



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 Eastern and Southern Africa for climate resilient development and adaptation to climate change			
Country(ies):	Zambia	GEF Project ID: ¹	4995
GEF Agency(ies):	UNDP(select)(select)	GEF Agency Project ID:	5091
Other Executing Partner(s):	Ministry of Transport, Works, Supply and Communication (Zambia Meteorological Department)	Submission Date:	Sept. 11, 2013
GEF Focal Area (s):	Climate Change	Project Duration(Months)	48
Name of Parent Program (if applicable):	n/a	Agency Fee (\$):	400,000
	<ul style="list-style-type: none"> ➤ For SFM/REDD+ <input type="checkbox"/> ➤ For SGP <input type="checkbox"/> 		

A. FOCAL AREA STRATEGY FRAMEWORK²

Focal Area Objectives	Expected FA Outcomes	Expected FA Outputs	Trust Fund	Grant Amount (\$)	Co-financing (\$)
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	2,574,000	9,107,680
	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	1,236,000	3,056,227
Project Management Cost			LDCF	190,000	400,000
Total project costs				4,000,000	12,563,907

¹Project ID number will be assigned by GEFSEC.

²Refer to the [Focal Area/LDCF/SCCF Results Framework](#) when completing Table A.

B. PROJECT FRAMEWORK

Project Objective: To strengthen the climate monitoring capabilities, early warning systems and available information for responding to climate shocks and planning adaptation to climate change in Zambia.						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Co-financing (\$)
Transfer of technologies for climate and environmental monitoring infrastructure.	Inv/TA	Enhanced capacity of Zambia Meteorological Department to monitor and forecast extreme weather and climate change.	<p>1.1 28 Automatic Weather Stations procured and installed, and 41 existing manual and automatic monitoring stations rehabilitated. (INV: US\$ 1,424,474)</p> <p>1.2 Weather and climate forecasting systems updated, including the installation of required hardware and software and integration of satellite observations. (INV: US\$ 553,065)</p> <p>1.3 Capacity developed for operating and maintaining the climate observation network and related infrastructure including the training of 10 engineers, 10 technicians and local communities to maintain and repair meteorological equipment, computer infrastructure and telecommunications network. (TA: US\$ 338,301)</p> <p>1.4 Technical capacity of ZMD is strengthened to improve the production of standard and customized weather and climate forecasts and packaging meteorological data and information into a suitable format for user agencies and local community end-users. (TA: US\$ 258,160)</p>	LDCF	2,574,000	9,107,680
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	2.1 Tailored, sector-specific weather and climate information made accessible to decision makers in government, private sector, civil society, development partners and local communities.(TA/INV:US	LDCF	1,236,000	3,056,227

		long-term development plans.	\$ 358,586) 2.2 National capacity developed for assimilating weather and climate information into existing national policies, development plans and disaster management systems. (TA: US\$ 122,389) 2.3 Communication channels and procedures for issuing warnings are enabled at a national level, and implemented at a district level through the development of mobile phone-based alert platforms in the priority districts of Chipata, Gwembe and Sesheke. (INV/TA: US\$ 653,326) 2.4 Public-private partnership developed for sustainable financing of the operation and maintenance of the installed meteorological observation network.(TA: US\$ 101,699)			
Subtotal					3,810,000	12,163,907
Project management Cost (PMC) ³				(select)	190,000	400,000
Total project costs					4,000,000	12,563,907

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

Please include letters confirming co-financing for the project with this form

Sources of Co-financing	Name of Co-financier (source)	Type of Co-financing	Co-financing Amount (\$)
National Government	Zambia Meteorological Department	In-kind	322,680
National Government	Disaster Management and Mitigation Unit	In-kind	2,456,227
Bilateral Aid Agency (ies)	German Federal Ministry of Research and Education	Grant	785,000
Bilateral Aid Agency (ies)	World Bank	Grant	8,000,000
GEF Agency	UNDP	Grant	600,000
GEF Agency	UNDP	Cash	400,000
Total Co-financing			12,563,907

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

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

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 this

table. 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 (\$)	Co-financing (\$)	Project Total (\$)
International Consultants	352,000	0	352,000
National/Local Consultants	540,750	0	540,750

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 PIF⁴

1. No significant changes in alignment with the project design of the original PIF have been made. All outputs have been contextualized to fit Zambia’s needs. Outputs from the original PIF not included in the final design of the LDCF project are:

- Output 1.1: during the preparatory and design phase it was established that procurement/installation and rehabilitation of hydrological monitoring stations at a national level are being funded jointly by World Bank (WB) and Gesellschaft für Internationale Zusammenarbeit (GIZ) projects in the water sector. Therefore, while capacity of technicians in the Department of Water Affairs (DWA) is still part of this LDCF project, hydrological monitoring equipment will not be procured/installed or rehabilitated through the LDCF project.
- Outputs 1.3 and 1.4: during the preparatory and design phase it was concluded, in consultation with Government of the Republic of Zambia (GRZ) stakeholders, that the procurement of radar (Output 1.3) was too expensive for the LDCF budget and installing upper air monitoring stations (Output 1.4) was not the most cost effective means of achieving the project objective.

2. Additionally, Output 2.1 was moved from Output 2 to Output 1 in the LDCF project document (Output 1.4) as a result of the budget available through the exclusion of Outputs 1.1, 1.2 and 1.3. This output (previously 2.1, now 1.4) is well aligned with Outcome 1 as the capacity of technicians within the Zambia Meteorological Department (ZMD) will be developed through the associated activities.

A.1 National strategies and plans or reports and assessments under relevant conventions, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSA, NIPs, PRSPs, NPFE, Biem Reports, etc.

⁴For 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

The text form the PIF has been further developed and additional strategies and plans of relevance have been added. 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

A.3 The GEF Agency's comparative advantage:

The text form the PIF has been further developed to strengthen the description of UNDP's comparative advantage. Please see Section 2.3 of the LDCF project document for further details.

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

3. A description of the baseline projects upon which Outcome 1 will build (see Sections 2.3 and 2.4 of the LDCF project document for further details) is provided below, as well as the problems they seek to address.

4. The **Southern Africa Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL)** project is funded by the German Federal Ministry of Education and Research. It is a regional project involving five South African Development Community (SADC) countries – Angola, Botswana, Namibia, South Africa and Zambia. The focus is on research and capacity development. The aim of the project is to address the limited capacities to provide sound science-based solutions for current problems and future risks in the SADC region, in particular regarding climate change and the associated land management demands. In so doing, SASSCAL will contribute to strengthening existing and developing new capacities for application-oriented scientific research and science-policy consultations on climate change, adapted land-use and sustainable development in the region.

5. In Zambia, the project will be coordinated through ZMD by the Ministry of Education, Science, Vocational Training and Early Child Education. Resources will be dedicated to improving weather forecasting and early warning, by “expanding, modernizing and improving the weather observation network, to improve forecasting in Zambia”. This includes the provision of 10 AWSs to be installed by ZMD, as well as fellowship support for staff training at undergraduate and diploma level in meteorology, climatology, engineering, and information and communication technology. The project was initiated to respond to the limited capacity and observational equipment in the climate/meteorology fields in Zambia.

6. The **WB-led Water Resource Development Project** will enhance the water resource management capacity of Zambia at national and regional levels. This project is therefore addressing the lack of capacity and equipment to manage the water resources of Zambia. In addition to water resource management (~USD 16 million), the project will also dedicate resources towards improving hydrological infrastructure (~USD 22 million) and providing institutional support (~USD 12 million). Activities relevant to the LDCF project include: i) re-enforcing the hydro-meteorological and groundwater monitoring network; ii) strengthening the national hydrological and geo-hydrological information management systems and improved decision support tools; iii) developing flood forecasting and associated early warning systems; iv) preparing consolidated basin-level water resources development plans and strategic assessment; and v) implementing arrangements and measures for water resource allocation and management. This will be achieved through the provision of both technical and financial (investment in goods, equipment and vehicles) assistance.

7. A description of the baseline projects upon which Outcome 2 will build (see Sections 2.3 and 2.4 of the LDCF project document for further details) is provided below, as well as the problems they seek to address.

8. **Government of the Republic of Zambia (GRZ) / UN Joint Programme on Climate Change and Disaster Risk Reduction.** As part of the UNDAF, and within the context of delivering as “One UN”, the UN in Zambia in cooperation with the GRZ has developed a Joint Programme with the objective of developing capacity and increasing investments at national and local levels for an effective multi-sectoral and multi-level response to climate change. The Joint Programme brings together seven agencies – FAO, UN-HABITAT, UNDP, UNICEF, UNIDO, WFP and the Global Mechanism of the UNCCD – which have complementary competencies to address gaps in the long-term climate change response in Zambia. The Joint Programme was designed to respond to a lack of capacity to integrate climate change in disaster risk reduction policies and the lack of investment in response to climate change events. The project therefore has two pillars dealing with: i) capacity development; and ii) climate change response investments.

9. The capacity development pillar is targeted at: i) supporting the development of revised and harmonized policy, legal and regulatory frameworks for climate change and disaster risk reduction coordination in five priority sectors, namely agriculture, forestry, energy, industry and water; ii) developing institutional capacity to stimulate greening of the economy in the five priority sectors; iii) strengthening capacities for effective implementation of Zambia’s policies, strategies and programmes on climate change and early warning, i.e. NAPA, draft NCCRS, CRLED programme, REDD+, NAMA and National Adaptation Programmes; iv) improving government’s capacity to access, utilize and report on finances applied to climate change adaptation and mitigation; and v) improving climate change responses and early warning systems in the five priority sectors.

10. The climate change response investment pillar is targeted at increasing investments in adaptation and mitigation responses in the same five priority sectors, as outlined in the NAPA and draft NCCRS. Special attention will also be dedicated to urban issues, including transport, energy, water, and urban planning and infrastructure development.

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 Zambia Meteorological Department to monitor and forecast extreme weather and climate change.

11. Outcome 1 will be achieved by installing a sustainable network of automatic weather stations under ZMD. This network will be established using a phased approach, ensuring each phase of installed equipment is fully operational before the next phase of equipment is installed. High risk districts, in terms of vulnerability to floods and droughts, will be prioritised for installation of automatic weather stations. Modern forecaster facilities (including workstations) will be installed to assist the meteorological team at ZMD in processing and analysing data, as well as integrating and using raw data for weather and climate forecasting purposes.

12. New infrastructure, including weather stations and forecasting facilities, will build upon and be integrated into the existing ZMD and partner institution infrastructure and capacity. Partner institutions in the generation and processing of weather, climate and hydrological data include DWA/WRMA (hydrological stations are being installed through associated baseline projects to provide the required hydrological data and processing infrastructure/expertise to be able to forecast flooding), while the University of Zambia (UNZA) Physics and Mathematics Department as well as the School of Natural Sciences are involved in climate-related research and modeling. Collaboration

between ZMD, DWA/WRMA, UNZA will be strengthened to ensure optimal use of weather and climate data, under the custody of ZMD. LDCF project activities under this outcome will also complement existing meteorological and hydrological support programs being implemented by GRZ/UN and WB. This will provide a solid platform for the effective and efficient use of hydro-meteorological information for early warning systems and enabling long-term development plans.

Baseline situation (without LDCF project)

13. The ZMD is the primary provider of meteorological services in Zambia and the principal institution for gathering weather and climate information and making forecasts. ZMD is responsible for storing weather and climate data and information, as well as communicating this data and information to local communities and various government ministries and departments. ZMD's mandate includes the following: i) establish and maintain a network of surface and upper air stations for the purpose of observing the weather and regional meteorology; ii) process and analyse meteorological data for use in the planning of economic development and for rational exploitation of natural resources; iii) provide meteorological information services to government departments, public corporations and the general public; iv) provide meteorological services for the development of agriculture, water resources and other weather sensitive economic sectors; and v) conduct research in meteorology and to co-operate with organisations concerned with meteorological research and applications. ZMD's annual budget including operation and maintenance is ~US \$ 322,680 per annum.

14. The weather and climate observation network under ZMD includes 39 manual weather stations and 2 AWSs. The stations are situated in less than 40 districts, leaving more than 60% of the districts in Zambia without any observational equipment. Thirty of the manual stations are synoptic, while nine are agro-meteorological stations, with the majority of stations designed to serve the aviation sector. Stations are mostly located on plateaus, rather than in climate-sensitive valley areas. Stations are supposed to be manned by up to 5 observers, who should observe hourly for between 9 and 24 hours a day. However, most stations are manned for less than 12 hours a day by 1 or at times 2 observers. Data from the stations are supposed to be transmitted to ZMD HQ and to the ZMD office at the Lusaka International Airport every 3-6 hours via phone or HF radio with 13 out of the 30 synoptic stations meant to transmit their data in real time into the Global Telecommunication System (GTS) of the World Meteorological Organisation (WMO). However, observations are often submitted weekly or even monthly at a time, and often by post. As a result, observations are largely not used to make forecasts, and meteorological data from Zambia are not available for use within international weather forecasting models.

15. The 41 observation stations are supplemented by a voluntary rainfall station network consisting of ~200 rain gauges located at agricultural research centres, education institutions, commercial farms and religious mission centres. Supply of data from these stations to ZMD is sporadic. As of 2010, ZMD has not carried out upper air ascents, has no weather radars or lightning detection system, and has non-functioning GTS communication facilities with other countries/institutions.

16. ZMD produces short-term (daily and 7-day) weather forecasts, while longer-term seasonal forecasts are produced by ZMD as part of the SARCOF (Southern African Climate Outlook Forum) process. Daily weather forecasts are produced through the following steps:

- previous days forecasts are reviewed;
- current weather reports (from the ZMD observation network of 41 stations) are checked for consistency when available;
- Regional Meteorological Centre fields (both current and forecast) are reviewed (from South African Weather Service, European Centre for Medium-Range Weather Forecasts, Meteo France, UK Meteorology Office, Canada and National Centres for Environmental Prediction);
- regional satellite imagery is compared with forecasts and available observations;

- a subjective inference is made, based on expert opinion; and
- a consensus forecast is produced which is issued via e-mail (to a subscriber list) and to the Zambia National Broadcasting Corporation and to the Zambia News and Information System.

17. Seasonal forecasts are produced through the SARCOF process, whereby a SADC regional consensus forecast is produced. ZMD contributes to this process by issuing a downscaled national seasonal forecast based on a statistical analysis of historical climate observations and sea surface temperatures. This national forecast, which provides some indication of the quality (timing and nature) of the rains, is issued to various user sectors who utilize these forecasts for planning their operations e.g. water resource managers at ZESCO. The seasonal forecasts are prepared and disseminated between mid-September and mid-October.

18. There are 8 products and services being offered by ZMD. These are:

- Daily weather forecasts prepared for e-mail and radio dissemination;
- seasonal rainfall forecasts issued in September/October;
- TV weather reports and forecasts issued 3 times a week on Mondays, Wednesdays and Fridays;
- 10-day Crop Weather Bulletin issued every 10 days during the rainy season;
- aviation forecasts issued at all scheduled flight airports and aerodromes in the country;
- severe weather warnings issued when an event is anticipated;
- technical reports/publications issued periodically; and
- climate data supplied on request to all respective stakeholders.

19. Daily and weekly forecasts are issued to those on an e-mail list⁵, as well as via radio. Meteorological hazard warnings on tropical cyclones, strong winds, thunderstorms, intense cold, floods and drought to alert the public and relevant government agencies to undertake appropriate interventions are disseminated using national radio broadcasts, telephones, email, print and electronic media. Warnings are also sent to national departments and DMMU. The spatial coverage of the observation network, however, is insufficient to accurately forecast these hazard warnings for all parts of Zambia, and the fragmented dissemination system means information and warnings are delayed in dissemination, often not being received by users.

20. Zambia has benefited from the PUMA (also known as the Meteorological Transition in Africa Project) and AMESD projects. Under the PUMA project, 3 satellite data receiving stations (GEONETCast stations) were installed at ZMD, MAL and Ministry of Lands, Natural Resources and Environmental Protection (MLNREP). The projects also assisted with technical and thematic training programmes. ZMD and MAL now have direct access to all of the products disseminated through GEONETCast. However, due to a lack of capacity to operate the systems effectively, these products are currently not used directly for weather, seasonal or crop forecasting, although the hardware and software allows for such forecasts to be generated.

21. UNZA is participating in the Coordinated Regional Climate Downscaling Experiment (CORDEX) Project – focusing on long-term climate modelling (10-50 years) to inform climate change adaptation planning. This is an initiative of the World Climate Research Programme, and involves the downscaling of 10 Regional Climate Models (RCMs) to produce downscaled climate change scenarios for Zambia. This expertise is valuable, though further collaboration is required with ZMD for the outputs of the project to be fully utilized for evidence-based adaptation planning.

22. The significant shortage of weather and climate information and monitoring stations in Zambia 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 compromising the ability of the ZMD to provide detailed and accurate weather and climate information and products (including < 1 day nowcasts and

⁵In-country consultations suggest that the issuance of forecasts is not regular.

1-10 day weather, seasonal and climate forecasts) to support social and economic development. Obsolete and inadequate equipment – including limited computers, forecasting facilities and communications to access modern weather forecasting technology – limits the integration, display and analysis of weather and climate data and its use. The shortage of automated monitoring stations and inadequate quality control procedures reduces the quantity and timeliness of weather and climate information products available for making early warnings and informing long-term development plans.

23. Other difficulties faced by ZMD above include: i) unreliable provision of data from the existing network – manual stations are supposed to send data at set synoptic hours i.e. (GMT) 06h00, 09h00, 12h00, 15h00, 18h00 and 00h00, however, this data is not always provided, particularly from the stations manned by 1 person; ii) staff shortages – the GRZ is increasing the budget allocated to ZMD which will allow additional staff to be recruited, but the extent of the increase is uncertain; iii) lack of relevant skills related to the latest technologies in meteorology – particularly in support staff and in new staff recruited by ZMD; and iv) lack of access to weather and climate model-related computing equipment.

24. These challenges are being addressed to some extent by the various baseline projects and related initiatives. AWSs are being provided by the: i) SASSCAL project (10 AWSs); ii) Common Market of Eastern and Southern Africa (COMESA – 5 AWSs); and iii) LDCF agriculture project, being implemented by MAL (8 AWSs). This will improve the spatial coverage of the ZMD observation network, but further additional stations are still required. Regarding receiving information from stations, ZMD – with support from the WMO – recently procured and installed an Automatic Meteorological Message Switching System (AMMSS) at the ZMD HQ in Lusaka. This will facilitate data collection, processing and exchange with AWS and also data transmission via the GTS. The system will use the GSM/GPRS system to link AWSs with the ZMD HQ. ZMD currently uses a climate data management system (CLICOM) and has access to numerical weather prediction output from the WRF model through the severe weather demonstration project (SWDP) supported by WMO.

25. A number of additional development partners and projects in Zambia are investing in hydrological and meteorological infrastructure and training to support the ZMD and DWA/WRMA in addressing their current capacity gaps. As a result of the GIZ and WB projects described in Section A.4 and in Section 2.3 of the LDCF project document, and based on consultations with the respective project managers and the DWA during the development of this LDCF project, it was decided that LDCF resources would not be used for the procurement and installation of hydrological equipment. This is because the required hydrological equipment and associated capacity building in the hydrological sector is being provided through the GIZ and WB projects. However, the LDCF project will work closely with these related and baseline projects, respectively, and ensure that data generated by the new and rehabilitated equipment is incorporated into the ZMD database and used for the generation of early warnings through Outcome 2 of the LDCF project. The existing institutional structures outlining collaboration between ZMD and DWA/WRMA, in particular concerning to data sharing and use, and also with the other line ministries and end-users of the data (DMMU, MAL, CSO, MoH, private sector and vulnerable communities), will be strengthened. This will be achieved through a statutory framework based on the mandates of the various government ministries, and will focus on data collection and analysis (meteorological and hydrological), management and operations of automatic and manual stations (meteorological and hydrological), data exchange, data processing, and assessment and warnings.

Adaptation alternative (with LDCF project)

26. The four outputs under Outcome 1 will build on the existing investments being made in the sector by the GRZ, including projects supported by WB and the German Federal Ministry of Education and Research, as described in Section A.4 and in Section 2.3 of the LDCF project

document. . Furthermore, the LDCF projects will synergise with activities of the GIZ/KfW investment project in the hydrological and meteorological sectors.

- LDCF resources will be used to improve ZMD’s existing meteorological observation network to support effective weather monitoring and climate change adaptation planning. This will include installing AWSs in priority districts, as well as rehabilitating existing manual and automatic stations (Output 1.1). Capacity development will be undertaken to sustain the enhanced observation network during and beyond the implementation phase of the LDCF project (Output 1.3). The main aim of the outcome will be to adequately cover the spatial variability that exists in the current station network to ensure that weather and climate information and data is collected for areas vulnerable to climate change. This will enhance ZMD’s capacity to undertake accurate and region-specific weather and climate modeling (Outputs 1.2 and 1.4), as well as provide a platform for generating early warnings for floods and droughts, and health warnings related to the spread of climate-influenced disease and epidemics. The required human technical capacity to make improved climate forecasts will be enhanced within the ZMD HQ (Lusaka), and at the provincial and district levels.
- The LDCF project will build on and complement the achievements and activities of SASSCAL – the locations of where the AWSs will be installed through the SASSCAL project have not yet been finalised. This decision will be made in conjunction with the LDCF project management and technical teams (through Output 1.1), so that maximum coverage of AWSs is obtained in Zambia. The climate information from the SASSCAL project AWSs will be compatible with the data transfer system and database at ZMD, upgraded to CLIMSOFTE through the LDCF project (Output 1.2).
- The LDCF project focus on the weather and climate sector will complement the WB focus on the hydrological sector, at a national level. The approach to the water resources information management system will be established at the Inception Workshop of the LDCF project, in collaboration with both WB and GIZ/KfW.

27. The activities of the LDCF project will be implemented in alignment with the GIZ/KfW investments in both the hydrological and meteorological sectors, particularly investments in 200 rainfall gauges for volunteer stations in the Kafue Sub-basin, the installation of IT infrastructure, and procurement of vehicles for ZMD and WRMA. The rainfall data will be integrated in the upgraded (through the LDCF project) CLIMSOFTE database (Output 1.2) used by ZMD, and ZMD will generate climate data through the provision of LDCF-financed AWSs, that will be made available to DWA/WRMA to improve the accuracy of hydrological modeling. This exchange of information will be directed by the framework established through Outcome 2.

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

28. Outcome 2 will be achieved by developing human technical capacity to use the data collected from the modernized weather and climate observation and information management systems established under Outcome 1.

29. The capacity of DMMU, DWA/WRMA, MAL, MoH, CSO and INCCS will be developed to work with the ZMD to streamline, consolidate and customise weather and climate services for government, private sector, civil society and development partners. This will be supported through a National Early Warning and Disaster Management Committee (NEWDMC) and an online early warning system platform coordinated and housed at the DMMU. The NEWDMC will include a National Disaster Management Technical Committee (NDMTC, already operational) and a National Early Warning Technical Committee (NEWTC, established through the LDCF project). Through Outcome 2, the various EWSs functioning to some degree in Zambia will be streamlined into a consistent service. The dissemination of information will be channeled through DMMU when the information constitutes a warning, as determined through systems established by the NEWDMC. In addition to warnings, tailored weather and climate forecasts and information for the agriculture, aviation, water, health, tourism, construction, transport and energy sectors will be generated. This

will be through collaboration between ZMD and the respective sectors. Dissemination will occur through extension services within the relevant line ministries and collated through the DMMU ZEPRIIS system. When the information constitutes a warning, this will be disseminated through the DMMU channels established through Output 2.3.

30. Outcome 2 will support the timely sharing and dissemination of relevant weather and climate data and information with users at both the national and district levels. Standard Operations Procedures (SOPs) for disseminating and responding to weather and climate forecasts through a two-way, mobile phone-based EWS will be established. The EWS will be implemented in Chipata, Gwembe and Sesheke Districts, which were found to be particularly vulnerable to floods and droughts through a gender-based vulnerability assessment. The system will allow communication of primarily flood and drought warnings, but also those related to health and other climate-related early warnings to vulnerable communities. The activities under this outcome will improve the resilience of local communities to climate change by enabling them to plan for, and respond to, climate change impacts.

31. LDCF project activities under this outcome will complement existing disaster risk reduction and community-early warning system activities under the GRZ/UNDP.

Baseline situation (without LDCF project)

32. There are various actors involved in the generation and dissemination of climate-related early warnings. These institutions (e.g. DMMU, DWA/WRMA, MAL, CSO and MoH) use climate and weather information provided by ZMD to generate warnings. These warnings and collaborations are described below per sector. The approach is currently uncoordinated, resulting in mixed messages reaching sector and community end users at sporadic time intervals. This is because of a lack of streamlining and data standards and warnings protocols, and results in less effective warnings as end-users are uncertain of how to react.

Agriculture and Food Security

33. The Agricultural Statistics and Early Warning Section (ASEWS) within MAL has the responsibility of providing early warning information on food security. This includes crop forecasting, between March and April, and post-harvest surveys, between September and October. The key participating institutions providing input into the sector are ZMD, CSO, FEWSNET and DMMU.

34. MAL extension officers at block and camp levels collect the following information: i) status of farm inputs (seeds and fertilizer); ii) date of planting; iii) phenological observation during the rainy season; iv) livestock status; and v) rainfall data from installed rain gauges. This information is filled in on a specific form which is sent to the District Agricultural Coordinator (DACO). The DACO compiles the information which is in turn sent to the Provincial Agricultural Coordinator (PACO), who sends it to the ASEWS at MAL HQ for processing and analysis. ASEWS combines this information with ZMD seasonal rainfall forecasts and Ten-Day Crop Weather Bulletins to generate the monthly Crop and Livestock Bulletin and Food Security Situation Bulletin for the country. This information is disseminated to local communities through the MAL extension officers at block and camp level.

35. The bulletin is sent via e-mail to cooperating partners, NGO's, UN agencies, the private sector and the Zambia National Farmers Union (ZNFU). At the local level, the DACO distributes the information to extension officers at block and camp levels for onward dissemination to the local farmers for planning appropriate agricultural activities during the rainy season.

36. CSO, a department under the Ministry of Finance and National Planning (MFNP), is a contributor to the ASEWS. Through its Agriculture and Environment Statistics Division, CSO conducts three types of survey: i) Crop Forecast Survey (December/January); ii) the Agricultural and Pastoral Production Survey (April/July); and iii) the Post Harvest Survey (September/October). A

household listing and crop forecast is issued in March/April. CSO uses the AGROMET SHELL model to forecast crop production. This model uses rainfall data/forecasts issued by ZMD as input. CSO has a website where all statistical information of Zambia can in theory be accessed to stakeholders in the country and beyond. However, the website is generally not accessible and data are outdated.

Disaster Management and Mitigation Sector

37. DMMU is the agency mandated with Disaster Risk Reduction and dissemination of disaster-related information and warnings to rural communities. The current focus of activities is reactive, i.e. rehabilitation and reconstruction activities. Data is requested for the purposes of contingency planning and budgeting based on the seasonal predictions of floods and droughts. This is based on overlaying risk maps – supplied by the Vulnerability Assessment Committee (VAC) within the WFP – with national seasonal forecasts supplied by the ZMD. A subjective estimate of cost of disasters over the next rainy/dry season is then made, and a contingency budget set aside.

38. Currently DMMU issues official warnings via mobile phone, the media, megaphones and through flyers. When disasters occur, the Emergency Operation Centre (EOC) is tasked with reacting. The EOC's activities are informed by 1-7 day forecasts issued by ZMD. At present, however, the information is not provided to DMMU with sufficient accuracy or timeliness to provide adequate warnings. To maintain close links with multi-sectoral institutions that provide early warning services, DMMU has established an Expert Group to form a core Early Warning System Sub-Committee to work with the EOC to strengthen preventative/planning activities. An integrated Zambia Emergency Preparedness Response Information System (ZEPRIS) model is being developed to connect EWS providers and end-users. In this regard, protocols between DMMU, ZMD, MAL and CSO need to be strengthened.

Water and Energy Sector

39. Energy utility companies such as ZESCO Ltd and Zambezi River Authority (ZRA) use rainfall forecasts as inputs into their hydrological models for electricity generation. These then produce flood forecasts for regions and river basins (such as the Zambezi) close to ZESCO and ZRA operations. However, flood forecasting activities in Zambia are currently weak and need to be strengthened. This will be the focus of the baseline projects described in Outcome 1.

Health Sector

40. The MoH has an Early Warning System for Disease and Epidemics with a well-established Health Management Information System (HMIS) maintained at MoH HQ. At the national level, MoH is a member of NDMTC sub-committee on Health, Water Sanitation and Nutrition. It also sits on the National Epidemic Preparedness, Prevention, and Control Management Committee co-chaired by Ministry of Local Government and Housing. MoH has strong collaborations with the Defense Forces, WHO, UNICEF, NGOs (e.g. Red Cross) and Local Authorities. The early warnings inform communities about outbreaks of diseases like malaria and cholera and other water and air-borne diseases. However, climate change is not taken into consideration when warnings are issued, despite the strong link between climate hazards and the spread of diseases such as malaria.

Environment and Tourism Sector

41. The role of the CCFU, under the ministry's Department of Environment and Natural Resource Management, is to assist the ministry to coordinate and facilitate the development of comprehensive climate response strategy for Zambia and implement immediate initiatives on climate change. While no warnings are issued by the MTENR, climate hazards are important for tourism purposes. MTENR corresponds with DMMU and other statutory bodies in the environmental sector such as Zambia Wildlife Authority (ZAWA), Environment Council of Zambia (ECZ) and the National Heritage Commission.

Aviation Sector

42. The ZMD is the sole authority charged with the responsibility of providing weather and climate information to the aviation industry. The operations of aircraft, including ensuring the safety of passengers, crew and cargo, rely on inter alia: i) landing and take-off forecasts; ii) aerodrome forecasts; iii) area and route forecasts; iv) aerodrome and wind shear warnings; and v) flight documentation. This information is directly or indirectly issued to aircraft operators by the meteorological officials located at various aerodromes or through National Airports Corporation and Department of Civil Aviation Air Traffic Services Unit.

43. Despite the numerous warnings issued and used by the sectors described above, the approach of producing and disseminated warnings is uncoordinated and based on limited weather and climate observations. This means false or duplicated warnings are sometimes issued, which reduces the confidence of end-users in the information supplied.

44. A number of development partners and projects in Zambia are investing in providing disaster risk reduction to support the DMMU and community-based early warning support for local communities. Additional support is required for ensuring the efficacy of these support measures and investments under a changing climate. There is in particular a need to consolidate and streamline the current dissemination channels and ensure that on-going activities are coordinated. Additionally, innovative mechanisms for sustaining weather and climate forecasting and warning systems under a changing climate are required.

45. To ensure that the LDCF funds are used in a strategic manner, the LDCF outputs under Outcome 2 will not only be linked to – and closely coordinated with – meteorological services baseline projects described under Outcome 1, but will also build upon additional baseline projects focused on disaster risk reduction, community-based early warning systems and developing mobile alerts communication systems for severe weather alerts.

Adaptation alternative (with LDCF project)

46. Despite the achievements of the GRZ and the support of the baseline projects outlined under Outcome 1 and 2, additional support is required to 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 result in a streamlined, coordinated approach to the national EWS in Zambia.

47. Without additional support, the effectiveness of the current centralized and decentralized EWSs, as well as disaster risk reduction activities in Zambia – including local communities and socio-economic sectors supported by these activities and projects – will be undermined by climate change impacts, particularly an increase in intensity and frequency of extreme weather and climate events.

48. The four outputs under Outcome 2 will build on the existing investments being made in the sector by the GRZ including a donor-supported baseline project (though the GRZ/UNDP project described in Section 2.3).

- LDCF resources will build on GRZ EWS efforts within DMMU and be used to strengthen the provision of tailored, sector-specific flood and drought (primarily) as well as health and other climate-related warnings and information. The issuance of warnings will be through a central facility housed with DMMU. Information will be fed into DMMU's information management system and database, and disseminated through standard communication channels. This will be guided by SOPs and inter-ministerial collaboration guidelines established through Output 2.1.
- Weather and climate information will be mainstreamed into national policies, annual workplans and local development plans, including the Seventh National Development Plan, and district development plans in priority districts of Chipata, Gwembe and Sesheke (though Output 2.2). This will build on the achievements of the GRZ/UN Joint Programme and in particular

complement the outcome of Outputs 3 and 4 through the provision of improved weather and climate data and associated forecasts and early warnings:

- Joint Programme Output 3: Government has effectively developed strategies, action plans and systems, and enforced related legal frameworks, for mounting a sectoral and multi-level response to climate change according to international and regional standards.
- Joint Programme Outcome 4: Stakeholders and beneficiaries at local levels have access to adaptive technology and sustainable production practices for climate resilient and environmentally friendly livelihoods.

49. The link between the national dissemination of early warnings to sector end-users and the decentralized, local level dissemination to vulnerable communities will be strengthened. This will be achieved by implementing two-way, mobile phone-based EWSs in the priority districts of Chipata, Gwembe and Sesheke. This will include an assessment of local knowledge on indigenous early warnings, as well as the testing of various communication methods. The results of the local level implementation will inform the up-scaling of dissemination of relevant information to other vulnerable districts and communities in Zambia. Activities will build on GRZ-funded DMMU activities to develop on-the-ground capacity to engage with vulnerable communities. This includes synergising with PPCR activities aimed at strengthening the provision of climate information, more specifically on: i) a social marketing awareness campaign to raise awareness on the importance of climate information; and ii) strengthening EWSs piloted in selected districts in the Barotse and Kafue sub-basins.

50. Furthermore, innovative financing options – including public-private partnerships and market-based mechanisms – will be identified, developed and promoted for providing sustainable finance for the operation and maintenance of the installed meteorological observation, forecasting and early warning systems. This will align with PPCR activities focused on climate change adaptation in the private sector.

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:

51. Risks, mitigation/reduction measures and assumptions to/of the LDCF project are summarised in Table 1 below.

Table 1: LDCF project risks, mitigation/reduction measures and assumptions.

#	Risk	Mitigation/reduction measure	Assumption
1	Human, technical capacity within DMMU, ZMD, MAL, DWA/WRMA, MoH and CSO, including within extension service providers and decentralised offices, is insufficient to effectively implement the LDCF project.	The capacity of technicians within DMMU, ZMD, MAL, DWA/WRMA, MoH and CSO is developed through training opportunities provided through the LDFC project.	Training opportunities provided through the LDCF project result in the development of the required capacity, and the government provides the necessary budget to provide the required institutional framework in which the newly skilled staff can operate.
2	Poor coordination and information sharing structures/agreements between IP (ZMD), RPs (DMMU, DWA/WRMA, MAL, MoH, CSO and INCCS) and UNDP CO results in institutional failure, compartmentalized progress and delayed implementation of the LDCF project.	A project organisation structure (see Section 5 of the PD) is implemented including representation of MTWSC (ZMD), DMMU and UNDP on the Project Board. These three institutions will steer the LDCF project and ensure that a coordinated approach is adopted.	The management arrangements established through the LDCF project result in a coordinated approach to implementing the project.

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

A.7. Coordination with other relevant GEF financed initiatives

52. In the preparatory phase it was verified that LDCF financed activities are not duplicating those of any other on-going project, but rather build on a number of baseline project and synergise with a number of related, on-going initiatives. A description of these GEF and non-GEF funded initiatives to which the LDCF project will link to is provided below. A description of the baseline projects is provided in Section A.4 of this document and in Sections 2.3 and 2.4 of the LDCF project document.

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

54. In all project countries, upgrades and rehabilitation of the hydro-meteorological monitoring network will be complemented by providing local stakeholders with training and capacity-building in operation and maintenance of the improved infrastructure (Output 1.3). In Zambia, this will include the development of a climate observation quality control and maintenance toolbox (including remotely accessible and online calibration and training courses, handbooks and manuals for AWSs and manual stations) and an awareness campaign on the importance/benefits of the installed equipment. Similar toolboxes are being developed in other countries, such as Uganda and Malawi, and the content of the toolboxes can be aligned. In addition, project countries will be provided with training and capacity building for modeling and forecasting climate and weather. They will also be generating tailored climate information packages and sector-specific Early Warnings (Outputs 1.4, 2.1 and 2.3). 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.

55. 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 2.1 and 2.3). The appointment of suitably qualified technical staff to provide technical support to all project countries, including Zambia, will reduce the budget and time allocated to hiring and training. It will also 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 senior climatologists, analysts, weather forecasters and researchers (Output 1.4 for Zambia) to produce forecasts and develop tailored hydro-meteorological information can be undertaken through regional workshops, as this is a training requirement of all 10 countries. This will allow all project countries to share costs such as workshop facilities and accommodation, hiring technically skilled trainers and purchasing/developing appropriate training materials.

56. By strengthening ties and collaboration between regional stakeholders, the individual projects will benefit from sharing relevant data and information packages (for example, in the case of shared watersheds and river systems). Stakeholders in Zambia who can benefit from participating in regionally-aligned training and workshops include ZMD, DMMU, DWA/WRMA, MAL and MoH. Relevant national sector policies, strategies and plans – which will be strengthened through regionally-aligned workshops and training activities – will include the National Development Plan and Disaster Management Policy. The development of standardized processes for disseminating flood, drought, health and other climate-related warnings through DMMU in Output 2.1 (and specifically in the priority districts of Chipata, Gwembe and Sesheke in Output 2.3) will be enhanced by sharing knowledge, experiences and best-practices between all project countries participating in regionally-aligned activities. In the case of the Zambia project, protocols and agreements for strengthening

interactions and coordination between ZMD, DMMU, DWA/WRMA and MAL – including those related to the sharing of hydro-meteorological information/data – will be enhanced by including experiences from other countries, particularly those neighbouring Zambia i.e. Malawi and Tanzania.

57. All of the above-mentioned 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 hydro-meteorological networks. These may include leveraging financing and logistic support from private sector companies and relevant socio-economic sectors, notably agriculture and telecommunications (Output 2.4). Wherever possible, activities (which include establishing public-private partnerships in various project countries, such as between ZMD Instrument Division and private sector agricultural insurers in Zambia) will be coordinated to assist participating private sector companies to engage efficiently and cost-effectively with the LDCF projects in the different countries. This will also 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.

Other relevant GEF and non-GEF initiatives

58. **GEF-LDCF Agriculture project.** UNDP is the Implementing Agency on the LDCF-funded project entitled “Adaptation to the effects of drought and climate change in Agro-ecological Regions I and II”, for which MAL is the Implementing Partner. To reduce the vulnerability of communities in AER I and II to climate change impacts, the LDCF agriculture project will take a two pronged-approach: i) mainstream adaptation into agricultural planning at national, district and community levels to make the case for increased investment in adaptation in the agricultural sector; and ii) test and evaluate the adaptation value of interventions that protect and improve agricultural incomes from the effects of climate change. Capacity and systems to anticipate assess and prepare for climate change risks will be developed at community, regional and national levels. Adaptation learning generated from the pilot projects will be used to guide mainstreaming of adaptation in national fiscal, regulatory and development policies, to support adaptive practices on a wider scale. The following four outcomes will be delivered by the project:

- Climate change risks integrated into critical decision-making processes for agricultural management at the local, sub-national and national levels.
- Agricultural productivity in the pilot sites made resilient to the anticipated impacts of climate change.
- National fiscal, regulatory and development policy revised to promote adaptation responses in the agricultural sector.
- Knowledge and lessons learned to support implementation of adaptation measures compiled and disseminated.

59. The LDCF agriculture project includes developing effective agriculture-based EWSs for 8 priority districts, and the installation of agro-meteorological monitoring stations and associated communication channels. The eight priority sites are:

- Western Province: Kataba (Senanga District) and Sioma (comprising two closely situated villages, Kabula II and Kandiyana, in the Shangombo District).
- Southern Province: Kasaya Catchment (Kazungula District) and Lusitu Catchment (Siavonga District).
- Eastern Province: Mundalanga-N’ganjo (comprising two closely situated villages, Mundalanga and N’ganjo, in the Chama District) and Chikowa (Mambwe District).

60. The project managers of the LDCF agriculture project and present LDCF project will work closely together to ensure synergies are created and lessons learned from the one project are applied to the other. Information generated through the LDCF agriculture project will be used in the generation of agriculture-specific forecasts and used to inform warnings, disseminated through the channels strengthened through the present LDCF project, when applicable.

61. **GIZ project.** The GIZ in collaboration with the German Investment Bank (KfW) is implementing a project to strengthen the management of Zambia's water sector. The aim of the project is to improve: i) collection; ii) processing; iii) management; iv) and utilisation of hydrological data in Zambia. The project is therefore addressing the limited capacity to plan and manage water resources in Zambia. The required information systems will be hosted by the Water Resources Management Authority (WRMA), which will replace the DWA. The required capacity will be built/developed through GIZ and KfW funding. A new information system will be developed – an Integrated Water Resource Management Information System (IWRMIS) – that will include a framework that can accept data from any database, i.e. from DWA, Zambia Electricity Supply Corporation Limited (ZESCO), Zambezi River Authority (ZRA), ZMD, Ministry of Agriculture and Livestock (MAL) and Central Statistics Office (CSO). The IWRMIS will assist in the integration of climate change considerations into water resource management.

62. The GIZ/KfW project will have a dual focus:

- Financial investments for the rehabilitation and expansion of the existing hydrological measuring network, IT infrastructure, and investments in the physical work environment of the operating institutions. This will include priority and secondary financial investments.
- Investments in the development of organizations and organizational change, and development of staff members' skills through technical cooperation measures.

63. The planned physical investments comprise of:

- Structural rehabilitation and instrumentation of 168 water level gauging stations:
 - 58 first priority stations will be equipped with continuous recorders, staff gauges, rainfall recorders and automatic data transmission facilities through Global System for Mobile Communication (GSM)/General Packet Radio System (GPRS); and
 - 110 second priority stations will be equipped with staff gauges and standard rainfall gauges.

64. **Pilot Programme for Climate Resilience (PPCR).** Zambia is one of nine countries in which the PPCR is being implemented⁶. Selection for participation in the PPCR was made by an Expert Group on the basis of risk and vulnerability profiles, and the capacity to integrate climate resilience into development planning and sector policies, as well as to promote the scaling-up of activities to achieve greater climate resilience.

65. Zambia's PPCR goal is to mainstream climate change into the most vulnerable sectors of the economy, in order to ensure sustainable economic development towards the attainment of the country's Vision 2030. The PPCR has been led and coordinated by the Ministry of Finance and National Planning (MoFNP), and involves two phases:

- Phase I, the objective of which was to formulate Zambia's Strategic Programme for Climate Resilience (SPCR). It involved five strategic components: i) mainstreaming climate resilience into national development planning⁷; ii) strengthening institutional coordination; iii) improving information for decision makers; iv) targeting awareness and communication; and v) preparing for Phase II. This phase is expected to run from 2010 to mid-2013.
- Phase II will focus on implementing the SPCR along three major strategic components: i) participatory adaptation; ii) climate resilient infrastructure; and iii) strategic programme support. This phase is expected to run from mid-2013 to 2020.

⁶The others are: Bangladesh, Bolivia, Kingdom of Cambodia, Republic of Mozambique, Nepal, Republic of Niger, Yemen and Tajikistan, in addition to two regional Programmes in the Caribbean (Dominica Grenada Haiti Jamaica Saint Lucia Saint Vincent and the Grenadines) and the Pacific (Papua New Guinea, Tonga and Samoa).

⁷ For the purposes of the Zambia PPCR, mainstreaming climate resilience into national economic planning means integrating and/or increasing budgetary allocations to Programmes and projects that promote climate resilience (e.g. agriculture diversification, develop risk management and vulnerability plans).

66. Given the high level of stakeholder interest on Zambia's Climate Change Programme, the critical need to build strong national capacity, and the risk of falling back on a business-as-usual model, the SPCR has chosen to support three dedicated (stand-alone) and well-coordinated investments:

- Strengthening Climate Resilience in Zambia and the Barotse Sub-Basin: this is being implemented through WB and will provide strategic support to Zambia's Climate Change Programme, while implementing participatory adaptation and climate resilient infrastructure in the Barotse Sub-basin of the Zambezi.
- Strengthening Climate Resilience in the Kafue River Basin: this is being implemented through AfDB and will focus on participatory adaptation and climate-resilient infrastructure in the Kafue Sub-basin of the Zambezi.
- Private Sector Support to Climate Resilience: this is being implemented through the WB by the International Finance Corporation (IFC) and will focus on priority private sector support to the two sub-basins in the areas of micro-finance, index-weather insurance, and information (ICT) support.

67. The LDCF project will build on GRZ-funded DMMU activities to develop on-the-ground capacity to engage with vulnerable communities. This includes synergising with PPCR activities aimed at strengthening the provision of climate information, more specifically on: i) a social marketing awareness campaign to raise awareness on the importance of climate information; and ii) strengthening EWSs piloted in selected districts in the Barotse and Kafue sub-basins.

68. Furthermore, innovative financing options – including public-private partnerships and market-based mechanisms – will be identified, developed and promoted for providing sustainable finance for the operation and maintenance of the installed meteorological observation, forecasting and early warning systems. This will align with PPCR activities focused on climate change adaptation in the private sector.

69. **“Radio and Internet” (RANET) Programme.** Whilst not a baseline project for the LDCF project, because lack of available funds to act as co-finance, the LDCF project will build on the achievements of ZMD's RANET Programme. RANET aims to improve the delivery of information on agriculture, education, health, environment, weather, forecasted severe events and other vital developmental information to rural communities. This is achieved by assisting rural communities to partner with local FM broadcasting stations and by helping them to establish community broadcasting stations so that the information can be disseminated in local languages. The primary objective of RANET is to enhance the living standards of rural communities by improving the food security base and general well-being.

70. To date, RANET Zambia has established partnerships with the following radio stations: i) Radio Chikaya; ii) PASME Radio; iii) Kafue FM; iv) Chongwe Community Radio; v) Radio Mano of Kasama; vi) Radio Mazabuka; vii) Radio Maranatha of Kabwe; viii) Mkushi Community Radio; ix) Radio Yangeni of Mansa; x) Oblate Radio LiselionMongi; xi) Radio Lyambai of Mongu; xii) Radio Maria of Chipata; xiii) Breeze FM in Chipata; xiv) IsokaCommunity Radio; xv) Mwinilunga Community Radio; and xvi) Radio FCC of Solwezi. RANET is in the process of establishing partnerships with: i) Kariba Radio in Sinazongwe District; ii) Kalabo Community Radio in Sesheke District; and iii) Radio Inyambo in Sesheke District. RANET is also connected by internet to the existing commercial radio stations, bringing the total number of connections to 21.

71. Through the RANET Programme, the following equipment has been provided to rural communities: i) over 3,050 solar/windup radio receivers; ii) 43 Tongshi DAMB-R satellite receivers; iii) 20 mobile phones as part of a pilot project to test feedback mechanisms; and iv) chatty beetle systems at ZMD HQ and district offices through a pilot project – this is a satellite-based communication instrument able to transmit 159 characters at a time through earth orbiting communication satellites. The LDCF project will incorporate the RANET programme into its

communication strategy, and use the available FM broadcast channels in the districts where the community-based EWS will be established through Outcome 2.1.

72. In addition to these related, on-going initiatives, the LDCF project will link and coordinate with activities under the: i) African Center of Meteorological Application Development (ACMAD) – namely Southern Africa Regional Climate Outlook Forum (SARCOF); 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.

B. ADDITIONAL INFORMATION NOT ADDRESSED AT PIF STAGE:

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

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

Objectives

74. The stakeholder consultation during project implementation will be expected to support all outcomes. Overall, the objective of the consultation plan is to provide a framework to guide and promote two-way engagements between the Implementing Partner (ZMD), Responsible Parties (DMMU, DWA/WRMA, MAL, MoH, CSO and INCCS) and the key stakeholders with whom the project will engage and directly impact upon.

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

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

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

- Identify constraints and solutions: As a two-way engagement, the consultation process should be used as an opportunity to identify with stakeholders possible constraints to or with the project’s implementation and to work with the stakeholders in finding sustainable solutions.
- Managing expectations: The LDCF investment is relatively minor, compared to the adaptation demands facing Zambia. It will be important that consultations take due consideration to manage expectations of stakeholders and stakeholder groups.
- Partnerships for co-financing: The LDCF seek to add value to their investments by building on existing and parallel projects that represent co-financing and consultations should consider

opportunities for partnerships that will leverage co-financing into innovative approaches or technologies that may improve efficiencies and enhance impact. Secured co-financing partners and amounts are detailed in Sections 2.4 and 4 of the LDCF project document.

Activities planned during implementation and evaluation

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

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

Phase I – Developing a strategy and action plan

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

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

79. Types of consultation mechanism will include:

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

Phase II - Consultation through implementation

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

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

Phase III - Project completion and scale up promotion

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

Stakeholders

82. The lead institution for project outputs will be ZMD for Outcome 1 and DMMU for Outcome 2. The outputs that the RPs and other groups will be key stakeholders in are shown in Table 2.

Table 2: Relevant partners and stakeholders identified for engagement by project outcome/output.

Outcome	Output	Lead Institution	Key Partners	Key Responsibilities
Outcome 1: Enhanced capacity of Zambia Meteorological Department to monitor and forecast extreme weather and climate change.	Output 1.1 28 Automatic Weather Stations procured and installed, and 41 existing manual and automatic monitoring stations rehabilitated.	ZMD	DWA/WRMA, MAL and INCCS	Undertake systematic analysis. Procure and install AWSs. Undertake repairs. Integrate AWSs into existing ZMD network.
	Output 1.2 Weather and climate forecasting systems updated, including the installation of the required hardware and software and integration of satellite observations.	ZMD	DMMU, DWA/WRMA, MAL and INCCS	Upgrade ZMD's climate prediction model. Upgrade and update the national ZMD database. Review and install appropriate telecommunication infrastructure. Procure and install forecasting workstations. Develop and establish an online web platform. Conduct training on the Satellite Distribution System.
	Output 1.3 Capacity developed for operating and maintaining the climate observation network and related infrastructure including the training of 10 engineers, 10 technicians and local communities to maintain and repair meteorological equipment, computer infrastructure and telecommunications network.	ZMD	INCCS and local communities where equipment is installed	Develop an observation network quality control and maintenance toolbox. Develop the capacity of 20 engineers. Undertake an awareness campaign.
	Output 1.4 Technical capacity of ZMD is developed to improve the production of standard and customized weather and climate forecasts and packaging meteorological data and information into a suitable format for user agencies and local community end-users.	ZMD	DMMU, DWA/WRMA, MAL, UNZA and INCCS	Conduct training of i) 4 senior climatologists (based in Lusaka); ii) 20 analysts (2 in each province) and 28 weather forecasters. Develop training packages and toolkits.
Outcome 2: Efficient and effective use of hydro-meteorological and environmental information for making early	Output 2.1 Tailored, sector-specific weather and climate information made accessible to decision makers in government, private sector, civil society, development partners and local communities.	DMMU	ZMD, DWA/WRMA, MAL, MoH, CSO, INCCS and local communities in the priority districts of Chipata,	Undertake a comprehensive assessment of existing centralised and decentralised early warning systems. Develop and promote a weather and climate information online

<p>warnings and long-term development plans.</p>			<p>Gwembe and Sesheke</p>	<p>platform. Train 3 personnel from each of DMMU, DWA/WRMA, MAL, MoH and CSO. Develop and implement SOPs and information sharing/analysis agreements. Evaluate the costs and benefits of accurate, timely and accessible weather and climate forecasts. Build the human and technical capacity of the DMMU to facilitate inter-sectoral sharing of weather and climate information</p>
	<p>Output 2.2 National capacity developed for assimilating weather and climate information into existing national policies, development plans and disaster management systems.</p>	<p>DMMU</p>	<p>ZMD, DWA/WRMA, MAL, MoH, CSO, INCCS, GRZ policy makers and local (district) government user agencies</p>	<p>Identify, review and propose revisions to sectoral policies, strategies, investment plans and annual workplans. Develop and implement protocols for integrating weather and climate information into plans and selected policies. Develop capacity to integrate weather and climate information into annual workplans. Develop the capacity of local (district) government user agencies.</p>
	<p>Output 2.3 Communication channels and procedures for issuing warnings are enabled at a national level, and implemented at a district level through the development of mobile phone-based alert platforms in the priority districts of Chipata, Gwembe and Sesheke.</p>	<p>DMMU</p>	<p>ZMD, DWA/WRMA, MAL, MoH, CSO, INCCS and local communities in the priority districts of Chipata, Gwembe and Sesheke</p>	<p>Develop a communication and coordination strategy Develop an early warning system dissemination national and local toolbox. Undertake field visits and stakeholder consultations. Map sub-basin climate hazards. Establish an Open Data Platform Implement a two-way, SMS-based alert system.</p>
	<p>Output 2.4 Public-private partnership developed for sustainable financing of the operation and maintenance of the installed meteorological</p>	<p>DMMU</p>	<p>ZMD (Instruments Division), MAL, CSO, INCCS and private sector</p>	<p>Undertake a review of the agriculture insurance sector. Develop Terms of Reference and issue a call for proposals.</p>

	observation network.		companies	Establish the public-private partnership.
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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):

83. Zambia is highly dependent on weather and climate-sensitive sectors for food, energy, water, income and livelihoods. These sectors, in turn, are reliant on climate information to inform long-term development plans. Monitoring of the predicted increases in temperature and rainfall vulnerability is therefore necessary to inform planning for adaptation actions for the impacts of climate change in Zambia. The procurement and installation of monitoring infrastructure will provide real-time climate data from most districts in Zambia. Training will be provided to engineers, technicians, climatologists, analysts and weather forecasters, primarily from ZMD, MAL, DWA/WRMA and DMMU. This climate information infrastructure and training, together with the appropriate hard- and software at centralized and decentralized offices, will improve: i) the accuracy and spatial coverage of available climate information; and ii) the use of this information in providing tailored, sector-specific information to sectors and societies vulnerable to the impacts of climate change at a national level. Additionally, strengthening the current institutional framework of the DMMU to ensure collaboration with technical departments of line ministries will result in a streamlined approach to the development of tailored information and the issuing of climate-related early warnings. At present: i) the spatial coverage of automatic stations is not sufficient to provide the required data to inform forecasts on the 1-7 day timescale, and the provision of data from the manual stations is unreliable; ii) there is a lack of skilled personnel to process the available, or any improved, climate data; and iii) there is limited coordination of climate and early-warning related activities in Zambia. The infrastructure, training and institutional coordination provided through the LDCF project will therefore be of great benefit at a national scale.

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

85. At a local level, the project will focus its interventions on establishing community-based EWSs in Chipata (Eastern Province), Sesheke (Western Province) and Gwembe (Southern Province) Districts (Figure 1). These districts were selected, through the DMMU/World Food Programme (WFP) Gender Based Participatory Risk Analysis Pilot Project⁸, because of their:

- high vulnerability to floods and droughts (based on a secondary review of the Zambia Vulnerability Assessment Committee (ZVAC) assessments reports for 2005, 2007, 2008, 2009 and 2010);
- high level of chronic food insecurity (based on ZVAC and Living Conditions Monitoring Survey (LCMS) assessment reports);
- high level of extreme poverty incidences; and
- geographical location based in the priority Zambezi and Luangwa Valley areas.

⁸DMMU and UN-WFP. 2012. Inception Baseline Assessment Report for the Gender Based Participatory Risk Analysis Pilot Project.

86. Two-way, mobile phone-based EWSs will be established in each of the above districts, which will allow communication of flood, drought, health and other climate-related early warnings to vulnerable communities. This provision of timely information will benefit communities in the three districts through: i) avoided loss of life and infrastructure from severe climate hazards such as floods and storms; ii) increased access to agricultural information and awareness of drought forecasts to improve agricultural productivity and enhance food security; iii) improved health status of people and animals; iv) improved access to market information with associated improvements in financial security; and v) improved access to educational material and training opportunities whilst the EWS is established. The two-way system will allow communities to send relevant, climate hazard-related information back to line ministries via the existing framework within the DMMU, which will be strengthened through the LDCF project.

87. Women and men play different roles in society and have different access to information in disaster-related situations. In Zambia, traditional gender roles mean that women make up the majority of smallholder farmers and are generally responsible for water collection and family health. Zambia's Gender Policy (2000) highlights the specific vulnerabilities of women, including limited livelihood options, restricted access to education and information services, and insufficient means to recover assets after disaster events. As such, women will benefit directly from improvements in the provision of flood, drought, health and other-climate related information and warnings.

88. The priority districts where the EWS will be implemented – Chipata, Gwembe and Sesheke – were selected through gender-sensitive surveys. Similarly, to ensure an effective early warning system is developed that includes all vulnerable persons in a community, specific project demonstration sites within these districts will be selected based on gender-sensitive assessments. The results of these assessments 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. Radio has been shown to be the most dominant and widespread medium for accessing information, however, men are more likely to have access to a radio than women⁹. Mobile phones are seen as an effective means of conveying information to women in Zambia, more so than television and internet¹⁰. One of the objectives of the mobile-based alert platform that will be established through the LDCF project is to ensure that at least 50% of mobile phone users are women. It is essential that this goal is reached, as women are often the worst affected by the impacts of climate change, due to their predominantly agriculture-based livelihoods¹¹. 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. Emphasis will therefore be placed on ensuring that the most appropriate means from engaging women through the EWS are prioritised in the LDCF project. Based on the 2010 population census¹², the LDCF project will benefit 599,751 people at the local level, including: i) 452,428 people (230,738 women) in the Chipata District; 94,612 people (48,252 women) in the Sesheke District; and 52,711 people (26,883 women) in the Gwembe District. This represents approximately 5% of the Zambian population, and approximately 2.6% of women in Zambia.

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

⁹ AudienceScaes Development Research Briefs. 2010. Zambia: Barriers to Traditional Media Use and Access. InterMedia Survey Institute.

¹⁰ AudienceScaes Development Research Briefs. 2010. Case Study: Young Zambia Women's Access to Information about Maternal and Child Health. InterMedia Survey Institute.

¹¹ Tall, A. and Choudhury, 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.

¹² Central Statistical Office. 2011. 2010 Census of Population and Housing: Preliminary Population Figures.

89. Quantifying the cost effectiveness of improved climate information and early warning system investments is acknowledged to be difficult, and is therefore not regularly undertaken¹³. 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 relief¹⁴. 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)¹⁵. There is potential for similar cost-benefits to be realised through investing in improved climate monitoring and early warnings systems in developing countries. These benefits are expected to be proportional to: i) the population of the country; ii) level of climate-related risk; and iii) exposure to weather due to the state of infrastructure. 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 be¹⁶:

- between US\$ 300 million and US\$ 2 billion per year of avoided asset losses due to climate change-induced disasters;
- an average of 23,000 saved lives per year, which is valued between US\$ 700 million and US\$ 3.5 billion per year using the Copenhagen Consensus guidelines; and
- between US\$ 3 and US\$ 30 billion per year of additional economic benefits.

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

91. The approach taken to ensure cost-effectiveness of the LDCF project's outcomes is detailed further below and in Table 3.

Outcome 1. Enhanced capacity of ZMD to monitor and forecast extreme weather and climate change.

92. LDCF project activities will build on existing networks, achievements and planned actions by ZMD and DWA/WRMA. 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 if the implementation of a separate initiative, as it will allow the LDCF project to be managed within the existing institutional and management frameworks. The LDCF project will also work closely with existing DMMU, ZMD and DWA/WRMA projects to co-produce outputs. This will promote cost-sharing with these other projects, reducing overheads and enhancing cost-effectiveness. The LDCF project will also develop sustainable financing mechanisms to support the operation and maintenance of the improved hydro-

¹³Tsirkunov, V. and Rogers, D. 2010. Costs and benefits of early warning systems. Global Assessment report on Disaster Risk Reduction. The World Bank.

¹⁴Healy, A. and Malhotra, N. 2009. Myopic Voters and Natural Disaster Policy. *The American Political Science Review* 103(3): 387-406.

¹⁵Tsirkunov, V. and Rogers, D. 2010. Costs and benefits of early warning systems. Global Assessment report on Disaster Risk Reduction. The World Bank.

¹⁶Hallegette, 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.

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.

93. 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. Stakeholders within the ZMD and DWA/WRMA 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 as well as procurement 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.

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

95. 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 Table 3 below.

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

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

98. After surveying the technical support needs for each country a set of common specialized technical staff were identified, each with particular skills related to: i) the development of hydroclimatic observing systems; ii) the effective design and implementation of standard operating

procedures; iii) tailored warnings/advisories; and iv) the communication of advisories/warnings. Hiring 3 or 4 full-time technical staff, which can provide the needed support for all countries, will be more cost-effective than hiring consultants for each country and all projects will benefit from the diverse technical support that will be provided. Further benefits include time saved on HR procurement procedures (e.g. for hiring, advertising etc.) and the ability to compare and standardize support across countries where possible. UNDP will directly undertake the recruitment for all project staff which will support all countries in this multi-country programme

99. A regional approach will also help strengthen the development of standard operating procedures (both protocols and the legal basis of inter-ministerial agreements) in Outputs 2.1, 2.2, 2.3 and 2.4. In Zambia, such standard operating procedures include those for: i) developing climate risk and sector-specific vulnerability maps and resultant tailored information and warnings using improved information (Output 2.1); ii) sharing and analyzing hydro-meteorological data and information (Output 2.1); iii) integrating weather and climate information into development policies and plans (Output 2.2); iv) disseminating of and responding to weather and climate information and warnings (Output 2.3); and v) allowing the private sector to use data generated by the hydro-meteorological observation network (Output 2.4). A regional approach will allow Zambia to benefit from experiences and development/implementation of standard operating procedures in other countries in the region, which in turn will benefit from Zambia-specific actions. In addition, capacity building/development workshops will be undertaken at a regional level. This will allow all project countries to benefit from shared information, lessons learned and best-practices, and will be more cost-effective as costs such as workshop facilities and accommodation, hiring technically skilled trainers and purchasing/developing appropriate training materials can be shared between the countries. For example, the training of senior climatologists, analysts, weather forecasters and researchers (Output 1.4 for Zambia) to produce forecasts and develop tailored hydro-meteorological information can be undertaken through regional workshops, as this is a training requirement for most countries.

100. All projects under this programme will develop a sustainable financing strategy for ongoing operation and maintenance of the newly enhanced hydro-meteorological networks. These strategies may include leveraging financing and logistic support from private sector companies and relevant sectors. In the instance of Zambia, specific sectors that the ZMD aims to align with (Output 2.4) include, but are not limited to, the agricultural insurance sector, particularly weather-based index insurance for private sector farmers and agricultural investors. Where private sector engagement includes multi-national corporations, regional support will assist in engaging head offices in multiple countries. This will increase the total effective services being offered and the bargaining position of each government. In the case of mobile (cellular) communications (which will be used for both disseminating alerts and the collection of data used to generate alerts), the regional support programme will leverage collective negotiations for data services. The programme will also engage with corporate social responsibility programmes of multi-national corporations to enhance services where possible. This is a more cost effective approach than were the 10 individual countries to approach such corporations individually.

Table 3: Comparison of LDCF project outputs and alternates considered.

Output	Barrier Addressed	Alternatives Considered
<p>Output 1.1 28 Automatic Weather Stations procured and installed, and 41 existing manual and automatic monitoring stations rehabilitated.</p>	<p>Inadequate weather and climate monitoring infrastructure, which limits data collection, detection of climate trends, analysis and provision of timely meteorological services.</p> <p>Limited knowledge and capacity to effectively monitor and predict future weather and climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.</p>	<p>Alternative 1: Only use manual stations and incorporate SMS communication services, using the existing capacity to monitor and report data with familiar and user-friendly equipment. Automated data collection is necessary in order to generate timely alerts, particularly at night when manual stations will not be monitoring or reporting data.</p> <p>Alternative 2: Expansion of the meteorological monitoring network through procurement of only new Automatic and Manual Stations. However, the costs and technical challenges of maintaining 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.</p> <p>Alternative 3: Lightning detection systems. At present, there is considerable variability around the costing for lightning detection systems. Besides startup costs, which in some cases are a significant portion of the project budget, the costs of implementing new technologies, training and maintenance, as well the requirement for ground based observations (for calibration) and the untested nature of the technology in Africa were significant concerns.</p> <p>Alternative 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 the high costs and extensive technical capacity requirements for operation and maintenance of these technologies suggest that investments in simpler, more fundamental skills and technologies would be more sustainable and appropriate to the local context.</p>

<p>Output 1.2 Weather and climate forecasting systems upgraded, including the installation of the required hardware and software and integration of satellite observations.</p>	<p>Inadequate weather and climate monitoring infrastructure, which limits data collection, analysis and provision of timely meteorological services.</p> <p>Limited knowledge and capacity to effectively predict future weather and climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.</p>	<p>Alternative 1: Ongoing and planned monitoring, forecasts and EWS initiatives will continue to operate independently. Moderate investments could be directed to restoring the functionality of existing facilities. However, this will not result in a modernization of the hydro-meteorological monitoring and forecasting system and there will be only a limited development of national capacity as a result of LDCF investments. Furthermore, if existing facilities are not appropriately modernized and data is not readily accessible to various stakeholders, it will be challenging to incorporate other user-agencies of weather, climate and hydrological information such as DMMU, DWA, WRMA, MAL, MoH, CSO and INCCS.</p> <p>Alternative 2: Forecasting and data management capacity is sourced offshore. However this is not popular with GRZ as this places data (which is considered a national asset) offshore and does not build local human and technical capacities.</p>
<p>Output 1.3 Capacity developed for operating and maintaining the climate observation network and related infrastructure including the training of 10 engineers, 10 technicians and local communities to maintain and repair meteorological equipment, computer infrastructure and telecommunications network.</p>	<p>Inadequate weather and climate monitoring infrastructure, which limits data collection, analysis and provision of timely meteorological services.</p> <p>Long-term sustainability of observational infrastructure and technically skilled human resources to maintain it because of inadequate GRZ and/or private sector funding.</p>	<p>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.</p> <p>Alternative 2: Technical capacity of personnel could be built 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 ZMD and DMMU and will reduce the up-scaling of technical capacity built through the LDCF project.</p>

<p>Output 1.4 Technical capacity of ZMD is developed to improve the production of standard and customized weather and climate forecasts and packaging meteorological data and information into a suitable format for user agencies and local community end-users.</p>	<p>Limited knowledge and capacity to effectively project future climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.</p> <p>Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.</p> <p>Low community level uptake of warnings, advisories and available climate/weather information.</p>	<p>Alternative 1: Generalised weather and climate forecasts can continue to be produced at periodic intervals with comparatively little economic investment. However the limited availability of tailored sector-specific climate information packages is likely to result in a low level of use of climate information as the data is not directly applicable to many end users.</p> <p>Alternative 2: Only regional and international products are used. This would reduce their applicability and usefulness within the districts and sectors targeted in Zambia.</p>
<p>Output 2.1 Tailored, sector-specific weather and climate information made accessible to decision makers in government, private sector, civil society, development partners and local communities.</p>	<p>Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.</p> <p>Low community level uptake of warnings, advisories and available climate/weather information.</p>	<p>Alternative 1: Generalised weather and climate forecasts can continue to be produced at periodic intervals with comparatively little economic investment. However the limited availability of tailored sector-specific climate information packages is likely to result in a low level of use of climate information as the data is not directly applicable to many end users.</p> <p>Alternative 2: 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.</p> <p>Alternative 3: 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.</p>

<p>Output 2.2 National capacity developed for assimilating weather and climate information into existing national policies, development plans and disaster management systems.</p>	<p>Limited knowledge and capacity to effectively project future climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware.</p> <p>Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.</p>	<p>Alternative 1: Allow national, district and local policy-making and planning to continue under present <i>modus operandi</i>. This would perpetuate the current reactive approach to climate change adaptation and disaster risk management planning. This would result in poor coordination of early warning-related planning and implementation across all levels, leading to duplication of efforts and/or gaps in delivery of services (especially in localized flood, drought and extreme weather management and relief efforts).</p>
<p>Output 2.3 Communication channels and procedures for issuing warnings are enabled at a national level, and implemented at a district level through the development of mobile phone-based alert platforms in the priority districts of Chipata, Gwembe and Sesheke.</p>	<p>Limited knowledge and capacity to effectively project future climate events as a result of an acute shortage of technology and skilled human resources, as well as access to climate models and hardware. This means climate information and warnings do not reach those who need the information, either because there is no access to technology or inappropriate communications and terminology are used.</p> <p>Weak institutional coordination between institutions leading to limited packaging, translating and disseminating climate information and warnings.</p> <p>Low community level uptake of warnings, advisories and available climate/weather information.</p>	<p>Alternative 1: Continue using present communication channels and procedures for issuing alerts. This would result in a poor coordination of alerts being issued. Also, there would be no standards in terms of <i>inter alia</i> protocols, content, timing and modalities of alerts. Consequently, alerts may contain insufficient information, be of poor quality, not reach the proper recipients, and/or be transmitted/received too late. 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.</p>
<p>Output 2.4 Public-private partnership developed for sustainable financing of the operation and maintenance of the installed meteorological observation network.</p>	<p>Long-term sustainability of observational infrastructure and technically skilled human resources is threatened. GRZ agencies are unable to grow and develop services to generate revenue.</p>	<p>Alternative 1: Operation and maintenance of upgraded hydro-meteorological network can be financed purely through allocation of public budgets. However this will reduce the participation of various socio-economic sectors in the development of tailored forecasts and EWS services i.e. reduce dialogue regarding most vulnerable services. Furthermore, the limited availability of funding from ZMD and DWA/WRMA budgets is likely to affect the efficacy and sustainability of the LDCF project's investments.</p>

C. DESCRIBE THE BUDGETED M & E PLAN:

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

102. 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.

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

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

104. 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.

105. **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 and lessons learned. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

106. **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.

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

- Progress made toward project objective and project outcomes , including indicators, baseline data and end-of-project targets (cumulative);
- Project outputs delivered per project outcome (annual);

- Lesson learned/good practice;
- AWP and other expenditure reports;
- Risk and adaptive management; and
- ATLAS QPR.

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

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

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

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

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

Table 4: Project Monitoring and Evaluation

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Inception Workshop and Report	<ul style="list-style-type: none"> ▪ Project Manager (MEE) ▪ PIU 	Indicative cost: 10,000	Within first two months of project

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

NAME	POSITION	MINISTRY	DATE(MM/dd/yyyy)
Mr. Godwin Fishani Gondwe	Director, Environment and Natural Resources	Ministry of Lands, Natural Resources and Environmental Protection	04/19/2012

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, Office-in-Charge, and Deputy Executive Coordinator, UNDP/GEF		Sept. 11, 2013	Mark Tadross Technical advisor, Gr-LECRDS	+27216502884	mark.tadross@undp.org

ANNEX A: PROJECT RESULTS FRAMEWORK

<p>This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: 2.1) Government and partners enable vulnerable populations to be food secure by 2015; 4.1) Disaster Management and Mitigation Unit (DMMU) has a fully functional national disaster management and early warning system to prevent, alert and respond to disasters by 2015; 4.2) Government promotes adaptation and provide mitigation measures to protect livelihoods from climate change by 2015; and 4.3) Government implements policies and legal frameworks for sustainable community based natural resources management by 2015</p>					
<p>Country Programme Outcome Indicators: 2.1) Proportion of population below minimum level of dietary energy consumption (%); 4.1) % of disasters with timely responses; 4.2) Number of households benefiting from environment and Climate Change adaptation and mitigation funds; and 4.3) % reduction in annual average deforestation rate.</p>					
<p>Primary applicable Key Environment and Sustainable Development Key Result Area: Promote climate change adaptation</p>					
<p>Applicable SOF (e.g. GEF) Strategic Objective and Program: Objective 2 “Increase adaptive capacity to respond to the impacts of climate change, including variability, at local, national, regional and global level”.</p>					
<p>Applicable 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”.</p>					
<p>Applicable SOF (e.g. GEF) Outcome Indicators:</p> <ul style="list-style-type: none"> • Relevant risk information disseminated to stakeholders • Type and no. monitoring systems in place • % of population covered by climate change risk measures 					
	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
<p>Project Objective: To strengthen the climate monitoring capabilities, early warning systems and available information for responding to climate shocks and planning adaptation to climate change in Zambia.</p>	<p>1. Capacity as per capacity assessment scorecard.</p> <p>2. Domestic finance committed to ZMD and DMU to monitor and warn against extreme weather</p>	<p>1. Average capacity scorecard rating of 80 across men and women (see Annex 5 of PD).</p> <p>2. Annual budget of: USD 322,680 allocated to ZMD; and USD 614,057 allocated to DMMU.</p>	<p>1. Capacity scorecard rating is increased to an average of 171 for both men and women (see Annex 5 of PD).</p> <p>2. 20% increase¹⁷ in annual domestic finance allocated to ZMD and DMMU to monitor and warn against extreme weather and climate</p>	<p>1. Focus group interviews with climate information and EWS-related stakeholders; consultant reports.</p> <p>2. Review of ZMD and DMMU annual budgets.</p>	<p><u>Risk:</u> Human, technical capacity within DMMU, ZMD, MAL, DWA/WRMA, MoH and CSO, including extension services and within decentralised offices, is insufficient to effectively implement the LDCF project.</p> <p><u>Assumption:</u> Training opportunities provided through the LDCF project result in the development of the required capacity, and the government provides the necessary budget to provide the required institutional framework in which the</p>

¹⁷To be confirmed during project inception.

	and climate change.		change.		<p>newly skilled staff can operate.</p> <p><u>Risk:</u> Poor coordination and information sharing structures/agreements between IP (ZMD), RPs (DMMU, MAL, DWA/WRMA, MoH and CSO) and UNDP CO results in institutional failure, compartmentalized progress and delayed implementation of the LDCF project.</p> <p><u>Assumption:</u> The management arrangements established through the LDCF project result in a coordinated approach to implementing the project.</p> <p><u>Risk:</u> Insufficient institutional support and political commitments from the government leads to a decrease in the political will ensured during project design, ultimately destabilizing the LDCF project.</p> <p><u>Assumption:</u> Government commitment established during the design phase of the LDCF project is maintained for the project duration.</p> <p><u>Risk:</u> The slow pace of policy modification may mean that identified development frameworks do not integrate climate change in a timely fashion</p> <p><u>Assumption:</u> Climate change adaptation considerations are included in development framework formulation, based on advancements in climate information and forecasting achieved through the</p>
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					LDCF project.
Outcome 1: Enhanced capacity of Zambia Meteorological Department to monitor and forecast extreme weather and climate change.	1. Percentage of national coverage of climate monitoring network (fully operation ¹⁸).	1. Automatic: 0% of districts; Manual: 0% of districts ¹⁹ .	1. Automatic: 29% of districts; Manual 37% of districts ²⁰ .	1. Field inspection of AWS sites; review of climate information database.	<p>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.</p>
	2. Frequency data transmission and reception.	<p>2. At present, 2 AWSs record data which is sent daily</p> <p>Majority of manual stations record data at (GMT) 06h00, 09h00, 12h00, 15h00. However, provision to ZMD does not occur daily.</p>	<p>2. 30 AWSs (28 new, 2 rehabilitated), transmitting data continuously.</p> <p>39 rehabilitated manual stations collecting data at the synoptic hours of (GMT) 06h00, 09h00, 12h00, 15h00, 18h00 and 00h00, and sending to ZMD daily.</p>	2. Review of climate information database.	<p>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.</p> <p>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</p>

¹⁸This is interpreted as all sensors and equipment functioning as intended, including the communication/data transfer system, if installed.

¹⁹At present, there are only 2 AWSs and 39 manual stations across the 105 districts – however, all of these are in need of rehabilitation (extent required to be determined through Output 1.1).

²⁰AWSs will be installed in 30 (28 new, 2 rehabilitated) out of 105 districts and will be fully operational; manual stations will be rehabilitated in 39 of the 105 districts and will be fully operational.

					<p>communities where the effectiveness of the EWSs will be tested.</p> <p><u>Risk:</u> Local information technology and telecommunications infrastructure restricts the transfer of data from installed equipment to necessary recipients, and restricts communication amongst key role players and end-users.</p> <p><u>Assumption:</u> Information technologies and telecommunications systems implemented or used, where such suitable system already exist, through the LDCF project are best suited to the local context and do not restrict the transfer and communication of information.</p> <p><u>Risk:</u> Procurement and installation of hydro-meteorological equipment, including hardware and software, is delayed because of complications with the release of funds and/or national procurement procedures.</p> <p><u>Assumption:</u> UNDP CO and HQ will coordinate with the IP to ensure effective administrative planning meaning the equipment is procured and installed in a timely manner.</p>
<p>Outcome 2 Efficient and effective use of hydro-meteorological and environmental information for making early warnings and long-term development</p>	<p>1. Percentage of population in Chipata, Gwembe and Sesheke Districts with access to improved climate-related flood and drought</p>	<p>1. <u>0 %</u> of men <u>0 %</u> of women.</p>	<p>1. <u>100 %</u> of men; <u>100 %</u> of women.</p>	<p>1. Gender-sensitive field surveys undertaken within identified priority sites, representative the Zambia population; consultant reports</p>	<p><u>Risk:</u> Lack of commitment from communities where EWS are established undermines the effectiveness of the LDCF project demonstrations.</p> <p><u>Assumption:</u> Awareness raising activities, and the demonstration of the advantages of responding to the information provided through the</p>

<p>plans.</p>	<p>warnings (disaggregated by gender).</p> <p>2. Development frameworks and disaster policies that integrate climate information in the formulation.</p> <p>3. Sector-specific, tailored climate information packages that integrate climate risks.</p>	<p>2. The <u>Sixth National Development Plan</u> highlights the need to develop climate change mainstreaming and response strategies, but not the need for improved information to inform the strategies.</p> <p>3. ZMD, in collaboration with the relevant line ministries, produces sector-specific forecasts for <u>agriculture, aviation, water and health.</u></p>	<p>2. At least the <u>Seventh National Development Plan</u> to incorporate the availability of climate information into planning for the five year period.</p> <p>3. Sector-specific, tailored climate information packages produced for <u>agriculture, aviation, water, health²¹, tourism, construction, road and rail transport, and energy.</u></p>	<p>2. Review of Seventh National Development Plan.</p> <p>3. Interviews with line ministries and a review of the information packages released.</p>	<p>established EWS, will ensure the commitment of the communities in participating in the LDCF project.</p> <p><u>Risk:</u> Poor coordination and information sharing structures/agreements between IP (ZMD), RPs (DMMU, MAL, DWA/WRMA, MoH and CSO) and UNDP CO results in institutional failure, compartmentalized progress and delayed implementation of the LDCF project. <u>Assumption:</u> The management arrangements established through the LDCF project result in a coordinated approach to implementing the project.</p> <p><u>Risk:</u> Human, technical capacity within DMMU, ZMD, MAL, DWA/WRMA, MoH and CSO, including extension services and within decentralised offices, is insufficient to effectively implement the LDCF project. <u>Assumption:</u> Training opportunities provided through the LDCF project result in the development of the required capacity, and the government provides the necessary budget to provide the required institutional framework in which the newly skilled staff can operate.</p> <p><u>Risk:</u> Insufficient institutional</p>
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²¹ Forecasts for agriculture, aviation, water and health are already being produced, but the indicator stresses the use of “improved climate information”.

					<p>support and political commitments from the government leads to a decrease in the political will ensured during project design, ultimately destabilizing the LDCF project.</p> <p><u>Assumption:</u> Government commitment established during the design phase of the LDCF project is maintained for the project duration.</p> <p><u>Risk:</u> The slow pace of policy modification may mean that identified development frameworks do not integrate climate change in a timely fashion</p> <p><u>Assumption:</u> Climate change adaptation considerations are included in development framework formulation, based on advancements in climate information and forecasting achieved through the LDCF project.</p>
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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).

Comment	Response
USG Comments	
<p>Include detailed activities related to production of climate/hydrological information, communications and sustaining this work and retaining expertise, particularly under component 2.</p>	<p>The LDCF project will invest in rehabilitation of existing hydro-meteorological monitoring infrastructure in addition to the procurement of new monitoring equipment. Relevant computer hardware and software will be procured to support the management and analysis of the enhanced climate and weather datasets. Investments in infrastructure will be complemented by capacity-building and training activities, both within Implementing Parties as well as within various end-users of climate information. 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.</p> <p>Component 2 will strengthen inter-agency coordination and communication by establishing cross-sectoral committees on Disaster Management and Early Warnings. The mainstreaming of weather and climate information into relevant national policies, workplans and development plans will establish a precedent for using improved hydro-meteorological data to inform planning, thereby providing incentives to public decision holders to allocate sufficient operation and maintenance budgets. Standard Operating Procedures (SOPs) and lessons learned generated by pilot demonstration projects can be used to guide relevant initiatives and up-scaling of project activities.</p>
<p>Include clear explanations of how local communities and women will be involved in shaping the project and describe how the project will benefit vulnerable populations and individuals.</p>	<p>The project demonstration sites, in Chipata, Gweme and Sesheke, were selected based on a gender-sensitive vulnerability assessment. Project benefits will therefore be realised in areas where women are among the most climate-vulnerable demographics. The dissemination mechanisms will include not only radio but mobile phones and mega-phones, led by DMMUs Satellite early warning and disaster management personnel in order to reduce the risk of excluding particular demographic groups. Further, the project will develop a feedback mechanism to enable women to voice their suggestions/comments to improve alerts and climate information dissemination.</p>
<p>Activities related to data stewardship should be expanded to include a plan for data sharing throughout the region and globally.</p>	<p>The Zambian 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 Zambian LDCF project and related initiatives in other LDCF project countries. Baseline initiatives identified by the LDCF project include regional initiatives such as “Southern Africa Science Service Centre for Climate Change and Adaptive Land Management (SASSCAL)”, the World Bank-led “Water Resource Development Project”, the UNZA-linked “Coordinated Regional Climate Downscaling Experiment (CORDEX) Project”. The aforementioned and other regional initiatives are anticipated to benefit from the results of the LDCF interventions, including the provision of high-quality real-time weather and climate data.</p> <p>The LDCF project will ultimately be overseen by a Project Manager and Project Board, the mandated responsibilities of which will include liaising and coordinating with national as well as regional authorities and project participants.</p>
<p>Clearly articulate the sectors that will benefit from the project, and include considerations of the adaptation priorities and needs of local communities.</p>	<p>Sector-specific, tailored climate information packages produced for agriculture, aviation, water, health, tourism, construction, road and rail transport, and energy.</p> <p>The project demonstration sites, in Chipata, Gweme and Sesheke, were selected based on a gender-sensitive vulnerability. Project benefits will therefore be realised in areas where women and most climate-sensitive. The dissemination mechanisms will include not only radio but mobile phones and mega-phones, led by DMMUs Satellite early warning and disaster</p>

	management personnel. Further, the project will develop a feedback mechanism to enable women to voice their suggestions/comments to improve alerts and climate information dissemination.
The proposal requests funding for an “appropriately equipped hydrological boat for comprehensive profiling of salinity”. We request UNEP and UNDP to explain why this platform was chosen over lower cost platforms.	N/A
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 ZMD and DMMU as well as user-agencies namely DMMU, DWA/WRMA, MAL, CSO, MoH and local communities in Zambia. 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 11 September 2012; ii) a series of stakeholder consultations in December 2012; and iii) a validation workshop on 2 May 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 (World Bank, GIZ). Please see details of stakeholder involvement during the preparation phase in Annex 2 of the Project Document.
Long term data records require sustainability and therefore need more detail for output 2.5 (sustainable financing) and how it will overcome barriers.	Output 2.4 (Output 2.5 in the PIF) has been developed and focuses on establishing public-private partnerships between the private sector and ZMD (particularly the Instrument Division, responsible for maintenance of meteorological infrastructure) for sustainable financing of the operation and maintenance of the installed meteorological observation network. This, and government (ZMD) commitment to maintaining the installed equipment (through co-financing agreements), will assist in overcoming the barrier of sustainability of the monitoring network. This in turn will allow for the continuation and further development of long-term data records.
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 1.2 focuses on the integration of satellite and existing data in to the upgraded ZMD climate prediction model, as well as collaboration the WRMA and linking the meteorological data with that housed in the hydrological database (IWRMIS). Rehabilitation/installation of radar and upper air monitoring stations are not included in the project, as the initial and recurring (daily radiosonde launches) were considered to be too high for the project budget, and would not be maintained after the project duration period.
Projects will be challenged by a lack of IT infrastructure (bandwidth, etc.) to collect, analyse, exchange and archive data.	Increasing the internet bandwidth was considered to be outside of the scope of the project, however this is a barrier that the government needs to address. For the LDCF project, the necessary IT and telecommunications systems have been included and budgeted for to link the installed AWS with the ZMD district and national office in Lusaka. ZMDs database will be upgraded (to CLIMSOFT) to store and exchange the data, and GTS communication with Regional Meteorological Centres will be rehabilitated to share information with international agencies.
There is a lack of workstations to make forecasts, access global products for downscaling etc.	Thirty modern forecasting workstations will be provided to ZMD, including the required hard- and software, to improve forecasting capabilities i.e. downloading meteorological information and processing it through climate models. Twenty workstations will be located at the ZMD HQ in Lusaka, and ten will be located in the provincial offices (one in each office).
There is a lack of private capital to support the large costs of modernisation.	Output 2.4 has been designed to catalyse private sector support in installing and maintain meteorological equipment. This will complement the efforts of the International Finance Corporation (IFC), though the PPCR, that is aiming to enhance private sector support in climate change adaptation activities, including weather-based index insurance and the establishment of a

	climate platform to assist farmers in the Kafue and Barotse sub-basins.
Specific details on which hazards are important and where should be included.	The LDCF project will focus on the priority climate hazards of drought and flood. Agro-ecological Zones I (in particular) and II are prone to drought, while Agro-ecological Zone III is prone to flooding because of a predicted increase in rainfall. See Annex 6 for a map of the Agro-ecological Zones. Other areas prone to flooding include the floodplains of major rivers e.g. the Zambezi, Kafue and Barotse. The LDCF project demonstration sites are in Agro-ecological Zones I and II.
More analyses of climate needs to be included in determining where hydromet stations should be located.	Through consultations with ZMD, 28 districts have been prioritized for installation of AWSs. The exact location of the AWSs will be determined through Output 1.1. Emphasis will be placed on the monitoring of climate-sensitive valley areas – at present most (manual) station are located on plateaus.
To ensure that the appropriate climate observations are recorded and applied, the following considerations should be included: Clear descriptions of the types of observations that are required and how they will feed into an EWS appropriately.	Synoptic stations will collect the a range of data which will be transmitted to district ZMD offices as well as to the national HQ in Lusaka. The data will be used to inform forecasts which will be provided to DMMU, after being packaged and translated into the appropriate format by technicians at DWA/WRMA, MAL, CSO and MoH (through activities in Output 2.1). This appropriately packaged information will be disseminated through the communication channels established within ZMD established through Outcome 2.3, and lead by the early warning and disaster management technical committees within the NDMC.
Provide data to world climatic data centres.	Data will be supplied to GTS (Global Telecommunication System) – the international system for meteorological data collection/analysis. Data will include that collected by the AWSs. The GTS is non-functioning at present, and will be restored through Output 1.2.
Clearly distinguish between weather and climate observations and how they are used.	The following distinction has been included: i) forecasting the next 1-10 days is considered a weather forecast; ii) a seasonal forecast (next 1-6 months) is a climate forecast; and iii) any longer-term (10 years) prediction is considered a climate prediction. Improved weather forecasting will be used to inform short-term warning advisories, as well as improve the provision of expected weather conditions to the public. Seasonal forecasting will be used for sectoral and contingency planning e.g. in the water and energy, in relation to rainfall and associated water availability; and in the agriculture sector in relation to predictions for the forthcoming growing season. Climate predictions will be used to inform long-term climate change adaptation planning and development strategies.
Details should be provided on whether additional funding for procurement of technology can be accessed.	Additional funding through the LDCF cannot be accessed, however, numerous baseline projects are installing equipment and technologies of relevance to improving the climate observational network and dissemination of information in Zambia. These baseline projects (SASSAL and WB WRDP) and related initiatives (COMESA, UNDP-GEF agriculture project, WB PPCR and GIZ/KfW) have been detailed in the Project Document.
Project goals include mitigation of flood/drought losses but have insufficient hydrological modelling described in the PIF.	Hydrological modelling in Zambia is being strengthened through the GIZ/KfW water sector reform programme, and the WB WRDP. The WB project is a baseline project and the GIZ/KfW is a related initiative. LDCF resources will therefore not be used to develop hydrological modelling capabilities. However, the improved climate information will assist the WRMA with their hydrological forecasts.
Include considerations of how capacity of hydrological services (and agriculture) can be improved e.g. issue flood and drought monitoring and early warnings.	As stated above, hydrological services and capacity will not be a focus of the project. However, LDCF resources have been directed to developing the capacity (through Output 2.1) of technicians at DMMU, DWA/WRMA, MAL MoH and CSO to produce sector-and region-specific information, based on the improved climate information provided by ZMD.

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?	Collaboration will be strengthened – ZMD and MAL do work together to produce a 10-day crop-weather bulletin, but this will be strengthened through improved information and packaging of the bulletin in a format that is more useable to local farmers. This information will be disseminated through DMMU EWS system – which will incorporate Satellite early warning and disaster management personnel, as well as MAL extension officers. The data supplied by ZMD will need to be packaged (manipulated) into a useable format – the capacity required for this will be developed through Output 2.1.
In Component 2 there is a need to articulate the types of forecasts that will be produced.	Meteorological (severe weather), agro-meteorological (including drought, crop planting and harvesting advisories, and market-related information), hydro-meteorological (flood) and health related forecasts will be packaged through Output 2.1, and disseminated through the channels developed in Output 2.3. These will include early warning on short-term scales, (daily and weekly for floods and disease outbreak), long-term seasonal forecasts for extreme weather (droughts) and long-term climate predictions and trends.
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 project is still on generating climate information and disseminating this through early warnings, however an output is included (2.2) focussed on ensuring the information on future long-term projections (climate predictions) is integrated into plans and policies at the national and district scale.
Hydromet products which are sold for a fee will limit uptake by vulnerable populations.	Hydro-meteorological information will be free for the general population, as per the current situation. The PPPs developed through Output 2.4 will result in companies established, in partnership with ZMD, selling packaged data to private sector users, such as weather-based risk insurance. In return for selling this information, the private sector will fund the maintenance of the installed meteorological equipment.
Include consideration of how the project will benefit women, noting that evidence suggests that women do not receive EWS messages via radio.	The project demonstration sites, in Chipata, Gweme and Sesheke, were selected based on a gender-sensitive vulnerability. Project benefits will therefore be realised in areas where women and most climate-sensitive. The dissemination mechanisms will include not only radio but mobile phones and mega-phones, led by DMMUs Satellite early warning and disaster management personnel. Further, the project will develop a feedback mechanism to enable women to voice their suggestions/comments to improve alerts and climate information dissemination.
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), 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. These groups are included in the baseline situation analysis (Section 2.3), upon which the LDCF project will build, however, as they are not providing co-financing, they are not considered baseline projects.
There is a need to include WMO and the GFCS initiative.	The WMO focal point in Zambia is based in the ZMD and therefore the LDCF project will be closely linked and aligned to WMO initiatives in the country. This will include the GFCS initiative to the extent that it will be active in Zambia and the region.
Clarify how it plans to promote coordination between ministries at both the national and provincial level. We appreciate the involvement of multiple government agencies and institutions as this EWS will not only require input	Component 2 will strengthen inter-agency coordination and communication by establishing cross-sectoral committees on Disaster Management and Early Warnings. Weather and climate information will be mainstreamed into relevant national policies, workplans and development plans. Management arrangements introduced by the LDCF project will address gaps in coordination between IP (ZMD), RPs (DMMU, MAL, DWA/WRMA, MoH and CSO) and UNDP CO.

<p>from various sector experts but also produce information applicable to numerous ministries and institutions.</p>	<p>Forecasts tailored to specific sectors such as agriculture and aviation will be produced by ZMD in collaboration with the relevant line ministry, thereby strengthening communication and coordination between government departments.</p>
<p>Outline how users will be involved both in the design of the EWS and in deciding what information is produced from the EWS as well as how information will be disseminated. Better results can be achieved by ensuring that climate information and early warning system products are user-driven and communicated to users through various innovative channels</p>	<p>LDCF project activities will build on existing networks, achievements and planned actions by ZMD and DWA/WRMA and will work closely with existing DMMU, ZMD and DWA/WRMA projects to co-produce outputs.</p> <p>The proposed activities of the LDCF project are based on information received from a range of stakeholder consultations conducted in Zambia from September 2012 to April 2013. This participatory approach has been initiated through collaboration with national government departments in designing the LDCF project approach and interventions. This approach of broad participatory consultation will be maintained under implementation of the LDCF project. Consequently, relevant government departments, as well as local communities, will be involved in the design and implementation of project interventions.</p> <p>Implementation of the LDCF project activities will include technical capacity building focused on appropriate government departments that will coordinate and/or support the implementation of the LDCF project. Furthermore, local communities will be consulted during the development of early warning systems in Chipata, Gwembe and Sesheke Districts. The LDCF project will thereby address needs identified by local communities which will instill community ownership of the project's activities.</p>
<p>Clarify how it will communicate results, lessons learned and best practices identified throughout the project to the various stakeholders both during and after the project; and</p>	<p>Progress of the LDCF project will be monitored in the UNDP Enhanced Results Based Management Platform.</p> <p>Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS.</p> <p>Based on the information recorded in Atlas, Project Progress Reports (PPR) can be generated in the Executive Snapshot.</p> <p>Other ATLAS logs will be used to monitor issues and lessons learned. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.</p> <p>Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks which may be of benefit to project implementation through lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. There will be a two-way flow of information between this project and other projects of a similar focus.</p>
<p>Engage local stakeholders, including community-based organizations and environmental NGOs in both the development and implementation of the program</p>	<p>The proposed activities of the LDCF project are based on information received from a range of stakeholder consultations conducted in Zambia from September 2012 to April 2013. This participatory approach has been initiated through collaboration with national government departments in designing the LDCF project approach and interventions. This approach of broad participatory consultation will be maintained under implementation of the LDCF project. Consequently, relevant government departments, as well as local communities, will be involved in the design and implementation of project interventions. Local communities will be consulted during the development of early warning systems in Chipata, Gwembe and Sesheke Districts. The LDCF project will thereby address needs identified by local communities which will instill community ownership of the project's activities.</p>
<p>Germany Comments</p>	

<p>The project involves substantial investments in infrastructure. Germany appreciates that questions of sustainability, and international recommendations regarding climate services in particular, have been considered. However, it doesn't 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.</p>	<p>Government (ZMD) commitment has been secured through co-financing to maintain the installed equipment for the duration of the LDCF project. The value of the climate information and early warnings to vulnerable sectors and communities will contribute to securing the required funds beyond the project. Output 2.4 will establish PPP aimed at assisting with this maintenance, and installing further stations to improve the accuracy and coverage of the data, as, for example, the weather-based index insurance market requires a constant flow of high quality data. While it was not possible to establish partnerships with specific companies in the project development phase, the LDCF project will capitalise on the interest generated in the Zambia private sector through the IFC components of the PPCR.</p>
<p>As the proposed project requires very specialized technical expertise on meteorology (hardware and software), provide detailed information on how expertise and comparative advantages of partners is incorporated in the project.</p>	<p>ZMD have long standing relations with EUMETSAT and the British Met service (UKMO) and have access to experts and technical expertise that will be procured during the project to transfer this knowledge. The WMO focal point in Zambia is based in the ZMD and therefore the LDCF project will be closely linked and aligned to WMO initiatives in the country. A pool of international and local specialists with specific expertise in meteorology and EWS will be supporting the project implementation, meaning the required external technical specialists will be available where necessary. Lastly, UNDP have Regional Technical Advisors with experience in implementing climate information and EWS projects, and will guide the development of this LDCF project in Zambia.</p>
<p>The additional cost reasoning should be outlined more clearly. Much of the investment is for the weather related observational network and brings considerable co-benefits for economic activities, logistics and transport. However, a baseline development of maintaining and upgrading of infrastructure is not described. Please elaborate on the climate and climate change related benefits in comparison to the business as usual investment.</p>	<p>The additional cost reasoning is detailed under the adaptation alternative for each outcome (Section 2.4). In summary: the current climate information (including monitoring) and early warning systems in Zambia 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 Zambia will significantly undermine social and economic development under a changing climate. This is captured in the problem statement that the LDCF project is addressing. The baseline development of maintaining and upgrading infrastructure under the ZMD as well as the baseline development situation for disaster management under the DMMU 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 ZMD and DMMU. 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</p>

	<p>response to weather and climate information and early warnings, including efficient delivery mechanisms using radio and telecommunications networks.</p>
<p>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.</p>	<p>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)</p>
<p>World Bank Comments</p>	
<p>There is concern that approving these projects based on a template is at the expense of more robust proposals (perhaps more targeted) and could pose a reputational risk to the GEF.</p>	<p>The Zambian project has been designed and prepared to focus on Zambia-specific problems and solutions. This includes the contextualisation of information presented in the PIF, as captured in the project outputs. The most significant deviation from the PIF is the exclusion of procuring and installing hydrological monitoring and observation equipment. The GIZ and WB related initiative and baseline project, respectively, (described in Section 2.3), are supplying the required hydrological equipment and associated capacity building in the hydrological sectors. The decision not to include these activities in the project was based on consultations with the respective project managers and the DWA during the development of this LDCF project. However, the LDCF project will work closely with these baseline projects and ensure that data generated by the new and rehabilitated equipment is incorporated into the ZMD database and used the generation of early warnings through Outcome 2 of the LDCF project. Other deviations from the PIF include a contextualisation of the numbers stipulated in the logframe, including: i) number of automatic and manual stations procured and rehabilitated; and ii) number of staff trained. The installation of radar, upper air monitoring and satellite equipment has also been excluded as it was determined, in consultation with government stakeholders, that these installations were not the most cost effective way of addressing the climate monitoring related problems in Zambia. Details of the sector-specific products have been provided, and an indicator has been added to reflect the number of products produced. Communication channels to relay warnings to vulnerable communities have been made specific, to build on the activities of DMMU at a national level. The budget, risks, benefits and stakeholder sections have also been contextualized, based on the stakeholder consultations undertaken in the project preparation phase.</p>
<p>There is insufficient assessment of current state of hydro-met sector, past failures and their causes.</p>	<p>The baseline (current) situation has been described in Section 2.4. This and the Barriers section (1.3) highlight the challenges and inadequacies of the meteorological sector. These characterise the past failures, which include a lack of maintenance of meteorological equipment and an un-coordinated approach to the generation, issuance and dissemination of climate information and warnings. The additional cost reasoning section describes how the LDCF project will address these past failures and present challenges. This includes developing capacity to maintain the meteorological equipment, and securing GRZ funding to provide the necessary resources to sustain maintenance. In addition, Output 2.4 of the project will establish PPPs to generate revenue to fund O&M of the installed equipment. The approach to the generation, issuance and dissemination of climate information and warnings will be formalized through a statutory framework governing data sharing</p>

	and institution collaboration. Capacity will be developed in both the climate information and early warning generation and dissemination fields, to ensure a co-ordinated approach is maintained through the LDCF project.
There is insufficient consideration of the limitations of current capacity, which currently prevents many of the proposed activities in some countries.	ZMD is currently short-staffed, and this is acknowledged in the Project Document. However, increased budget allocations will provide additional meteorologists at senior and support level. The capacity of these and existing staff members will be developed through Output 1.4. Capacity limitations in end-user institutions (DMMU, DWA/WRMA, MAL, CSO and MoH) also prevent the currently available data from being used in the most effective manner. These capacity limitations will therefore limit the use of improved (more regularly available, covering a wider area of Zambia) climate information. To address this problem, capacity will be developed in end-user institutions through Output 2.1 to produce climate risk and vulnerability sector-specific maps and resultant tailored information. The institutional framework within which data sharing and collaboration will occur will be strengthened through a statutory regulatory framework developed through the LDCF project. This will ensure there is no confusion as to how to access meteorological data, and outline who is responsible for producing what information. Ultimately, this statutory regulatory framework will reinforce the mandates of the institutions involved in the generation and use of climate information.
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 ZMD as well as cost estimates of preferred models of equipment that are currently being used in the country. Activities related to the procurement of spare parts have been included and budgeted for.

ANNEX C: STATUS OF IMPLEMENTATION OF PROJECT PREPARATION ACTIVITIES AND THE USE OF FUNDS²²

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

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

PPG Grant Approved at PIF: 100,000			
<i>Project Preparation Activities Implemented</i>	<i>GEF/LDCF/SCCF/NPIF Amount (\$)</i>		
	<i>Budgeted Amount</i>	<i>Amount Spent To date</i>	<i>Amount Committed</i>
1. Review and technical feasibility study and cost assessment analysis	46,000	37,719	8,281
2. Information collection and stakeholder consultations (including stakeholder workshops)	34,000	32,630	1,370
3. Identification of co-funding sources and formulation of project documents	14,000	12,510	1,490
4. Institutional arrangement for implementation	6,000	4,910	1,090
Total	100,000	87,769	12,231

²²If 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