.1 to 1.5 have all been designed in consultation with stakeholders to identify the procurement and rehabilitation needs for the climate and hydrology observation infrastructure. Also Outputs 2.2 and 2.4 have taken specific inputs from stakeholders to ensure they are compliant with local needs.
4. 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.	The 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 (Output 2.2 and 2.4). Different groups in Uganda have different vulnerabilities based on their culture, gender, caste, ethnicity or other characteristics that influence their capacities to prepare, prevent and respond effectively to disasters. Women and men often play different roles in society and have different access to information in disaster situations. 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.
5. Activities related to data stewardship should be expanded to include a plan for data sharing throughout the region and globally.	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 UgandaLDCF project and related initiatives in other LDCF project countries as well as regional initiatives such as i) African Center of Meteorological Application Development (ACMAD) – including those involving ICPAC and the GHACOF process (see Annex 3); 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.
6. Clearly articulate the sectors that will benefit from the project, and include considerations of the adaptation priorities and needs of local communities.	Sectors in Uganda that will benefit from the project include the water, environment, agriculture, disaster risk management and civil aviation sector. Section 2.3.2 details the local and national benefits that this project will provide. At a local level, the Kyoga Water Management Zone (WMZ) – which includes the Teso and Mt. Elgon sub-regions – will benefit from the LDCF project. The Kyoga WMZ covers approximately 58,000 km^2, which mostly comprises relatively flat terrain between 900 and 1,150 m above sea level and includes the Teso and Elgon sub-regions. Mean annual precipitation exceeds 1,200 mm. There is considerable potential for the large-scale development of hydro-electricity production in the region[43]. The population of the Kyoga WMZ is estimated to be 9.3 million and the primary livelihood activity is agriculture[44]. Flood risk is very high throughout the WMZ while drought risk ranges from moderate to very high[45]. This zone includes the following catchments: Karamoja (Kapiri), Sironko, Lake Kyoga sub-catchment, Mpologoma and Kwania. The Teso and Mt. Elgon sub-regions will benefit from tailored weather and climate information, specifically for flood, drought, severe weather and agricultural stresses, integrated cost-benefit analyses and sector-specific risk and vulnerability maps. The Teso sub-region – containing eight districts – is negatively impacted by cyclical floods, droughts, famine, conflicts and cattle-raiding and is consequently vulnerable to periodic food insecurity.

[43]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.
[44]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.
[45]The Republic of Uganda.2010. Operationalisation of Catchment-based Water Resources Management. Ministry of Water and Environment, Directorate of Water Resources Management: 1-135.

	Local governments and humanitarian parties endeavour to address issues of food security while disaster risk reduction activities are currently insufficient[46]. The Elgon sub-region – also containing eight districts – is susceptible to floods and landslides and is characterised by high levels of poverty as well as poor infrastructure and service delivery access[47].These sub-regions will also benefit from the development of mobile-based alert platforms**.** One of the aims of this initiative is to ensure that at least 50% of mobile phone users are women**.** It is essential that this goal is reached, as women in these regions are often the worst affected by the impacts of climate change, due to their predominantly agriculture-based livelihoods[48]. Women need to be 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[49]. 79. Priority sub-regions of Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango will also benefit from the mainstreaming of weather and climate information into inter alia the National Policy for Disaster Preparedness and Management, as well as district and sub-county development plans.
7. 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.	The outputs for this LDCF project have been tailored to address the gaps and needs for the DoM, DDMPR and DWRM as well as user-agencies namely CCU and MAAIFS and local communities in Uganda. 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 conducted including i) an initial inception workshop on 4 September 2012; ii) a stakeholder follow-up workshop to obtain feedback on proposed project framework on 1 February 2013; iii) a stakeholder retreat on 21 March 2013; and iv) a validation workshop on 9 April 2013. Consultations were attended by national operational focal points, government departments responsible for generating and using climate information and early warning systems as well as a number of development partners (FAO, World Bank, USTDA), NGOs and civil society organisations (e.g. ACTED, Uganda Red Cross Society). Please see details of stakeholder involvement during the PPG phase in Annex 1 of the project document.
8. Long term data records require sustainability and therefore need more detail for output 2.5 (sustainable financing) and how it will overcome barriers.	The DoM is entirely funded by the Government. Like many other Government institutions, the Department suffers from a shortage of funds for its operations. A key factor that has inhibited the Uganda Department of Meteorology from improving its weather system was a lack of adequate funding, which in turn led to less than desirable strategic implementation practices. In the absence of other sources of substantial funding, most of its requirements are catered for by Government within the context of the performance of the economy, and are, therefore subject to national budgetary priorities and limitations. The Uganda National Meteorological Bill was passed by Parliament in April 2012. The anticipated impact of the Bill will be the transformation of the Department of Meteorology into an Authority (an autonomous body). Quality Policy, Quality Objectives, Quality Procedures and other Quality Manuals for Quality Management System (QMS) Certification have already been developed and approved. The process of attaining ISO 9001:2008 certification, however, has not been finalised. The major revenue sources for DoM/UNMA are government direct billing, the private sector and government reimbursements. To capitalise on these earnings comprehensive studies will be needed to establish the viability of the different sources of revenues and demonstrating the value of improved meteorological services and products in particular to the Civil Aviation Authority, which is a primary user of the data. Since the DoM is one of the government departments that are chronically under-funded, ways of generating its own

[46]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.

[47]The Republic of Uganda.2011. Uganda Humanitarian Profile. Northern Uganda Data Centre: 1-30.

[48]Tall, A. andChouwdhury, M. 2012. Who gets the information? Gender, Power and Equity considerations in Climate Services Provision - Lessons from Climate Service Provision to Women Farmers in Kaffrine (Senegal), 2011-12. Working Paper. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): 1-60.

[49]Tall, A. andChouwdhury, M. 2012. Who gets the information? Gender, Power and Equity considerations in Climate Services Provision - Lessons from Climate Service Provision to Women Farmers in Kaffrine (Senegal), 2011-12. Working Paper. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): 1-60.

income from the services it provides needs to be explored.

The GoU requested that the LDCF project document be developed for the status quo i.e. the DoM and not the Uganda National Meteorological Authority. It has however been based on the Modernisation Plan, capital investment plan and business plan that was prepared to assist DoM move towards an independent agency. Output 2.5 is in particular streamlined with the modernisation plan. This includes the following activities:
2.5.1 Conduct a comprehensive study to establish the viability of different sources of revenues – rated as mixed good/commercial as well as public good – identified in the existing **DoM/UNMA MWE Business and Modernisation Plan** (see Table 1 and Table 2). This will include a market analysis of the need for improved forecasting and other services and products by the Uganda Civil Aviation Authority (CCA), private sector and government institutions – and the fees/reimbursements these entities are willing to pay.

Table 1. Services rated as mixed good and potential revenue identified in DoM/UNMA Business Plan prepared by MWE.

Source of income	**Total annually**
Civil Aviation (International Flights)	367,394
Civil Aviation (Local Flights)	367,39
National Environment Management Authority	2,296
Contribution to the State of the Environment	383
National Forest Authority (data and service)	2,296
Uganda Bureau of Statistics	4,592
Construction Industry	68,886
Oil Exploration and Extraction	13,777
Energy Sector	2,296
Marine Industry	22,962
Media	13,777
Tourism Industry	13,777
Hydro Power Sector	13,777
Commercial Farmers	22,962
Consultancies	45,924
Legal and Insurance	2,296
Climate Proofing	13,777
Beverages	4,592
Bank of Uganda and other Banks	13,777
NGOs and CBOs	9,185
Levy on Clean Development Mechanism (CDM)	309,989
Total potential revenue annual from mixed good services	*985,457*

Table 2. Services that are rated as public good and potential revenue identified in DoM/UNMA Business Plan prepared by MWE.

Source of income	**Total annually**
UPDF Air Force	68,886

	Mercy Flights (e.g. UN)	22,962
	Health Sector	22,962
	Water Resources	22,962
	Agriculture Sector	413,318
	Disaster Preparedness and Management	45,924
	Public Weather Forecasts	91,848
	Planning and Finance	45,924
	Police Airwing	13,777
	Capital Development Needs (from Treasury)	1,148,106
	Total potential revenue annual from public good services	***1,896,670***

2.5.2 Develop and implement sector-specific marketing strategy and programme for improved meteorological services and products to the Civil Aviation Authority as well as for other key economic sectors, namely banking, insurance, agriculture and tourism.
2.5.3 Review and propose revisions to the current cost recovery arrangement between the DoM and Civil Aviation Authority to adequately reflect enhanced services and fee structures based on the results of Activity 2.5.1 and 2.5.2. The cost recovery for DoM/UNMA should be achieved in a manner that is in accordance with Article15 of the Chicago Convention on "Meteorological Services for International Air Navigation.
2.5.4 Review and propose revisions to the current government reimbursement levels for meteorological services to reflect higher levels of operating expenses and capital costs needed to maintain and operated automated and modernised equipment and retain forecasting skills.
2.5.5 Based on the results of 2.5.1 and 2.5.2 develop service level agreements for government organizations and private companies requiring specific customised meteorological services from DoM/UNMA. This will have a focus on "climate proofing" services for integrating weather and climate information into development and programmes.

9. 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.	Output 1.1 and 1.2 include activities focused on integrating the new automated stations as well as rehabilitated manual and automatic stations into the existing DoM network, including reviewing and installing appropriate telecommunication infrastructure, and creating linkages with the DWRM observation network and forecasting systems. Output 1.3 focuses on updating weather and climate forecasting facilities. 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. These workstations will provide the means to generate calibrated weather forecasts based on *inter alia* numerical weather prediction model, graphical imagery, surface observations and station-based forecasts. The national DoM database and information system will be upgraded from CLIMCOM/ASC11 to an appropriate modern system and this will be linked to the current DWRM's water management and information system that is being developed with joint funding from GoU and World Bank. The DoM has no radar, lightning detection equipment, upper air and pilot balloon stations. The C-band radar located at the Entebbe Airport is non-functional. Rehabilitation of the radar is not possible because spare parts are not available, as the manufacturer no longer operates. Because of this limited observational infrastructure, atmospheric parameters (beyond the surface) are only being observed through satellite observations. Despite this limitation, the DoM has indicated that they would prefer the LDCF project as it is only running over a four year period to focus on aligning with the departments short-term goals – next 5 years – and thus the LDCF project implementation phase. This includes undertaking the necessary upgrades to existing automatic and manual equipment as well as increasing coverage of the

	country with new automatic weather stations. Radar is part of the DoM's medium to long-term goals and therefore will not be covered by LDCF resources.
10. Projects will be challenged by a lack of IT infrastructure (bandwidth, etc.) to collect, analyse, exchange and archive data.	The relevant IT infrastructure including servers, modems and telecommunications infrastructure including computers, computer servers and software, radiotelephones, portable telephones, GSM/GPRSGSM/GPRS modems and other equipment to for internet access have been budgeted for under Output 1.1, 1.2 and 1.3. Internet bandwidth is extremely costly in Uganda and therefore **Output 2.5** focuses on establishing a public-private partnership and service level agreement between the DoM and an internet service provider with regards to start-up costs for servers and modems as well as running bandwidth costs for internet connection to collect, analyse, exchange and archive data.
11. There is a lack of workstations to make forecasts, access global products for downscaling etc.	Output 1.3 focusing on upgrading forecasting facilities (computers, storage and networking) this includes procuring and installing **meteorological workstations** to support synoptic stations and the NMC at Entebbe. These forecasting facilities aim to provide the platform for meteorologists to : i) visualize meteorological, environmental and oceanographic data from various sources and in various formats[50]; ii) produce standard and customised<1 day severe weather nowcasts, 1-10 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.
12. There is a lack of private capital to support the large costs of modernisation.	Domestic and international air traffic activities – along with other key sectors – in Uganda are expected to increase appreciably because of continued economic growth[51,52]. The improvement of forecasting and other services and products provided by DoM in conjunction with the growth of banks, insurance companies, oil and gas sector, tourism and other elements of the private sector, could position DoM to accrue higher private sector revenue streams.
13. Specific details on which hazards are important and where should be included.	Uganda is particularly vulnerable to the increasing frequency and severity of droughts, floods and severe storms (hail, thunder, lightning and violent winds), and their impacts on sectors such as agriculture, fisheries, as well as infrastructure. Sub-regions identified in the literature as being particular at risk to these hazards include: i) Karamoja; ii) Teso; and iii) Mt Elgon by stakeholders in the country. This was reiterated based on analysis of stakeholder feedback when the Karamoja sub-region scored the highest for the implementation of community-based climate information and early warning system outputs and activities followed by the Teso and then Mt Elgon sub-regions. The LDCF project although having a national focus with regards to strengthening the existing hydro-meteorological networks in the country will also be focusing local efforts in all three of these regions. This will in particular include integrating weather and climate information into district development plans which focuses on all three of these regions. Output 2.4 focuses on developing a sms-based alert system for floods, droughts, severe weather and other agricultural

[50] E.g. surface observations and station based forecasts, NWP (Numerical Weather Prediction) fields, satellite data and derived synthetic products, radar data and derived products, aviation reports and forecasts, sounding data, sat-sounding data, satwind data, automatic satellite image interpretation data, SCIT (Storm Cell Identification and Tracking) data, lightning data, road weather observations and forecasts, MOS (Model Output Statistics) data, ocean profile data, warnings based on the monitoring of incoming data, trajectories, webcams and geographical information (based on vector and raster data).

[51] Ministry of Water and Environment. 2012 Business Plan for Uganda National Meteorological Authority.

[52] Heitkemper, L. Kirk-Davidoff, D and Haynes, C.S. MDA Information Systems LLC. (Draft-2013). A Modernization Plan for Uganda's Meteorological Services. Gaitherburg, US.

	advisories for local farmers and vulnerable communities in the Teso and Mt Elgon sub-regions. Stakeholders in country agreed that for implementing local level actions such as the latter, Karamoja should not be used as, while Karamoja is prone to hazards as indicated, many EWS interventions have already been implemented and are planned for this sub-region. The next highest scores were in the Kyoga WMZ, which includes the Teso and Mt Elgon sub-regions**.**
14. More analyses of climate needs to be included in determining where hydromet stations should be located.	Station location was determined together with the DoM and DWRM. Various parameters were used in these discussions and analyses. The DWRM indicated the importance of covering all four Water Management Zones. The DoM indicated the necessity to focus on areas outside the Kyoga Water Catchment area as many stations are being installed in the zone under other development projects. Another key criteria in determining placement of weather stations was to particularly address gaps in the observation network in the Western and Northern Regions of the country.
15. To ensure that the appropriate climate observations are recorded and applied, the following considerations should be included: i) clear descriptions of the types of observations that are required and how they will feed into an EWS appropriately; ii) provide data to world climatic data centres; iii) clearly distinguish between weather and climate observations and how they are used; and iv) details should be provided on whether additional funding for procurement of technology can be accessed.	Existing observation stations in the country only partially functioning or are non-operational because of vandalism, limited spare parts and inefficient maintenance and calibration. Furthermore, the DoM has no radar, lightning detection equipment, upper air and pilot balloon stations. The DoM's National Meteorological Center (NMC), based at Entebbe, has a direct link to the MSG Low Rate Information Transfer (LRIT) Direct Dissemination Service. This link provides access to satellite and model data (UKMO and ECMWF numerical models) as well as observations, analyses and forecasts from Regional and Global meteorological centres. In the design of the LDCF project – to ensure that the appropriate climate observations are recorded and applied – the following considerations were discussed with the relevant stakeholders and included into the design. i) The DoM and DWRM have indicated that there is a need for **automated synoptic, agro-meteorological and hydrological observations** that are transmitted **on an hourly (synoptic) to ten-day basis (agro/hydro-met)** in the country for developing accurate and timely standard and customised<1 day severe weather nowcasts, 1-10 weather forecasts, 1-6 month seasonal forecasts and >6 month climate forecasts. ii) At present only 30% of the required information and data from Uganda is transmitted international through the **Global Telecommunications** Network. This is as a result of the obsolete and inadequate status of meteorological infrastructure in the country. Weather and climate observations from Uganda are therefore not being effectively incorporated into regional and global circulation models, which decreases the accuracy of downscaling models to the Ugandan context. iii) 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. iv) The LDCF project builds upon the following baseline projects which are also providing additional funding for the procurement of technology: i) Joint Partnership Fund (GoU Ministry of Water and Environment budget lines) - $ 5,400,000; ii) Uganda Red Cross Society – $ 5,200,000; iii) GoU, Department of Water Resource Management (DWRM) budget line $ 2,800,000; iv) Government of Uganda (GoU), Department of Meteorology (DoM) budget line - $ 6,000,000; v) World Bank Water Management and Development Project - $ 1,000,000; vi) GIZ Reform of the Urban Water and Sanitation Sector (RUWASS) programme - $ 1,000,000; vii) ITU/UCC - $ 300,000; viii) World Bank, ATAAS $ 1,000,000; ix) ACTED ECHO $ 400,000. The exact technology that these projects will be funding is described in the baseline situation under Section 2.4 of the project document.
16. Project goals include mitigation of flood/drought losses but have insufficient hydrological modelling described in the PIF.	The project will build on work under the World Bank Water Management and Development Project. The total financing for the project is US$ 135 million, of which US$ 1.1 million has been allocated for flood and drought risk assessment, management and preparedness. The WMDP has planned two activities on flood and drought risk management and preparedness: i) strengthening, expanding and automating the existing hydro-meteorological monitoring network in the

	Kyoga and Upper Nile Water Management Zones; and ii) developing a comprehensive water resource information system for Uganda. The LDCF project will build upon the flood and drought risk-related WMDP project activities at a national level as well as at the regional and local level in Kyoga WMZ. This will include strengthening the hydrological observation network in the Albert and Victoria WMZs as well as filling gaps in the network in the Kyoga and Upper Nile WMZs not being filled by the WMDP. LDCF funds will be used to integrate the AWLSs installed into the water information system being developed under the WMDP. This will also include linking the DWRM system to the DoM data and information system developed.
17. Include considerations of how capacity of hydrological services (and agriculture) can be improved e.g. issue flood and drought monitoring and early warnings.	Protocols and agreements under Outcome 1 will be developed and implemented between the DWRM and DoM for data collection, data exchange, data processing, data analysis and flood, drought and severe weather risk assessment and warnings as well as for the management and operations of automatic and manual stations, particularly where stations are in close proximity. This will build on existing MoUs that exist between these two departments and assist in identifying clear mandates and procedures for issuing flood and drought early warnings as well as related monitoring activities.
18. 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?	Tailored weather and climate alerts including colour-coded advisories, watches and warnings for flood, drought, severe weather and agricultural stresses will be developed by integrating and customising standard forecasts, e.g. daily forecasts, ten-day and monthly agro-meteorological bulletins, seasonal forecasts, drought and flood forecasts and risk and vulnerability maps, based on sector specific and end-user needs and in collaboration with DWRMA, MAAIF and DRDPM. For example, maps of surface water availability and ground water levels are needed to guide farmers' planting practise, in order to avoid waterlogging and flooding. Protocols and agreements under Outcome 1 will be developed and implemented between the DWRM and DoM for data collection, data exchange, data processing, data analysis and flood, drought and severe weather risk assessment and warnings as well as for the management and operations of automatic and manual stations, particularly where stations are in close proximity. Protocols and agreements will be developed and implemented under Outcome 2 for efficiently and effectively exchanging, processing and analysing data and information among DoM, DWRM, MAAIF, DRDPM, CCU and related institutions for making early warnings and long-term development plans. This will include developing risk and vulnerability assessments for *inter alia* floods, droughts and severe weather as well as integrated assessments of the costs and benefits of adaptation – including strengthening hydro-meteorological services and early warnings – to support policy and domestic budget adjustments. These above protocols and agreements will build upon existing structures in place, whereby the above institutions collaborate to develop sector-specific forecasts. These existing structures need strengthening as they are often only conducted on an ad hoc basis. For example, MAAIF and DWRM receive ten-day and monthly weather and seasonal forecasts from DoM on an *ad hoc* basis through email and, in certain cases, through national workshops. Agronomists and agro-meteorologists at MAAIF use weather and seasonal forecasts to prepare advice for farmers regarding appropriate crops for the expected conditions as well as on the occurrence of seasonal dry-to-wet and wet-to-dry transitions for informing planting and harvesting times. Hydrologists at DWRM use the weather and seasonal forecasts for the implementation of catchment-based IWRM including flood risk assessment and warnings. Weather and seasonal forecasts are also made available to regional agricultural and hydrological research institutions and stations for further dissemination to local farmers. Although this system on paper seems adequate, at present the accuracy and timeliness of forecasts provided by DoM are

	limited. At present most seasonal forecasts produced are released with 0 days lead time or alternatively are two weeks late. Furthermore, monthly weather reviews and forecasts and agro-met advisories are generally not issued at all or are too late for the farmers to use the information. For example when information is released it usually reaches farmers when the rains have started and therefore it is too late for them to plan their farming practices accordingly. Furthermore, farmers need the information on the onset of rains, distribution and cessation. This needs to be further broken down into recommended actions for a relevant region and/or district and/or crop type. The LDCF project aims to address these challenges in the current systems. See Section 2.4 Outcome 2 – in particular Output 2.2.
19. In Component 2 there is a need to articulate the types of forecasts that will be produced.	At present, the DoM aims to provide a range of standard and customised forecasts (see Table 11 under Section 2.4 of the PD). These however are hampered by a range of technical and infrastructural challenges including obsolete and partially functioning observation network as well as limited forecasting facilities and limited forecasting and prediction capabilities. The following existing forecasts will be strengthened with regards to accuracy and timeliness: i) daily forecasts; ii) aviation forecasts; iii) monthly weather bulletins; iv) ten-day (dekad) and monthly agro-meteorological bulletins; v) seasonal 1-6 month forecasts; and vi) warnings for extreme weather. With regards to alerts for extreme weather, these will be tailored to include a colour coded system for watches, advisories and warnings with related descriptions and recommended actions with the target audience being local farmers as well as vulnerable communities in the Teso and Mt Elgon regions. With regards to ten-day and monthly agro-meteorological bulletins, these will be tailored to include information from DoM, DWRM, MAAIF and DDMPR. This will be achieved by integrating and customising standard forecasts e.g. daily, ten-day and monthly agro-meteorological bulletins, seasonal forecasts, drought and flood forecasts and risk and vulnerability maps, based on sector specific and end-user needs and in collaboration with DWRMA, MAAIF and DRDPM. For example, maps of surface water availability and ground water levels are needed to guide farmers' planting practise, in order to avoid waterlogging and flooding.
20. The focus of the PIF tends to be on early warnings and does not include long term changes to extreme weather events. Ensure that climate information can be integrated into development plans.	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. Output 2.3 focusing on mainstreaming and integrating weather and climate information into national policies, annual budgets and local development plans in the Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango sub-regions. 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 Uganda 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.
21. Hydromet products which are sold for a fee will limit uptake by vulnerable populations.	See response to USG comment 2. The project will consider public good and mixed good services as defined by the GoU (see Table 1 and 2 above and in the PD under Output 2.5). In general, the question of which hydro-met services and products should be freely available and which should be charged for is a contentious 'political issue' in both developing and developed countries. Most countries still rely on government budget lines as well as government reimbursements to cover the costs of hydro-met services, particular if the hydro-met department is a government institutions and not an autonomous agency. Therefore, the formation of the Uganda National Meteorological Authority is intended to help overcome this limitation as it may now carry out its operations with a certain level of autonomy, including a higher level of involvement with the Ministry of Finance. The reorganization of the DoM into the Uganda National Meteorological Authority (UNMA) will serve to enhance the ability to modernize its meteorological observing, forecasting and warning technology and expand its services, including access to higher levels of funding for capital investment, maintenance and staff training.

	Output 2.4 focuses on providing sms-based alerts for floods, droughts and severe weather to local farmers and vulnerable communities in Teso and Mt Elgon sub-regions. This will be established through building on existing Mobile Alert Pilot projects for fishermen in Lake Victoria and farmers in the Kasese district. The importance of cooperative responsibility of relevant service providers will be promoted. These products will be initially freely available to local communities until a market analyses is conducted to gauge the viability of charging a fee to communities. A marketing programme will then be developed and implemented based on the findings of the analyses – see Output 2.5 – whereby a service level agreement can be developed with a relevant service provider.
22. Include consideration of how the project will benefit women, noting that evidence suggests that women do not receive EW messages via radio.	Under Output 2.2, tailored information products – including alerts, risk and vulnerability maps and results from integrated assessments – will be developed through gender-sensitive consultations with end-users in the Teso and Mt Elgon sub-regions, and appropriate research organizations. 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 Uganda and internationally. Different groups in Uganda have different vulnerabilities based on their culture, gender, caste, ethnicity or other characteristics that influence their capacities to prepare, prevent and respond effectively to disasters. Women and men often play different roles in society and have different access to information in disaster situations. 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. The Teso and Mt Elgon sub-regions will benefit from tailored weather and climate information – specifically for flood, drought, severe weather and agricultural stresses, integrated cost-benefit analyses and sector-specific risk and vulnerability maps. The Teso sub-region – containing eight districts – suffers from cyclical floods, droughts, famine, conflicts and cattle raiding causing food security to remain fragile. While local governments and humanitarian parties endeavour to handle food security issues, disaster risk reduction activities are currently insufficient. The Elgon sub-region – also containing eight districts – is susceptible to floods and landslides and is hampered by high levels of poverty as well as poor infrastructure and service delivery access. These sub-regions will benefit from the development of mobile-based alert platforms**.** One of the aims of this initiative will be to ensure that at least 50% of mobile phone users are women**.** It is essential that this goal is reached, as women in these regions are often the worst affected by the impacts of climate change, due to their predominantly agriculture-based livelihoods[53]. Women need to be able to access climate information as easily as men – even if it is through differing mediums – otherwise there is the risk of the information not reaching women[54].
23. ACMAD, GEO and AfriGEOSS are not mentioned despite coordinating earth observations and climate observations.	The LDCF project will link and coordinate with activities under the African Center of Meteorological Application Development (ACMAD) – namely ICPAC GHACOF, 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 WMO 's Global Framework Climate Services (GFCS) initiative.

[53]Tall, A. andChouwdhury, M. 2012. Who gets the information? Gender, Power and Equity considerations in Climate Services Provision - Lessons from Climate Service Provision to Women Farmers in Kaffrine (Senegal), 2011-12. Working Paper. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): 1-60.

[54]Tall, A. andChouwdhury, M. 2012. Who gets the information? Gender, Power and Equity considerations in Climate Services Provision - Lessons from Climate Service Provision to Women Farmers in Kaffrine (Senegal), 2011-12. Working Paper. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS): 1-60.

	These initiatives are mentioned in Section 2.3 and 2.4 in the LDCF project document as necessary. Seasonal forecasts in Uganda are issued twice a year, based on seasonal precipitation forecasts generated for East Africa at the Greater Horn of Africa Climate Outlook Forum (GHACOF) regional meeting conducted twice a year by representatives of several East African states. Uganda sends 10-day precipitation and temperature data to Intergovernmental Authority on Development (IGAD) Climate Prediction and Application Centre ICPAC[55] in Djibouti – WMO nominated Eastern Africa[56] regional centre for **ACMAD[57].** Furthermore, the DoM participates in the IGAD ICPAC's Greater Horn of Africa Climate Outlook Forum (GHACOF), which brings together national, regional and international climate experts, on an operational basis, to produce regional climate outlooks based on input from NMHSs, regional institutions, Regional Climate Centres (RCCs) and global producers of climate predictions. This is further elaborated in the PD.
24. There is a need to include WMO and the GFCS initiative.	The WMO focal point in Uganda is based in the DoM under the MWE and therefore this LDCF project will be closely linked and aligned to WMO initiatives in the country. This will include the GFCS initiative. WMO is also included for technical support to the project under Section 5 of the PD.
Council Comment (World Bank)	**UNDP Response**
1. 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.	This Government of Uganda led initiative has been designed by stakeholders in Uganda to complement existing business-as-usual initiatives on EWS. It is aligned with Uganda's: i) **NAPA** priorities - 3) Strengthening Meteorological services including expanding weather observation infrastructure (networks) and promoting a multimedia approach to weather and climate information dissemination and 9) Climate change development and planning project including reviewing existing relevant policies and laws/regulations in relation to climate change and sensitizing and training decision makers, planners and implementers on impacts of climate change; ii) **NDP** priorities - "total overhaul and automation of the meteorological instrumentation" including enabling sectors climate change, meteorology and disaster management; and iii) DRRM Policy and Draft CC policy. **Multi-stakeholder consultations** were conducted to inform the design of the LDCF project including: i) an initial inception workshop on 4 September 2012; ii) a stakeholder follow-up workshop to obtain feedback on proposed project framework on 1 February 2013; iii) a stakeholder retreat on 21 March 2013; and iv) a validation workshop on 9 April 2013. Consultations were attended by national operational focal points, 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. The stakeholder retreat was attended by government departments that were identified as key responsible parties for the LDCF project. **Bi-lateral stakeholder** consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi- and multi-lateral organisations, government departments, NGOs as well as private sector partners. See Section 2.2 for further details on country ownership and drivenness as well as Annex 1 with regards to stakeholder involvement in the project preparatory phase. The current project document is thus adapted to the Ugandan context, with elements of the original PIF only taken forward if the Ugandan government and stakeholders considered it useful and needed in the context of building a robust and effective early warning system, or if it would promote the use of climate information.
2. There is insufficient assessment of current	The gaps and needs of key early warning institutions and end-users of early warning system information have been

[55] IGAD continues assisting its member states and the regional and international for a with coordination of regional and national workshops (IGAD – website: www.igad.net). With regard to climate issues, the IGAD Secretariat in Djibouti covers policy issues while ICPAC covers technical aspects. ICPAC evolved in 2007 from the Drought Monitoring Centre (DMC) under the auspices of the WMO and UNDP to the IGAD Climate Prediction and Application Centre (ICPAC). It is also nominated by the WMO to be a regional centre for ACMAD (WHO, 2010).The ICPAC – website is: www.icpac.net.

[56] Djibouti, DR Congo, Ethiopia, Kenya, Rwanda, Tanzania and Uganda

[57] ACMAD. 2012. Assessment and Analysis of the state of the art of Warning Systems and vigilance products in Eastern Africa Region. Niamey, Niger

state of hydro-met sector, past failures and their causes.	identified through multi-stakeholder consultations – see response to previous comment. Consultations were attended by national operational focal points, government departments responsible for generating and using climate information and early warning systems as well as a number of development partners (FAO, World Bank, USTDA), NGOs and civil society organisations (e.g. ACTED, Uganda Red Cross Society). Please see details of stakeholder involvement during the PPG phase in Annex 1 of the project document. **Bi-lateral stakeholder** consultations included a range of additional meetings that were held between September 2012 and April 2013 with bi- and multi-lateral organisations, government departments, NGOs as well as private sector partners. To improve assessments on climate and environmental observational infrastructure needs and capacity building requirements, a self-reporting questionnaire and summary of technical and budgetary questions were sent out to information dissemination agencies as well as the IP and RPs of the project. National Consultants then further met stakeholders and guided them through the questionnaire and highlighted where additional information and critical comments were needed. In this process 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. This was further discussed during a stakeholder retreat and validation workshop as mentioned above.
3. There is insufficient consideration of the limitations of current capacity, which currently prevents many of the proposed activities in some countries.	Output 1.4, 2.1, 2.2, 2.3 and 2.4 of this GoU LDCF project focuses on capacity building to support the improved and automated climate monitoring observation network. These outputs have been designed based on an assessment of climate and environmental observational infrastructure needs and capacity building requirements conducted through a range of in-country consultations as well as literature reviews undertaken by an international consultant and two national consultants based in the country. This builds on work already undertaken by USTDA and others to assess current capacities and develop plans for the future growth of the DoM.
4. Cost estimates are unrealistic and do not include variation between countries and O&M (operations & management) costs.	Costs have been revised and based on existing O & M budgets under the DoM and DWRM as well as cost estimates of preferred models of equipment that are currently being used in the country. See response to comment 1 and 2 above. Activities related to the procurement of spare parts have been included and budgeted for.
Council Comment (Germany)	**UNDP Response**
1. It does not become evident that a robust strategy or plan is already developed and accepted by different partners. Instead, this is stated as a project output (2.1.4. "Plan for sustainable financing for the operation and maintenance of the installed EWS developed and implemented.") Germany requests that evidence of partner commitment on sustainability as well as an assessment of risks related to the sustainability of investments are provided in the final project document.	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, in particular Output 1.4, 2.1, 2.2, 2.3 and 2.5. and were included into the Risk Log in Annex #. The DoM is entirely funded by the Government. Like many other Government institutions, the Department suffers from a shortage of funds for its operations. A key factor that has inhibited the Uganda Department of Meteorology from improving its weather system was a lack of adequate funding, which in turn led to less than desirable strategic implementation practices. Baseline government budget lines for operation and maintenance have been committed to the LDCF project as co-financing see Section 2.3 and 2.4 and co-financing letters in Annex #. The formation of the Uganda National Meteorological Authority is intended to help overcome this limitation as it may now carry out its operations with a certain level of autonomy, including a higher level of involvement with the Ministry of Finance. The reorganization of the DoM into the Uganda National Meteorological Authority (UNMA) will serve to enhance the ability to modernize its meteorological observing, forecasting and warning technology and expand its services, including access to higher levels of funding for capital investment, maintenance and staff training. Domestic and international air traffic activities – along with other key sectors – in Uganda are expected to increase appreciably because of continued economic growth. The improvement of forecasting and other services and products provided by DoM in conjunction with the growth of banks, insurance companies, oil and gas sector, tourism and other elements of

	the private sector, could position DoM to accrue higher private sector revenue streams. Output 2.2 will focus on tailoring weather and climate information (including colour-coded alerts for flood, drought, severe weather and agricultural stresses, integrated cost-benefit analyses and sector-specific risk and vulnerability maps to make it more accessible to decision makers in government (MWE, OPM, MAAIF, MoH) private sector, civil society, development partners and local communities in the Teso and Mt Elgon sub-region. Under Output 2.3 LDCF resource will be used to mainstream weather and climate information and early warning systems into national sector-specific policies, annual budgets and local development plans in priority districts in Bukedi, Busoga, Elgon, Teso, Acholi, Karamoja and Lango sub-regions. Output 2.5 focuses on conducting a comprehensive study to establish the viability of different sources of revenues – rated as mixed good/commercial as well as public good – identified in the existing DoM/UNMA MWE Business and Modernisation Plan. 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 Civil Aviation Authority – which is the primary use of DoM data – as well as for other key economic sectors, namely banking, insurance, oil and gas exploration and recovery, agriculture and tourism (for further details see response to USG comment 2 and Output 2.5 activities in the PD). 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 the Department of Meteorology and Department of Water Resource Monitoring and Assessments to monitor extreme weather and climate change.
2. 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	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. These initiatives are mentioned in Section 2.3 and 2.4 in the LDCF project document as necessary. Seasonal forecasts in Uganda are issued twice a year, based on seasonal precipitation forecasts generated for East Africa at the Greater Horn of Africa Climate Outlook Forum (GHACOF) regional meeting conducted twice a year by representatives of several East African states. Uganda sends 10-day precipitation and temperature data to Intergovernmental Authority on Development (IGAD) Climate Prediction and Application Centre ICPAC[58] in Djibouti – WMO nominated Eastern Africa[59] regional centre for **ACMAD[60].** Furthermore, the DoM participates in the IGAD ICPAC's Greater Horn of Africa Climate Outlook Forum (GHACOF), which brings together national, regional and international climate experts, on an operational basis, to produce regional climate outlooks based on input from NMHSs, regional institutions, Regional Climate Centres (RCCs) and global producers of climate predictions. This is further elaborated in the PD.The WMO focal point in Uganda is based in the DoM under the MWE and therefore this LDCF project will be closely linked and aligned to WMO initiatives in the country. This will include the GFCS initiative. WMO is also included for technical support to the project under Section 5 of the PD.
3. The additional cost reasoning should be	The additional cost reasoning is detailed under the adaptation alternative for each Outcome. In Summary: the current

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[59] Djibouti, DR Congo, Ethiopia, Kenya, Rwanda, Tanzania and Uganda

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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 investment.	climate information (including monitoring) and early warning systems in Uganda are not functioning as optimally as they could 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 Uganda will significantly undermine social and economic development under a changing climate. The baseline development of maintaining and upgrading infrastructure under the DoM, DWRM as well as the baseline development situation for disaster management under the DDMPR is described in Section 2.4. A range of baseline donor support projects are also described which are providing additional support to the business-as-usual situation at the DoM, DWRM and DDMPR. The climate change related benefits in comparison to the business-as-usual investment is described in the adaptation alternative under Outcome 1 and 2. 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. Monitoring climate change, forecasting impacts and using early warning systems to disseminate data to a range of stakeholders, from national to local levels, are important components of successful long-term adaptation measures. Meteorological services provide real-time, short-, long-term and seasonal forecasts as well as other meteorological parameters for planning and management of agricultural production, water resource management, solar energy use, research, disaster and rescue operations, transport, trade and tourism, and environmental-related diseases. Meteorological parameters are particularly important for the design, construction and management of physical infrastructure. Furthermore, they are necessary for understanding weather variability and climate change, as well as climate change impacts on socio-economic development. The more extensive the available information, the better the climate can be understood and future conditions can be assessed at the local, regional, national and global level[61]. Accurate weather and climate information and forecasting are essential for planning and managing economic production and the provision of social services, under a changing climate.
4. 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 fee (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).

[61]Zhu, X. 2011.Technologies for Climate Change Adaptation – Agriculture Sector – TNA Guidebook Series. UNEP Risø Centre on Energy, Climate and Sustainable Development Risø DTU National Laboratory for Sustainable Energy, Denmark.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS[62]

A. DESCRIBE FINDINGS THAT MIGHT AFFECT THE PROJECT DESIGN OR ANY CONCERNS ON PROJECT IMPLEMENTATION, IF ANY:

NA

B. PROVIDE DETAILED FUNDING AMOUNT OF THE PPG ACTIVITIES FINANCING STATUS IN THE TABLE BELOW:

PPG Grant Approved at PIF: **100,000**			
Project Preparation Activities Implemented	***GEF/LDCF/SCCF/NPIF Amount ($)***		
	Budgeted Amount	***Amount Spent Todate***	***Amount Committed***
1. Review and technical feasibility study and cost assessment analysis	46,000	39,753	6,247
2. Information collection and stakeholder consultations (including stakeholder workshops)	34,000	32,880	1,120
3. Identification of co-funding sources and formulation of project documents	14,000	12,970	1,030
4. Institutional arrangement for implementation	6,000	5,040	960
Total	100,000	90,643	9,357

[62] If at CEO Endorsement, the PPG activities have not been completed and there is a balance of unspent fund, Agencies can continue undertake the activities up to one year of project start. No later than one year from start of project implementation, Agencies should report this table to the GEF Secretariat on the completion of PPG activities and the amount spent for the activities.

ANNEX D: CALENDAR OF EXPECTED REFLOWS (if non-grant instrument is used)

Provide a calendar of expected reflows to the GEF/LDCF/SCCF/NPIF Trust Fund or to your Agency (and/or revolving fund that will be set up)

NA