Meeting of the Board
28 – 30 June 2016
Songdo, Incheon, Republic of Korea
Provisional agenda item 12(e)

GCF/B.13/16/Add.04

8 June 2016

Consideration of funding proposals – Addendum

Funding proposal package for FP012

Summary

This addendum contains the following three parts:

a) A funding proposal titled "Africa Hydromet Program: Phase 1 - Mali Country Project" submitted by World Bank;
b) A no-objection letter issued by the national designated authority or focal point; and
c) Environmental and social report(s) disclosure.

The documents are presented as submitted by the accredited entity, and national designated authority or focal point, respectively.

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Funding Proposal

Version 1.1

The Green Climate Fund (GCF) is seeking high-quality funding proposals.

Accredited entities are expected to develop their funding proposals, in close consultation with the relevant national designated authority, with due consideration of the GCF's Investment Framework and Results Management Framework. The funding proposals should demonstrate how the proposed projects or programmes will perform against the investment criteria and achieve part or all of the strategic impact results.

Project/Programme Title:	Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Mali Country Project
Country/Region:	Mali (Sub-Saharan Africa)
Accredited Entity:	The World Bank

GREEN CLIMATE FUND

Contents

Annexes are available separately.

Note to accredited entities on the use of the funding proposal template
• Sections **A, B, D, E** and **H** of the funding proposal require detailed inputs from the accredited entity. For all other sections, including the Appraisal Summary in section F, accredited entities have discretion in how they wish to present the information. Accredited entities can either directly incorporate information into this proposal, or provide summary information in the proposal with cross-reference to other project documents such as project appraisal document. • The total number of pages for the funding proposal (excluding annexes) is expected not to exceed 50.

Please submit the completed form to:

fundingproposal@gcfund.org

File name:

"FP-WBG-151207-Revised-160425"

A.1. Brief Project / Programme Information			
A.1.1. Project / programme title		**Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Mali Country Project**	
A.1.2. Project or programme		Project	
A.1.3. Country (ies) / region		**Mali**	
A.1.4. National designated authority (ies)		**Environment and Sustainable Development Agency (AEDD)**	
A.1.5. Accredited entity		**The World Bank**	
A.1.5.a. Access modality		☐ Direct ☒ International	
A.1.6. Executing entity		Directorate-General for Civil Protection (Government of Mali)	
A.1.7. Project size category (Total investment, million USD)		☐ Micro (≤10) ☐ Medium (50<x≤250)	☒ Small (10<x≤50) ☐ Large (>250)
A.1.8. Mitigation / adaptation focus		☐ Mitigation ☒ Adaptation ☐ Cross-cutting	
A.1.9. Date of submission Date of last submission		December 7, 2015 April 25, 2016	
A.1.10. Project contact details	Contact person, position	Christoph Pusch, Practice Leader, Urban and Disaster Risk Management, Africa Region Prashant Singh, Senior DRM Specialist, GSURR, World Bank.	
	Organization	The World Bank	
	Email address	cpusch@worldbank.org; prashant@worldbank.org	
	Telephone number	+1 202 352 2193; +1 202 460 6178	
	Mailing address	J8-075, The World Bank, 1818 H Street NW Washington DC 20433 USA	

A.1.11. Results areas *(mark all that apply)*

Reduced emissions from:

- ☐ Energy access and power generation
  (E.g. on-grid, micro-grid or off-grid solar, wind, geothermal, etc.)
- ☐ Low emission transport
  (E.g. high-speed rail, rapid bus system, etc.)
- ☐ Buildings, cities and industries and appliances
  (E.g. new and retrofitted energy-efficient buildings, energy-efficient equipment for companies and supply chain management, etc.)
- ☐ Forestry and land use
  (E.g. forest conservation and management, agroforestry, agricultural irrigation, water treatment and management, etc.)

Increased resilience of:

- ☒ Most vulnerable people and communities
  (E.g. mitigation of operational risk associated with climate change – diversification of supply sources and supply chain management, relocation of manufacturing facilities and warehouses, etc.)
- ☒ Health and well-being, and food and water security
  (E.g. climate-resilient crops, efficient irrigation systems, etc.)
- ☐ Infrastructure and built environment
  (E.g. sea walls, resilient road networks, etc.)
- ☐ Ecosystem and ecosystem services
  (E.g. ecosystem conservation and management, ecotourism, etc.)

A.2. Project / Programme Executive Summary (max 300 words)

Please provide a brief description of the proposed project/programme, including the objectives and primary measurable benefits (see investment criteria in section E). The detailed description can be elaborated in section C.

Mali is vulnerable to several climate related hazards, including flooding and drought, is already experiencing the impacts of climate change and urgently needs additional concessional support for strengthening the scientific base for generating climate and weather information to inform climate-resilient development pathways.

The **Project Development Objective** is to strengthen the adaptive capacity and climate resilience of vulnerable communities and the economy of Mali. This will be achieved by developing the capacity of national hydro-meteorological and warning services, which will in turn support adaptation planning for public and private sector users.

Mali already experiences extreme weather and climate variability, resulting in high exposure to floods and droughts. The impacts of climate change are projected to increase both the frequency and severity of these events. Improved weather and climate information is required from the national level down to the household level so that government, communities and the private sector can better plan for and adapt to these projected changes in climate. Hydromet and early warning services act as a key enabler for a broad range of adaptation decisions, ranging from the agriculture sector, infrastructure, disaster risk management, and others. For example, projected changes in climate are expected to result in increased rainfall over shorter time spans for some areas of Mali. Improved hydromet and early warning services would allow agencies to better monitor, prepare for and respond to extreme rainfall events and flooding, thus building adaptive capacity and reducing the vulnerability of communities. In areas of infrastructure development, hydromet information will inform the resilient design of relevant works such as bridges, culverts, and erosion protection. In terms of agriculture and food security, reliable hydromet information assists farmers in deciding which agricultural technologies and adaptation mechanisms may be most useful in responding to weather variability and climate change. Private companies and businesses also need and rely on the hydromet data to make investment decisions related to climate risk mitigation for their operations.

By ensuring delivery of services to communities, the project will benefit highly vulnerable groups, including the 80% of country's population whose livelihoods are dependent on predominantly rain-fed agriculture and about 5.3 million people directly exposed to drought or flooding.

The project will consist of the following components:

1 - Capacity building and institutional development
This will include: (i) training and capacity building programs for agencies' staff and management, (ii) enhancing institutional and regulatory frameworks, and (iii) providing support for detailed design and system integration of project activities.

2 - Improvement of hydromet and early warning infrastructure
This will include (i) expanding and upgrading hydromet observation networks, (ii) enhancing data collection & transmission, forecasting and decision support systems, and (iii) strengthening preparedness and emergency response facilities and operations.

3 - Enhancement of service delivery and warnings to communities
This will include (i) establishing a national framework of climate services, (ii) improving flood and drought forecasting and warnings, (iii) developing new products for sector specific needs (agriculture, health, energy, water resources management, disaster risk management, etc.), (iv) strengthening "last mile" connectivity to ensure appropriate understanding and use of information, and (v) mobilization and sensitization of community and establishing effective feedback mechanisms for communities at risk.

4 - Project management
This component will include support to the project management unit providing assistance to executing entities and ensure fiduciary compliance.

Primary **benefits** include:

- Increased generation and use of climate information in decision making for adaptation planning

- Strengthened adaptive capacity and reduced exposure to climate risks
- Strengthened awareness of climate threats and risk-reduction processes
- Increased food security

The executing entity of the project will be the Directorate General of Civil Protection (DGPC), which will manage the project in close collaboration with and in support of Mali Météo (MMA), National Directorate of Hydraulics (DNH), and Food Security Early Warning System (SAP). Extensive consultations were held with the Government of Mali and users of hydromet information and warning services in preparing this project proposal. It is fully in line with national strategies such as the Strategic Growth and Poverty Reduction Framework (CSCRP), the NAPA, the National Climate Change Policy (PNCC), and the draft National Strategy for Disaster Risk Reduction.

This project is prepared under the Africa Hydromet Framework Program, which is jointly developed by the World Meteorological Organization, the African Development Bank and the World Bank Group. Currently, the World Bank and African Development Bank (Clim-Dev) are finalizing the joint work program on this account. Action has also commenced between the World Bank and WMO in terms of the Memorandum of Understanding between the two entities.

The Program seeks to improve hydromet and early warning capacity and strengthen networks through open data and information sharing in Sub-Saharan Africa. This approach will enable the Program to maximize economies of scale and regional integration, apart from promoting south-south cooperation to ensure transformational change and longer-term sustainability to enhance climate adaptation and climate-resilient development. For streamlined implementation, vulnerable countries in climate sensitive zones in Sub-Saharan Africa, such as the Sahel and the Zambezi River Basin will be selected for targeted project support under the Program. The countries will be selected in terms of their vulnerability and readiness, and also on the basis of the scope of leveraging ongoing efforts by governments and their development partners. Individual funding proposals under the Program will be submitted on a project by project basis. This funding proposal is the first project under the Program.

A.3. Project/Programme Milestone

Expected approval from accredited entity's Board (if applicable)	28/06/2016
Expected financial close (if applicable)	31/12/2016
Estimated implementation start and end date	Start: 01/01/2017 End: 31/12/2020
Project/programme lifespan	4 years 0 months

B.1. Description of Financial Elements of the Project / Programme

Please provide:

- *an integrated financial model in Section I (Annexes) that includes a projection covering the period from financial closing through final maturity of the proposed GCF financing with detailed assumptions and rationale; and a sensitivity analysis of critical elements of the project/programme*

  The proposed financing instrument is grant and therefore projection from financial closing through final maturity is not applicable.

- *a description of how the choice of financial instrument(s) will overcome barriers and achieve project objectives, and leverage public and/or private finance*

  The proposed Grant financing is adequate for the development of public basic services supporting the safety of citizens and protection of livelihoods against natural hazards and climate variability – and would catalyse in the longer term the gradual development of value-added services to directly support climate-resilient development planning and investments, with some economic return.

- *Indicative breakdown of cost estimates for total project costs and GCF financing by sub-component:*

Component	Sub-component (if applicable)	Amount (for entire project) *(USD, Million)*	GCF funding amount *(USD, Million)*
Component 1 - Capacity building and institutional development	1.1 – Training and capacity building programs	2.50	2.50
	1.2 – Enhancing institutional and regulatory frameworks	0.60	0.60
	1.3 – Detailed design and system integration of project activities	2.00	2.00
Component 2 - Improvement of hydromet and early warning infrastructure	2.1 – Expanding and upgrading hydromet observation networks	5.20 (includes Gov counterpart)	4.50
	2.2 – Enhancing data collection & transmission, forecasting and decision support systems	1.80 (includes Gov counterpart)	1.50
	2.3 – Strengthening preparedness and emergency response facilities and operations	7.50 (includes Gov counterpart and GFDRR co-financing)	5.15
Component 3 - Enhancement of service delivery and warnings to communities	3.1 – Enhanced service delivery, including: (i) establishing national framework of climate services, (ii) improving flood and drought forecasting and warnings, and (iii) developing new products for sector specific needs	2.50 (includes Gov counterpart)	2.00
	3.2 – Improved early warning and community preparedness, including: (i) strengthening “last mile” connectivity to ensure appropriate understanding and use of information, and (ii) mobilization and sensitization of community and establishing effective feedback mechanisms for communities at risk	3.50 (includes Gov counterpart)	3.00
Component 4 – Project Management		1.55 (includes Gov counterpart)	1.50
Total project financing		29.50	22.75

- *Indicative breakdown of cost estimates for GCF financing by component and implementing partner – in million US$):*

Row Labels	DGPC	DNH	Mali-Météo	SAP	Total
A - Capacity building and institutional development	1.67	0.59	1.86	0.98	5.10
B - Improvement of hydromet and early warning infrastructure	1.98	2.61	4.90	1.66	11.15
C - Enhancement of service delivery and warnings to communities	1.90	0.84	1.57	0.69	5.00
D - Project Management	1.50	0.00	0.00	0.00	1.50
Total	7.04	4.04	8.34	3.33	22.75

Detailed disaggregated breakdown of these aggregate categories of expenditures is available in the feasibility study.

Co-financing sources

Co-financing is secured in the amount of US$4.5 million as follows:

1. US$2.5 million from the World Bank (GFDRR), and
2. US$2 million from the Government of Mali.

Co-financing commitments are reflected respectively in Annexes 10 (Mali Government, signed by the Minister of Transports, in charge for Meteorology) and 11 (signed by GFDRR Manager).

World Bank - GFDRR grant funding will support strengthening of emergency preparedness and response facilities and operations in order to support and enhance the overall climate resilience of vulnerable populations.

World Bank will strongly encourage and strive to make the government agree to allocate sufficient funds for the staff, investment and operational budgets of Mali-Météo (from an annual budget of about US$4.5 million in 2015), DNH (annual budget of about US$1.2 million in 2015), DGPC (annual budget of about US$1 million in 2015) and CSA/SAP (annual budget of about US$900,000 in 2015). During the mission in November, 2015, the Government has already confirmed an ongoing large recruitment plan for civil servants (a total of about 500 in the next 3 years), and indicated a commitment to increase overall three separate budget lines for investment, operation and staff across the fours institutions.

The total US$2 million co-financing represents 6.8% of the total annual budget of these entities over the 4-year implementation period, signifying the salaries and overheads of the staff working on the implementation of the project. It will contribute to installation, operation and maintenance of equipment, as well as to cover staff time for development of institutional development and service delivery. The tentative budget breakdown of this counterpart funding is as below:

- US$1,000,000 from Mali-Météo;
- US$400,000 from DNH;
- US$300,000 from DGPC;
- US$300,000 from CSA/SAP

- *Indicative breakdown of cost/budget (expressed in US$ million) by expenditure type and sub-component, excluding fees*

(Sub-)Component	**Total GCF funding**	Of which : Staff	Of which: Individual Consultants	Of which: Training	Of which: Services (Firms)	Of which: Travels and field visits	Of which: Goods	Of which: Works
1.1 – Training & capacity building programs	2.50	0.01	0.09	2.40				
1.2 – Enhancing institutional & regulatory frameworks	0.60	0.01		0.20	0.39			
1.3 – Detailed design & system integration of project activities	2.00	0.01	0.40		1.59			
2.1 – Expanding & upgrading hydromet observation networks	4.50			0.55	0.65	0.15	3.15	
2.2 – Enhancing data, forecasting & decision support systems	1.50	0.01	0.08	0.20	0.21	0.15	0.85	
2.3 – Strengthening preparedness & emergency response facilities & operations	5.15	0.01	0.10	0.20	0.14		4.70	
3.1 – Enhanced service delivery	2.00	0.01	0.06	0.40	0.36		1.17	
3.2 – Improved early warning & community preparedness	3.00	0.01	0.10	0.60	0.56	0.30	1.43	
4 – Project Management (DGPC)	1.50	0.02	0.18	0.30	0.30	0.30	0.40	
Total GCF financing to Mali	22.75	0.09	1.01	4.85	4.20	0.90	11.70	0.00

- *An indicative breakdown of cost/budget (expressed in US$ million) by expenditure type (project staff and consultants, travel, goods, works, services, etc. and excluding fees) and disbursement schedule in project/programme confirmation (term sheet) as included in section I, Annexes.*

	Year 1	Year 2	Year 3	Year 4	TOTAL
Staff	0.02	0.02	0.03	0.02	0.09
Individual Consultants	0.20	0.30	0.31	0.20	1.01
Training	0.80	2.60	1.25	0.20	4.85
Services (Firms)	0.20	1.60	1.60	0.80	4.20
Travels and field visits	0.20	0.30	0.20	0.20	0.90
Goods	1.20	4.60	4.30	1.60	11.70
Works	0.00	0.00	0.00	0.00	0.00
TOTAL	2.62	9.42	7.69	3.02	22.75

B.2. Project Financing Information (Excluding Accredited Entities' Fee)

	Financial Instrument	Amount	Currency	Tenor	Pricing
(a) Total project financing	**(a) = (b) + (c)**	27.25	million USD ($)		
(b) GCF financing to recipient	(i) Senior Loans		Options	( ) years	( ) %
	(ii) Subordinated Loans		Options	( ) years	( ) %
	(iii) Equity		Options		( ) % IRR
	(iv) Guarantees		Options		
	(v) Reimbursable grants *		Options		
	(vi) Grants *	22.75	million USD ($)		
	** Please provide economic and financial justification in section F.1 for the concessionality that GCF is expected to provide, particularly in the case of grants. Please specify difference in tenor and price between GCF financing and that of accredited entities. Please note that the level of concessionality should correspond to the level of the project/programme's expected performance against the investment criteria indicated in section E.*				
	Total requested (i+ii+iii+iv+v+vi)	22.75	million USD ($)		

	Financial Instrument	Amount	Currency	Name of Institution	Tenor	Pricing	Seniority
(c) Co-financing to recipient	Grant	2.0	million USD ($)	Govt of Mali			Options
	Grant	2.5	million USD ($)	World Bank			Options
	Options	……	Options	……	( ) years	( ) %	Options
	Options	……	Options	……	( ) years	( ) % IRR	Options
	Lead financing institution: World Bank/GFDRR.						
	** Please provide a confirmation letter or a letter of commitment in section I issued by the co-financing institution.* **The availability of grant financing managed by the World Bank has been discussed and agreed with senior management, and with the competent authorities, including Mali's national designated authority.**						

(d) Financial terms between GCF and AE (if applicable)

In cases where the accredited entity (AE) deploys the GCF financing directly to the recipient, (i.e. the GCF financing passes directly from the GCF to the recipient through the AE) or if the AE is the recipient itself, in the proposed financial instrument and terms as described in part (b), this subsection can be skipped.

If there is a financial arrangement between the GCF and the AE, which entails a financial instrument and/or financial terms separate from the ones described in part (b), please fill out the table below to specify the proposed instrument and terms between the GCF and the AE.

Financial instrument	Amount	Currency	Tenor	Pricing
			( ) years	( ) %

	Please provide a justification for the difference in the financial instrument and/or terms between what is provided by the AE to the recipient and what is requested from the GCF to the AE. Not Applicable

B.3. Financial Markets Overview (if applicable)

How market price or expected commercial rate return was (non-concessional) determined?
Not applicable

Please provide an overview of the size of total banking assets, debt capital markets and equity capital markets which could be tapped to finance the proposed project/programme.
Not applicable

Please provide an overview of market rates (i.e. 1-year T-Bill, 5-year government bond, 5-year corporate bond (specify credit rating) and 5-year syndicate loan.
Not applicable

Provide examples or information on comparable transactions.
Not applicable

Please fill out applicable sub-sections and provide additional information if necessary, as these requirements may vary depending on the nature of the project / programme.

C.1. Strategic Context

Please describe relevant national, sub-national, regional, global, political, and/or economic factors that help to contextualize the proposal, including existing national and sector policies and strategies.

Sub-Saharan Africa – Regional Context

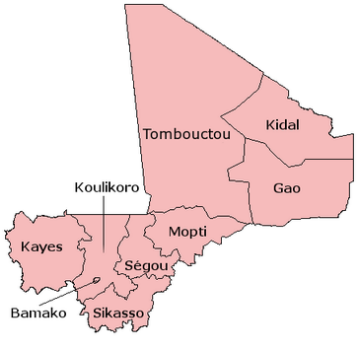
Africa accounts for a very small fraction of greenhouse gases' emissions, but is bearing the brunt of a disproportionate share of the effects of climate variability and volatility. Sub-Saharan Africa is a rapidly developing region of over 800 million people, with 49 countries, and great ecological, climatic and cultural diversity. Its population is projected to approach 1.5 billion by 2050. The region is confronted with a range of climate risks that could have far-reaching repercussions for its societies and economies. Even if warming is limited below 2°C, there are very substantial risks and projected damages, and as warming increases these are only expected to grow further. Sub-Saharan Africa is particularly dependent on agriculture for food, income, and employment, almost all of it rain-fed. Heat and drought would also result in severe losses of livestock and associated impacts on rural communities. Rapid urbanization in Sub-Saharan Africa is another driver of climate risk. It is projected that 56% of its population will live in cities by 2050, introducing a new aspect to the climate risk profile of Sub Saharan Africa. Huge natural resources, such as water, are turning into climate and disaster risks due to want to proper harnessing, which, in turn, depends on open data, its analysis and utilization in concrete sector investments to fight poverty and boost prosperity, thereby building climate resilience in the medium term. For example, the climate and disaster risks of Africa largely emanate from 'too much' or 'too little' water, but only 10% of the hydroelectric potential of Africa has been tapped so far – the lowest in any continent. In Sub-Saharan Africa, the Sahel and the Zambezi River Basin are among the most vulnerable 'hotspots' from the climate and disaster risk management perspective.

Instability and fragility in the Sahel are driven by land pressures from rapid population growth; high demographics; environmental degradation; climate volatility in countries already prone to desertification, drought, and flash floods; poor basic infrastructure in power and especially water; hunger and malnutrition; and a lack of economic opportunity, particularly for young women and men. These factors have created a regional 'fragility trap'. This complex development syndrome has spurred the Africa Hydromet Framework Program, which is jointly developed by the World Meteorological Organization, the African Development Bank and the World Bank Group. It seeks to improve hydromet and early warning capacity and strengthen networks through open data and information sharing in Sub-Saharan Africa. This approach will enable the program to maximize economies of scale and regional integration. The first investment of the program aims to augment the efforts by supporting climate resilience building in Mali, one of the worst affected Sahel countries battling the impact of climate variability.

Country Context - Mali

Background

Mali is a sparsely populated, predominantly dry country with a highly undiversified economy. The country has a land area of 1,241,248 sq km, representing 4.2% of the total area of Africa. It has a total population estimated at 14.5 million people, with approximately 63% living in rural areas. In addition to the capital city of Bamako, the country is divided into eight administrative regions. The northern regions of Gao, Kidal, and Timbuktu represent two-thirds of the entire country's area, but host only 10% of the country's population. The more populated southern area features the Niger and Senegal Rivers. Thus, delivery of hydro-meteorological and warning services to this large, sparsely populated territory involves severe challenges, with risks related to geographic inequity and low social cohesion.



In recent decades, Mali's economy has experienced mostly steady growth in the country's GDP, however, the recent socio-political crisis in early 2012 set the country back to fragile and highly vulnerable conditions. In 2012, there was a military coup and occupation of the northern regions by rebel and criminal groups. In the context of the food, political

and security crisis, Mali's economy contracted in 2012 with a negative growth rate of -1.2%[1]. The causes of the conflict are diverse and multi-layered and can be traced to a breakdown in the social contract, growing competition over resources (public funds as well as illicit rents), weak institutions, inequality and underlying social tensions. These drivers are exacerbated by climate change and population growth, which have put people's livelihoods under stress, as well as increasing access to arms, and maintaining persistently-high levels of youth unemployment. In May 2015, a peace accord was signed by the government and several militia and rebel factions to end the conflict in the north of the country. The peace agreement has created the minimum conditions for the Malian authorities to address the challenges of poverty reduction including in the North, however implementation remains challenging as the security situation in northern areas remains volatile. Details of how political and security issues have been integrated into the project design and particularly on the monitoring of the implementation, operations and maintenance of equipment and sustainability of project outcomes have been addressed in Section G1 on risks.

Economic growth in the country has been positive in aggregate terms, however, two features of Mali's growth merit highlighting: (1) the country's high population growth rates have translated in low economic growth rates in per capita GDP, and (2) economic growth has not been accompanied by increases in the number of jobs in the formal sector[2]. Poverty remains high, with just over half (50.6%) of the population living on less than $1.90 a day and the country ranking 176th on the 2015 Human Development Index. About 90% of poor people live in rural areas, relying on rain-fed agriculture and agro-pastoralism to make a living. Such households are highly vulnerable to shocks such as drought, which can significantly erode their productive assets and output (livestock, crop production, amongst others). Successive droughts and conflict in the country's northern region have also contributed to the rapid expansion of Mali's urban population, with urban growth rates of 4.7% (2010).

Climate and Disaster Risk Profile

Mali is exposed to a number of climate related hazards, but is particularly vulnerable to droughts, floods and locust invasion. From 1980 to 2014, more than 7 million people were affected by 28 drought and flood events. On average, these result in an annual economic impact of approximately US$140 million. Two thirds of Mali's land area is classified as desert or semi-desert, and the country is one of the most drought-prone in the world. Annual precipitation ranges from over 1000 mm per year in the southern Sudano-Guinean area to less than 200 mm per year in the northern Saharan area[3]. There is high inter-annual variability in rainfall, and recurrent dry years have become increasingly frequent since 1968. The main flood-prone areas are located in urban areas and along the Inner Niger Delta (64 000 sq km). More than 1.5 million fishermen, rice farmers and herdsmen depend on annual flooding for their livelihoods. Depending on the amount of rainfall, however, flood levels can vary significantly. High floods can result in casualties and extensive damages to physical assets such as roads, housing, crops and livestock, while low floods can cause very low production of rice and fish. The 2013 floods also highlighted the increasing vulnerability of Mali's urban areas to floods. In the capital of Bamako, torrential rains and inadequate drainage infrastructure provoked flash floods and resulted in 37 casualties as well as in the displacement of more than 20,000[4]. Thus, early warning for flood events is critical for protecting both the lives and livelihoods of the region's inhabitants.

[1] Konaté, A., & Diarra, B. (2014). *African Economic Outlook: Mali*. AfDB, OECD, UNDP.
[2] Bastagli, F., & Toulmin, C. (2014). Mali: Economic Factors Behind the Crisis. European Union.
[3] Nicholson, S. E., Kim, J., & Hoopingarner, J. (1988). Atlas of African Rainfall and its Inter-annual Variability. Tallahasse, FL: Department of Meteorology, Florida State University.
[4] UNOCHA. (2013). 2013 Rainy Season Overview: West and Central Africa.

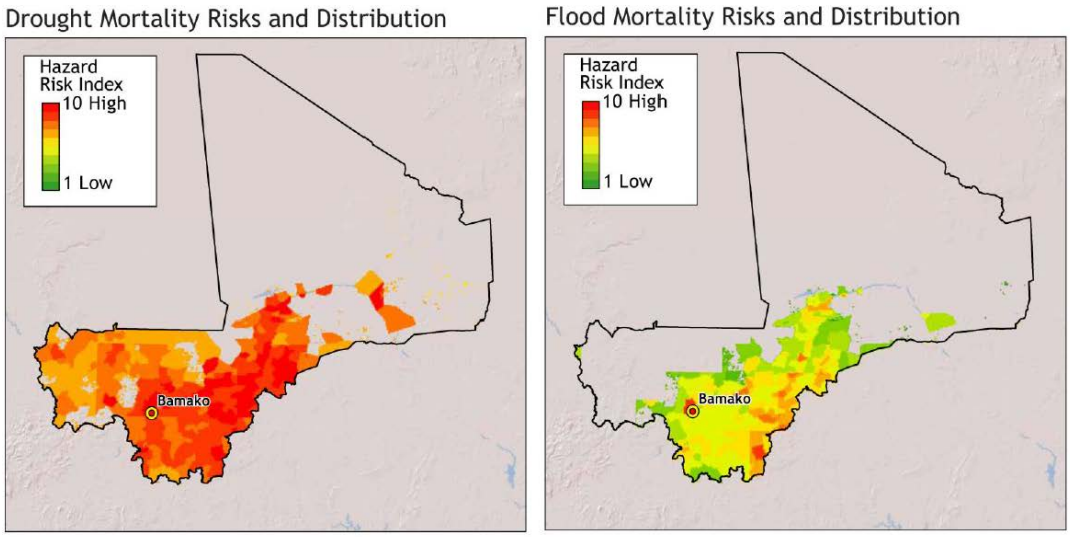


Figure 1: Exposure to Drought and Flood Hazards Across Mali[5]

Natural disasters (drought, flood and locust infestations), as well as other factors including limited arable land, environmental degradation, and fluctuating commodity prices have led to numerous food security and health challenges in Mali. This is particularly the case for vulnerable rural households dependent on subsistence farming and livestock herding. Following the 2011 drought and the subsequent loss of harvest, grain prices in 2011-2012 significantly increased in Mali, reaching price levels that were 80 to 100% above average during the lean season[6]. The escalation of conflict in 2012 also exacerbated the devastating impacts of food shortages in the country. Children are the most impacted and at risk from food shortages as early childhood malnutrition greatly increases the risk of death, and can lead to irreversible mental and physical impairment. According to the last Demographic and Health Survey in Mali, Global Acute Malnutrition among children under 5 was reported at 15%[7]. In March 2014, 3.7 million people were estimated in moderate and severe food insecurity with 1.5 million in immediate need of food assistance.

Existing National and Sector Policies and Strategies

The Government of Mali recognizes that strengthening the country's economic growth and addressing poverty reduction in a meaningful manner will require addressing climate and disaster risk. The Strategic Framework for Growth and Poverty Reduction (CSCRP 2012-2017), adopted by the Council of Ministers of Mali on 28 December 2011, is the reference document for the formulation and implementation of economic and social policies. The framework specifically identifies flood and drought hazards and the resulting food insecurity as significant barriers to addressing poverty reduction in the country. Mainstreaming climate change adaptation also has a prominent place thought the framework. Following the political and security crisis of 2012-2013, the CSCRP was supplemented by the Plan for the Sustainable Recovery of Mali (PRED 2013-2014) and the Government Action Plan (PAG 2013-2018). As part of its goal to strengthen economic growth in the country, one of the stated measures of the PAG is to develop and implement a plan to reduce the risk of flood and other natural hazards.

Disaster Risk Management Framework

Established in 1998, the Directorate General of Civil Protection (DGPC) acts as the Permanent Secretariat of the National Platform for Disaster Risk Reduction and has as its primary mandate to "develop elements of the National Civil Protection Policy and ensure its implementation". While the DGPC is the focal point for disaster risk management, several other agencies have an active role, including: Mali Metéo, the National Directorate of Hydraulics (DNH), the Environment and Sustainable Development Agency (AEDD), the National Center for the Fight against Locust (CNLCP), the Food Security Early Warning System of the Commissariat for Food Security (CSA/SAP), the National Directorate for Housing and Urban Development (DNUH), and the National Directorate of Land Use Planning (DNAT). A draft National

[5] The World Bank Group. (2011). Mali Climate Risk and Adaptation Country Profile.
[6] World Food Program. (2012). *Mali: Market Analysis Update, December 2012*.
[7] World Food Program. (2015). World Food Program: Mali Country Overview.

Strategy for Disaster Risk Reduction has been prepared, which articulates the need to identify, assess and monitor disaster risks and enhance early warning systems as one its five priority areas. Similarly, a Bill has been prepared which would clarify roles and responsibility of stakeholders for prevention and emergency response.

Climate Change Framework

Complementary to disaster risk management, Mali has also adopted a climate change framework to guide risk reduction and resilience building activities. It is signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. In 2007, Mali put in place a National Adaptation Programme of Action (NAPA) to identify its urgent and immediate needs for adaptation, and is currently in the process of formulating a National Adaptation Plan (NAP) for medium- and long-term adaptation planning. Mali has strengthened its institutional framework and policy instruments so that various ministries, agencies, and partner organizations can effectively contribute to climate change adaptation and mitigation. The AEDD was founded in 2010, and is responsible for coordinating national environmental policy and performing the function of national secretariat on climate change. AEDD supported the development of the National Climate Change Policy (PNCC), the National Climate Change Strategy (SNCC), and the Action Plan for Implementation (PANC), which were adopted in July 2011. To maximize its ability to finance its national priorities, the Government of Mali developed a national climate fund to combine financing from bilateral and multilateral sources as well as from the public and private sectors. With an initial contribution from Sweden in 2013, the Mali Climate Fund is one of the first national climate funds operational on the African Continent. The option of using the Mali Climate Fund to manage the proposed project was discussed as an option with the NDA, the WB and implementing partners, however it was considered that the Fund's capacity was not adequate for implementing a project of such technical and institutionally complex nature.

Strategy Engagements with the World Bank

In addition to such National Policies and Strategies, building resilience to disaster and climate risks has long been an area of strategic engagement between the World Bank and the Government of Mali. As part of the crosscutting theme "Peace and Security," disaster risk management was stated as a strategic pillar and crosscutting priority in the Growth and Poverty Reduction Strategy Framework (GPRSF, 2007-2011), developed by the World Bank and the Government of Mali. The exposure of the Malian economy to external shocks, including natural disasters, was also raised in the World Bank Country Assistance Strategy to Mali (CAS 2008-2011). However, no specific action was planned in this regard. Building resilience is one of the key objectives identified in the Country Partnership Framework (CPF), a strategy for engagement between the World Bank and the Government of Mali during the period of 2016-2019. The CPF identifies vulnerability to climate risks as a key constraint to poverty reduction and highlights the need to strengthen safety nets and improve risk management mechanisms. It also specifies that World Bank interventions on climate change will aim to alleviate negative climatic shocks and indirectly increase resilience for the vulnerable.

C.2. Project / Programme Objective against Baseline

Describe the baseline scenario (i.e. emissions baseline, climate vulnerability baseline, key barriers, challenges and/or policies) and the outcomes and the impact that the project/programme will aim to achieve in improving the baseline scenario.

Baseline Scenario

Mali's physical conditions along with factors of social, economic, political, and environmental vulnerability leave the country at risk to several climate related hazards; most notably droughts, floods and locust invasion. While these hazards are a natural occurrence in the country, they nevertheless pose serious constraints on development and food security. Crop failure is common and current food crop production is unable to adequately provide for local needs due to persistent threats from droughts, floods and pest invasions. Mali's poorest and most vulnerable populations are predominantly farmers and agro-pastoralists who practice dryland subsistence farming to feed their families, and contend with a poor and increasingly degraded resource base as well as limited access to basic services. Climate change is expected to exacerbate the impacts of flood and droughts, as these hazards are likely to become more intense and severe. And with more than 80% of Mali's population dependent on predominantly rainfed agriculture for their livelihood, the country is extremely vulnerable to the impacts of climate change.

Climate change effects are increasingly felt in Mali, in the form of higher temperatures, reduced precipitation and a moving desertification front. Records from Mali Metéo indicate that the country has become hotter and drier over the last several decades. Since 1960, temperatures have increased by 0.7°C across most of the country, with typical rates of warming greater than 0.15°C per decade[8]. Sahelian rainfall is characterized by high variability on inter-annual and inter-decadal timescales. Rainfall in Mali declined rapidly between 1950 and the mid-1980s, partially recovered in the 1990s, then declined slightly in the 2000s. While long-term trends may be difficult to identify within his type of variability, records from 1960-2005 show that overall annual precipitation trends are decreasing slightly, with a significant reduction in the wettest months (July and August), and a slight increase at the beginning of the rainy season (May)[9]. The persistent drought in 1970 has resulted in fairly significant rainfall deficits and a continuous shift of the isohyets to the South. The average flow of the Niger River, which reached 1300 m^3/s in 1978, was only 895 m^3/s in 2002.

Projections in future climate change are expected to increase inter-annual variability and the occurrence of extreme climatic events. According to climate scenarios developed for Mali, the average annual temperature is likely to increase between 1.2 to 3.6°C by the 2060s, and between 1.8 to 5.9°C by the 2090s[10]. The number of hot days and hot nights are projected to increase across Mali by 23-40% by 2060, and this rate of increase is projected to be more rapid in the South[11]. Projected mean annual changes in rainfall are less certain; however, values tend to increase in the South of the country (indicating an increase in heavy rainfall events), and decrease in the North[12]. More frequent El Niño events could also increase the frequency and intensity of droughts across Mali. Mali has been and will continue to be exposed to an uncertain and inadequate rainfall; however, it simultaneously faces an increasing frequency of floods. Water resources and agriculture are among the most vulnerable sectors to climate change, with projected overall yields decline (maize, rice river, cotton, millet / sorghum), exacerbating concerns of food security in the country.
A national platform of various agencies across Mali support climate related disaster risks. Baseline conditions for each of the relevant agencies are described below.

- **Mali Metéo** has the mandate to provide reliable and timely weather, and climate information and appropriate services to public and private users from various socio-economic sectors. Currently, their network of meteorological observations includes: 19 synoptic stations, 4 weather radars, 54 agro-meteorological stations, 214 rainfall observation stations, 2 systems to receive Meteosat Second Generation satellite images (under the support of the WMO, EUMETSAT, and AGRHYMET). However, technical discussions with Mali Metéo revealed the overall poor status of the agency's main observation infrastructure; significant needs for institutional strengthening; and capacity building needs for its staff. More specifically, the spatial resolution, number of monitored parameters and reliability of land-based synoptic, climate and agro-meteorological stations are inadequate to address users' needs. Many observation systems such as upper air, lightning detection and meteorological radars are not functioning or used for weather forecasting. Field visits showed that communication systems are unreliable and slow with frequent power outages. Observation systems in the North of the country are believed to have been completely destroyed during the recent military conflict.

  Mali Metéo produces a limited range of services such as basic weather forecasts with 24 hours lead time. However the information produced is of low accuracy and reliability. At the same time, Mali Metéo clients (Ministry of Agriculture, farmers etc.) have expressed great need for improved agro-meteorological services such as bulletins and seasonal outlooks. Mali Metéo does not operate 24/7, even during the rainy season. There is an on-going process of transferring weather forecasting responsibilities from the regional aviation institution ASECNA, to Mali Metéo, but so far there is no institutional clarity on which agency issues severe weather forecasts and warnings in the country. There is also a significant need to recruit new staff to replace senior technical and administrative staff approaching retirement age. Training and re-training of existing staff is also another priority.

- The **National Directorate of Hydraulics (DNH)** is part of the Ministry of Energy and Water (MEE), and is responsible for water resource management and regulation in Mali. In relation to hydrology, DNH is responsible for the collection, storage and analysis of hydrometric data. Such data is currently based on a network of 100

[8] http://api.commissiemer.nl/docs/os/i71/i7152/climate_change_profile_mali.pdf
[9] *Butt TA, McCarl BA, Angerer J, Dyke PT, Stuth JW (2005) The economic and food security implications of climate change in Mali. Clim Chang 68:355–378*
[10] http://api.commissiemer.nl/docs/os/i71/i7152/climate_change_profile_mali.pdf
[11] http://sdwebx.worldbank.org/climateportalb/doc/GFDRRCountryProfiles/wb_gfdrr_climate_change_country_profile_for_MLI.pdf (Note that hot nights/days are defined by the temperature exceeded on 10% of days/ nights in current climate of that region and season.)
[12] http://api.commissiemer.nl/docs/os/i71/i7152/climate_change_profile_mali.pdf

stations on the Niger and Senegal Rivers, divided into three categories based on the size of the targeted use of information. The stations are equipped with telemetric instruments and provide near-real-time data to transboundary river basin authorities. However, the majority of the telemetric equipment is not operational, and water levels are mostly reported manually on a daily basis, with issues related to precision of instruments and rating curves (the relation between observed water levels and discharges is often outdated or imprecise). The frequency of observations at reference stations is twice per day, while readings at other stations are taken only once per day. The transmission of data is done by radio or telephone to Bamako. Overall, the monitoring network is too sparse and most stations are not properly functioning or abandoned; data collection and transmission is poor. Instruments and equipment for discharge measurements are scarce and not often calibrated. The payments of field observers are so low that some are believed to forge measurements rather than actually making them. There is limited hydrological and hydraulic modeling or flood forecasting capability in the country. Also, there is limited operational data exchange with Mali Metéo, which can contribute to the development of such products.

- Food security and nutrition monitoring is carried out by the **Early Warning System (SAP)** of the Food Security Commissariat (CSA). SAP is responsible for the continuous monitoring of situation regarding food production and availability, determining areas at risk, and identifying vulnerable populations. SAP coordinates information obtained from over 20 members of its network, including both regional agencies and some international organizations and NGOs. Data collection involves rainfall, crop evaluation, livestock, market prices, migration of populations, their habitats and food stocks, as well as their health status. Information is collected from administrative and technical departments, civil society and local elected officials from municipal level to district capitals as well as regional capitals at national level. For example, meteorological data is provided from Mali Metéo. Assessments of pasture, agriculture, and climate are provided in a monthly food security bulletin, which provides information on food security outlooks and alerts, as well as response planning efforts. Major gaps in how SAP currently operates include: (i) lack of inclusion of urban and peri-urban areas, (ii) inadequate information management systems, and (iii) ineffective communication of early warning and actions directly to the affected population. Improved efficiency of SAP requires the development of enhanced tools to manage data and more efficient use of climate data to provide a more precise basis for analysis.

- The **Directorate General of Civil Protection** (DGPC) is attached to the Ministry of Security and Civil Protection, and is the coordinating body for disaster risk reduction, including emergency preparedness, response and longer-term prevention activities. It is responsible for issuing early warning to populations at risk, supporting communities to prepare and respond to warnings, sharing lessons learned from past disasters, and ensuring inter-ministerial coordination for mainstreaming disaster risk reduction and climate change adaptation among sector-specific and crosscutting activities. The strengthening of technical (meteorological, hydrological, and food security) services brings major benefits in terms of life saving and resilience if civil protection services are engaged in the process. In the past several years, with financial support from development partners such as UNDP, the World Bank, the Economic Community of West African States (ECOWAS), and the EU, the DGPC has developed an institutional and legislative framework for disaster risk reduction in Mali, developed a communication strategy and integrated disaster risk management into primary and secondary school curricula, and initiated vulnerability and risk mapping exercises.

  Despite the strong DGPC and sectoral actors' commitment and the significant progress made by the country, major challenges remain to be addressed. The DGPC's current profile could not allow for effective implementation of its coordination mandate, advocacy, and facilitation of interventions as well as sectoral actors involved in disaster risk management. Its current organization and human resources are primarily oriented towards relief operations. Civil protection services also lack critical infrastructure (incident coordination room, data management systems) to be able to work with their focal points from different ministries to prevent, prepare for or respond to a disaster. They also need basic institutional capacity development (training of staff, hiring of disaster risk management specialists) as well as equipment to pursue their mandate.

Key Barriers Addressed by the Project

As climate change begins to manifest itself and populations/communities become more exposed to increased climate variability including more frequent and intense extreme weather, the need to address climate risks is becoming urgent in Mali. Unattended climate risks become disaster risks, threatening economies and populations. While the government is currently supporting several baseline activities, there does remain significant barriers, which prevent the development

and dissemination of climate and early warning information and the capacity to use this information for local planning. The Project will address the following barriers and challenges:

1. Poor meteorological and hydrological observation networks and inefficient information exchange. Lack of adequate weather and climate data limits the ability of Government not only to provide life-saving warning and preparedness activities, but also to integrate climate considerations into development planning efforts and reduce the vulnerability of communities over the long term. In Mali, the spatial resolution of stations is poor, many observation systems are not functioning, and data communication systems are unreliable and slow. Observation infrastructures need to be strengthened urgently to provide the local climate information, which is required for various applications.

2. Limited range of products, services and decision-making tools for climate-resilient development across sectors. Current users of meteorological and hydrological information need to improve their products such that more effective warning information can be provided to communities at risk, including for flash flood events. In addition, the use of meteorological and hydrological information needs to expand beyond existing agencies, and information needs to be tailored to decision makers across a wider series of sectors, such as agriculture, health, energy, water resources management, natural disaster prevention. Effective management of climate variability and change requires that climate information be used effectively in planning and that climate risk be incorporated routinely into development decisions.

3. Limited financial, technical and institutional capacity. This hinders agencies such as Mali Metéo, DNH, SAP and the DGPC to fulfill their core mandates. There is limited hydrological and hydraulic modeling, flood forecasting and other climate and weather modeling capability in the country. There is also a need to strengthen institutional arrangements and regulatory frameworks and develop standard operating procedures for the agencies involved in managing risk from climate related hazards. And while more than 140 socio-economic studies have demonstrated that the benefit to cost ratio of investing in hydromet is high[13], with returns of 1:3 to 1:15, the initial investment costs are high and agencies have limited financial resources.

4. Limited transmission of information and warning to the population. Information and alerts are not adapted to the day-to-day needs of the population (both in terms of content, format and timing). Mechanisms for the translation of flood forecasts into early warning information for critical public response and for activating action at community levels are not well established.

Gaps in the early warning infrastructure/network in Mali range from poor meteorological and hydrological observation networks, limited technical capacity within agencies to conduct necessary hydrological and hydraulic modeling, flood forecasting and other climate and weather modeling, a limited range of information products to end users, and lack of connectivity with affected populations to ensure two-way communication between communities and institutions so that warning information can be provided to meet the day to day needs of the population and institutions can appropriately incorporate local knowledge within overall systems. Supported by the development of a National Framework for Climate Services with sectoral Working Groups, decision support systems for food security and hydromet services will be developed and/or improved. In regards to food security, Mali already has an Early Warning System (SAP) that helps Government understand the vulnerabilities and target its response. However, improvements are needed to incorporate urban and peri-urban areas, more efficiently manage weather and climate information and effectively communicate warning and recommendations for early actions directly to the responsible institutions, civil society and affected population. Regarding hydromet services, a decision support system is required to develop early warning capacities for flooding and extreme weather events.

The outcomes of the project are expected to contribute to strategic mobilization of resources in advance of climate related disasters, enabling effective risk reduction support to vulnerable populations. Improved hydromet services will also significantly contribute to the enhanced productivity in weather sensitive socio-economic sectors such as agriculture, health, energy, transport and water resources management.

[13] https://sustainabledevelopment.un.org/content/documents/1972Valuing%20Weather%20and%20Climate%20Change.pdf

Synergies with Ongoing Initiatives

In Mali, there are a number of ongoing projects and programs addressing various aspects of climate and disaster risks that can be capitalized by the proposed Project. It is therefore critical that donors act in a coordinated manner, in order to maximize opportunities and synergize activities. For this purpose, consultations have been held with several donor partners throughout the development of the project. Below is a list of ongoing initiatives that development partners are involved in. It is worth noting that while many of the activities are helping to build adaptive capacity, none of the existing initiatives specifically target the improvement of hydro-meteorological information and warning systems with end to end connectivity, starting from building capacity at the national level to providing end user services. The initiative by UNDP will target preparedness at the municipal level and will rely upon this proposed Project for provision of forecast and warnings. It will be important for donors to coordinate throughout the project cycle so that stations are installed in areas where there is the most need and value added to provide required information for warning systems essential to reduce the vulnerability of communities. While not specifically targeting hydro-met services, other adaptation initiatives such as the EU's policy reform of the National Food Security, USAID's institutional strengthening project, and GIZ's technical assistance to support climate risk mainstreaming will all help to improve the baseline conditions and readiness for agencies to successfully implement the hydro-met Project. The combination of this proposed project with ongoing initiatives will allow the use of scientific information to reduce climate risks to both the population and productive sectors. Major ongoing projects are described below:

Development Partner	Ongoing Initiative	Synergies identified
European Union (EU)	The EU is currently supporting the establishment of a regional system for food security monitoring (ECO-AGRIS) hosted by the Permanent Interstate Committee for Drought Control in the Sahel (CILSS, €18 million); as well as the MESA program for monitoring environment and security in Africa, with a budget of €37 million for the African continent. Since 2011, the EU has also been supporting the reform of National Food Security (NDS) system in Mali, guided by diagnostic work that was finalized in January 2014. In this context, the EU will support the development of a national food security policy, as well as food crisis prevention tools (food distributions, cash transfers and others), which annually represent a cost of about CFA 100 billion from development partners and CFA 15 billion from the Government of Mali.	A meeting was held on November 12 with Sylvie Fontaine (sylvie.fontaine@eeas.europa.eu), EU representative in charge of aid and international cooperation with the development, rural, environment and food security unit of the EU representation in Bamako. The EU-supported development of a national food security policy is instrumental to ensure optimal use of meteorological and climate information
USAID	USAID is: i) supporting an institutional strengthening project for Mali Metéo, aimed at providing sustainable financing for the newly formed autonomous public entity, ii) providing technical assistance to improve climate data, including the establishment of rainfall estimates over the entire country through a combination of station data and satellite estimates (in partnership with the International Research Institute for Climate and Society,(IRI), and iii) supporting the development of a decision making tool for farmers using agro-meteorological information, in conjunction with Mali Metéo and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).	A meeting was held on November 10 with USAID representatives Aminata Diarra (adiarra@usaid.gov) in charge of the environment and natural resources program and Jeff Ratcliffe (jratcliffe@maliccaaa.com), project director at Chemonics (implementing the project on behalf of USAID). The USAID project has been prepared in close consultation with the World Bank, and coordination started as early as 2013 when the institutional diagnosis of Mali-Météo was under analysis. The support from USAID for development of a long-term business plan is a small TA which will assist in targeting sustainable production of marketable services responding to specific user needs. The proposed project will start from this proposed business plan and enhance it with additional information related to public users' requirements and public financing. The development of a decision making tool for farmers using agro-meteorological information relies heavily on expected strengthened capacity of Mali-Météo at the central level to provide customized services for farmers and herders in the Mopti region.

United Nations Development Programme (UNDP)	Though a GEF funded project (US$9,000,000), UNDP will be supporting disaster prevention and preparedness for major risks (mainly floods) across seven municipalities (three in Bamako, two in Mopti and two in Kayes). In addition, with funding of about €1.3 million from the ASNaCC project, UNDP will be supporting the installation of meteorological stations with Mali Metéo.	A meeting was held on November 12 with UNDP representatives Abdoulaye Bayoko (abdoulaye.bayoko@undp.org), climate change specialist and program advisor, and Moustapha Diallo, disaster risk management specialist (moustapha.diallo@undp.org). UNDP project targets last-mile delivery of early warning information to selected communities, and therefore relies upon strengthening of central capacities to monitor extreme weather and hydrological events in order to serve the communities at-risk. This was reaffirmed in subsequent meeting with Pradeep Kurukulsuriya (Pradeep.kurukulsuriya@undp.org) and Bonizella Biagini (Bonizella.Biagini@undp.org) on April 18, 2016 in Washington DC.
German Cooperation (GIZ)	With approximately €1.5 million per year over five years, GIZ will be providing technical assistance to support the implementation of the National Strategy on Climate Change (ASNaCC) and the Innovative Project Planning for Adaptation to Climate Change (PICP). This will include supporting: i) the NAP process: ii) mainstreaming risk considerations into environmental and social impacts assessments, sectoral development planning and with the private sector, and iii) the implementation of the Mali Climate Fund.	A meeting was held on November 13 with GIZ representatives Solveig Schindler (solveig.schindler@giz.de), technical advisor on climate change adaptation and Hartmut Behrend (hartmut.behrend@giz.de), in charge of contracts and cooperation. The meeting confirmed the critical need for enhanced hydro-meteorological products and services in order to provide a baseline and to better anticipate weather, hydrology and climate for the upcoming decades.
World Meteorological Organization (WMO)	WMO will be providing technical expertise to develop a national framework for climate services in Mali to better understand the needs of different user groups (under the umbrella of the Global Framework for Climate Services – GFCS initiative).	The WB team is in contact with Filipe Domingos Freires Lúcio, Director of the Global Framework for Climate Services (GFCS) Office in the World Meteorological Organization (flucio@wmo.int). The proposed project would directly provide resources and expertise in order to implement the concept proposed in the Mali National Framework for Climate Services, which was initially developed in consultation between the WB team and WMO consultant () in 2013-2014.
French Dev. Cooperation (AFD), Civil Security, IRD)	For nearly 10 years, and until October 2015, the French Development Agency (AfD) has provided funding to the Integrated Water Resource Management 2 (IWRM 2) project, with the objective to support the Niger Basin Authority (NBA) with hydrological data collection, analysis and modeling to monitor water resources along the Niger River. The French Civil Security provides training for Malian civil protection officers (first aid, road rescue, fire prevention, operational management and emergency command) through the project Support to Civil Protection in Africa (APCA). With funding from the Mali Fund for Korean Green Growth (KGGTF) managed by the World Bank, IRD piloting an innovative method for the estimation of rainfall based on cellular networks (Rain Cell Africa), which will support develop of public-private partnerships between Mali-Météo and Orange cellphone operator. In addition, IRD has worked on estimates of water resource problems in small basins, rainfall-runoff modeling and the impact of human activities on soil and changing hydrological regimes.	The Mali activity financed by the Korean Green Growth Trust Fund (KGGTF) is managed by the World Bank. The WB team was in discussion remotely (email and phone) with the research consortium (Marielle Gosset, marielle.gosset@ird.fr, Frédéric Cazenave, frederic.cazenave@ird.fr, François Zougmoré, zougmore@univ-ouaga.bf). The piloting of an innovative method for the estimation of rainfall based on cellular networks (Rain Cell Africa) is a critical opportunity for Mali-Météo to develop capacities related to real-time provision of spatially distributed rainfall maps. If this technology could become operational during project implementation, it would provide immediate benefits for early warning in urban areas affected by urban flooding. The TTL for the IRD project (supported by WB) and for the proposal is the same person.

African Development Bank (AfDB)	The AfDB supports (i) since 2014, the establishment of a regional water observatory, the Water Resources Coordination Unit of the Economic Community of West African States (ECOWAS), and (ii) the Institutional Support Project to the African Climate Institutions (ISACIP), for USD 30 million, to strengthen the capacity of African Climate Institutions to generate climate information and to allow their wide dissemination to end users.	The team interacted with Justus Joseph Kabyemera, Coordinator of the ClimDev Africa Special Fund (j.kabyemera@afdb.org) and the discussion confirmed the value-added of collaboration. AfDB provides about US$1 million to Mali-Metéo to procure meteorological equipment, and the sustainability of such equipment depends upon the proposed project.

The proposal was developed in close consultation with partners involved in hydro-meteorology, climate adaptation, food security and disaster risk management in Mali. This was done in order to ensure that there are no overlaps and duplication of efforts by different development partners.

As an example, the USAID-supported project provides about US$850,000 of technical assistance to support the development of an institutional 10-year business plan for Mali-Météo in order to improve cost recovery, financial management and communication, This business plan will provide directions for modernization, towards a performing and sustainable meteorological service. However recommendations would remain unfunded if the GCF funding does not materialize.

Another example is the WMO-supported development of a National Framework for Climate Services (NFCS). This activity also provide strategic directions in order to involve the users (and potential users) of hydro-meteorological institutions in the design of future products and services; these directions have a great potential to guide the successful implementation of the proposed project, but would remain unfunded unless GCF funding materializes.

WMO, USAID and other partners are relying extensively upon GCF funding for hydro-meteorological products and services to become available. For example USAID, UNDP, Caritas and GIZ support projects for delivery of hydro-meteorological products and services, including warnings, to communities at-risk. The success of these synergetic projects also depends upon the Project to enable delivery of enhanced hydro-meteorological products and services including flood warning services to vulnerable populations.

C.3. Project / Programme Description

Describe the main activities and the planned measures of the project/programme according to each of its components[14].

The **Project Development Objective** is to strengthen the adaptive capacity and climate resilience of the vulnerable communities and economy of Mali. This will be achieved by developing the capacity of national hydro-meteorological and warning services, which will in turn support adaptation planning for public and private sector users.

Project Contribution to Climate Adaptation

Enhanced hydro-meteorological information and standard operating procedures linking hydromet information with early response is a critical contribution to preparedness and climate adaptation. Strengthening of hydro-meteorological services has been recently confirmed as an integral part of the World Bank climate adaptation agenda, specifically in the Africa Climate Business Plan (http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/11/30/090224b0837b0f0d/1_0/Rendered/PDF/Accelerating0c0limate0business0plan.pdf) presented in Paris at the COP21. Improving hydromet services is a key contribution to adaptation and a critical requirement for i) adapting water resources for irrigated agriculture, hydro power and an improved water supply ii) adapting planning for health services iii) providing access to safe air and road transportation and iv) reducing the economic and social impacts of floods, drought and other extreme weather events.

Specifically, Mali already experiences extreme weather and climate variability, resulting in high exposure to floods and droughts. The impacts of climate change are projected to increase both the frequency and severity of these events. Improved weather and climate information is required from the national level down to the household level so that government, communities and the private sector can better plan for and adapt to these projected changes in climate. Improved hydromet and early warning services would allow vulnerable communities, supported by the national

[14] GCF Funding only.

institutions, to better monitor, prepare for and respond to droughts, as well as extreme rainfall events and flooding. In areas of infrastructure development, hydromet information will also inform adaptation in the form of the resilient design and positioning of works such as bridges, culverts, and erosion protection. In terms of agriculture and food security, reliable hydromet information assists farmers in deciding upon optimal sowing and harvest dates, the types of crops and seeds used, and technologies available to reduce the impacts of adverse weather and climate variability and change. Private companies and businesses also need and rely on the hydromet data for adaptation decisions.

Project Scope and Coverage

The proposed project has a national coverage and will rely upon and strengthen existing delivery mechanisms from agro-meteorology, food security, civil protection and humanitarian contingency planning. Criteria for identification of the optimal hydrological and meteorological networks include user group requirements (which reflect the potential use and potential value of the information generated), availability of climate series at specific locations (stations should be setup in locations where historical data is available if this location matches with current user requirements), as well as potential for interpolation using remote sensing techniques. Tentative optimal networks have been identified and maps are provided in Annex 7. Precise location of equipment and investments is yet to be confirmed by the in-depth analysis of user requirements and status of equipment, which will be carried out during the first phase of the project.

Types of Works and Equipment

The requirements in terms of works and equipment have been identified during project preparation as an optimal fit between responding to anticipated requirements of the users and keeping the technology as simple as possible to ensure resistance to extreme climate conditions, and reducing as much as possible operation and maintenance cost with minimal technical complexity. For example, the project will not finance radars or upper-air monitoring equipment which would results into excessive operation costs.

Works include new premises (on public-owned land) for

- National Operational Center for Crisis Monitoring, Activation and Management Center (COVACC) and
- Food Security Early Warning System (SAP).

Equipment anticipated to be procured include:

- Surface meteorological and lighting detection network (AWSs, agromet stations, rain gauges, lightning detectors, standard equipment, power supply, telecoms for filed stations, etc.)
- Tools, spare parts and instruments for equipment repair and calibration
- Communication equipment (mostly SMS and GPRS technologies) for real-time and near-real-time collection of information and data access;
- Specialized vehicles and equipment for field work (data collection, calibration, maintenance and repairs) and for emergency response including flood management and search and rescue
- Computers, tablets, printers and software for field data collection, remote sensing, GIS, Numerical Weather Prediction (NWP), database management and development of user applications

The design of the system dully considers the value chain of hydromet services and aims at strengthening end-to-end hydromet systems from observation networks, data management systems, forecasting systems to service delivery. The design of the observation networks will consider automation and telemetry systems and be significantly enhanced by installing (i) surface meteorological and lighting detection network (Automatic Weather Stations (AWSs), agro-met stations, rain gauges, lightning detectors, standard equipment, power supply, telecoms for filed stations, etc.), (ii) automatic hydrological stations (data collection platforms, automatic stage recorders) and specialized hydrological equipment (Acoustic Doppler Current Profiler, bathymetric instruments, sediment measurement instruments, current meters, boats) for rivers and small flood-prone watersheds (including urban). The data obtained from the enhanced observation networks will be quality assured by establishing (iii) calibration facility and will feed into the (iv) data management and forecasting systems, where modernizing Information and Communications Technology (ICT) infrastructure is at its core.

The project aims at improving lead time and accuracy of weather, climate and hydrological forecasts and developing and improving basic and specialized information products in an efficient and effective manner by leveraging regional and global resources, for example, by participating in WMO Severe Weather Forecasting and Demonstration Project (SWFDP), introducing Numerical Weather Prediction (NWP) and developing forecast accuracy verification system. Mali

Météo and DNH will jointly develop flood and drought forecasting. Development, dissemination and utilization of climate information products will be particularly emphasized under the National Framework for Climate Services, which empowers demand driven climate services for sectoral users as well as end-users down to the community. The seamless operation and cooperation among key agencies involved (Mali Météo DNH, DGPC and SAP) will be ensured and streamlined by developing and operationalizing Standard Operating Procedures (SOPs), establishing information exchange platform and reinforcing National Operational Center for Crisis Monitoring, Activation and Management (COVACC) infrastructure.

The observation network includes a vast majority of manual sensors which are not powered, and a small number of automatic sensors (only when needed for rapid-onset hazards) powered with solar panels. One option being considered is to link the energy source of the hydromet station to that of community drinking water stations, where solar power is used to pump the water. These facilities are closely protected by the community, so the energy source would be more secure.

Beneficiaries and Users

Mali's agrometeorological advisory program was established to address food insecurity linked to droughts in the late 1970s and early 1980s, focused on rain-fed millet, sorghum, peanuts, cotton, and maize. Current rates of use by farmers of agrometeorological advisories are still very low (less than 20% of farmers in villages participating in the program). Further women's rate of use of the advisories is still lower than that of men, and often there is no participation in the agrometeorological programs by women. The Project will dramatically enlarge the number of users from hydromet services, enhancing use of hydromet information by rain-fed farmers (women and men), and extending it to livestock herders (with support from the Sahel Regional Pastoralism project effective in Mali since Nov 2015), to food insecure households (with support from the reformed national food security mechanism adopted in Dec 2015) as well as to populations vulnerable to flooding (with support from the national risk reduction strategy and national emergency response planning (ORSEC) adopted by the Government in Dec, 2015).

Field data collection in Mali is already participatory, with contributions from civil servants, individual contractors, voluntary farmers and paid observers. A large proportion of the equipment has not been replaced since the 1960's. The project will modernize the equipment (with some degree of automation) while still relying upon ownership and participation of communities (mostly farmers) and civil servants (teachers, agronomists) for vulnerability monitoring, gauge reading (important for verification purposes even with automatic stations), protection of equipment and monitoring of reliability of the equipment .

Climate Information Flow

Field data collection in Mali is participatory, with contributions from voluntary farmers and community observers (today mostly using radio and telephone). The information flow for warning dissemination has recently been clarified (in the National Disaster Risk Reduction Strategy and National Emergency Response Plan adopted on December 28th, 2015). The hydrological and meteorological services are officially mandated to collect data with participation from users (farmers for agro-meteorological data, observers for hydrological data). The project would allow great improvement in the quality and availability of data over the territory, with verification, validation and interpolation techniques based upon remote sensing and data management. In addition, the project would make the information and services available to decision makers, which include the Food Security Commissariat and Civil Protection Authorities (national level), Préfets (Department admin 2 level) and mayors (admin 3 level). While the mayor is ultimately responsible for security of citizens, the emergency preparedness and response capacities of local governments are still very limited and most preparedness and emergency response capacities are at the admin2 (Préfet) and central levels. The technology used today is still archaic (phone, radio) and would be strongly enhanced with the project (cloud geospatial decision support tool accessible through multiple technologies including traditional communicators, radio, telephone, SMS, smartphones and internet).The early warning and hydromet information would be disseminated through multiple technologies including traditional communicators, radio, telephone, SMS, smartphones and internet. It is not expected to rely upon Internet. As an example, most automatic weather stations would be using GPRS (cellphone network) for data concentration, and early warning information would be disseminated through multiple technologies including traditional communicators, radio, telephone, SMS, smartphones and internet, where feasible.

Knowledge Products Anticipated

The project will improve availability and accuracy of existing products including (i) agro-climatic reference tables, for planning agricultural activities such as: mobilization, field clearing, and the use of different varieties of seeds and pesticides, etc., based on the hydrological reports and daily weather forecasts; (ii) advices on the right time to begin the planting season, with the help of planting forecast tables, daily rainfall figures, hydrological reports, and daily weather forecasts; (iii) outbreak of certain crop diseases, especially mildew (warning based on rainfall, temperature, and humidity); (iv) crop water balance computations at the end of each dekad (10-day period); (v) probability that the rainfall for the next 10 days will be equal to or greater than the climatological plant water demand for that specific 10-day period; (vi) climatological crop calendar; (vii) climatological sowing dates; (viii) dry and wet spells and (iv) food security bulletins identifying food insecure households. In addition, the project will enable to production of shorter-term meteorological and hydrological services including (i) flood warnings (fluvial and pluvial) and (ii) extreme weather warnings. Users are in parallel (i) institutions (food security mechanism, civil protection, local governments, officially in charge for issuance of warnings), (ii) media and traditional communicators (responsible to support warning dissemination) and (iii) vulnerable populations (rain-fed farmers, irrigated farmers, livestock herders, fishermen, fluvial transporters, households). Uptake for new services will be ensured through existing (thus strengthened) agro-meteorological, livestock, food security and civil protection networks and committees.

Indigenous Knowledge

The practices of agriculture and pastoralism in the Sahel are largely centered on uncertainty of biophysical conditions: uncertainty about when the rainy season will start, uncertainty about the quantity of rainfall, as well as its geographic and temporal distribution during the season, and uncertainty about pest and diseases pressure on crops. Indigenous knowledge is already used in several ways in Mali in both formalized and informal manners. Mali Metéo together with the Multi-Disciplinal Working Group (GTP) produces 10-day agro-meteorological bulletins with active engagement of farmers, whereby they take part in reading gauges and interpret information to help with the forecasting process. In some municipalities, farmers employ a cropping strategy that creates an opportunity for mid-season adjustment based on real-time environmental observations. Indigenous knowledge will continue to be a priority in the Project, which has a strong focus on community engagement, particularly in Component 3. Strengthening last mile connectivity includes mobilization and sensitization of the community, and importantly, establishing effective feedback mechanisms for communities at risk. Given this design, warning systems will not only disseminate information to appropriate users, but also allow input from farmers and vulnerable communities into climate service delivery. Importantly, the Project will ensure that climate services reach women and other socially and economically marginalized groups.

Capacity Building

The design of the project has been informed by previous smaller single-purpose projects in Mali, which have successfully invested in capacity building without achieving a paradigm shift. In addition to select high-level individual training provided abroad for key experts and engineers (hydrologists, meteorologists), most training activities are planned to be delivered in-country, as joint activities bringing together service providers and their users. In addition, training is also planned as field “on-the-job” training sessions, taking advantage of all available national, regional and international expertise. Each activity will be considered as a training opportunity, and firms hired to provide guidance on institutional development, equipment, software and hardware will all contribute to training of staff with a sustainable approach. The planning of activities will ensure regular support to trainees all along the duration of the project

Lessons Learned from Mali Agro-Meteorological Program (1981-2011)
The USAID assessment of Mali Agro-Meteorological Advisory Program points out a number of recommendations drawing from lessons learned with the ongoing program, including:

- strengthening climate services need to start with strengthening the capacity of service providers to collect, process, and disseminate climate data and information
- project and program designs must dig deeper into what climate information users need and why, but effort to address these needs must also be tempered by scientific and technological constraints that shape the quality of the available information
- whether users find the information delivered by climate services useful and actionable depends on how that information aligns with the decisions they make;
- Some users are more likely to benefit from climate services than others;
- The wide disparities between men and women’s use of the advisories points to the importance of both understanding livelihoods activities and decisions and the enabling environment for climate services use.

This project will strive to internalize and build upon the lessons from the Mali Agro-Meteorological program in order to cover and correct the identified deficiencies and weaknesses of earlier programs through improved design and implementation of the project components.

Security and Vandalism

There is a risk that the project is affected by conflict and vandalism. Tight security procedures will therefore be put in place by DGPC, to ensure the security of staff working on this project.

In order to prevent vandalism and damage to project assets, fences will be erected around hydromet stations to prevent access. Very often it is the solar panels that are stolen from hydromet equipment, one option being considered is to link the energy source of the hydromet station to that of community drinking water stations, where solar power is used to pump the water. These facilities are closely protected by the community, so the energy source would be more secure. Awareness raising and training of local communities about the importance of these hydromet stations, will be part of component 3, so that the community appreciates the value of the infrastructure to enhance their own wellbeing.

All equipment procured under the project will be included in the national inventory. As it is the case for all government-owned equipment operated by government employees in Mali, the equipment will be covered under self-underwriting option by the Government. In addition, further insurance avenues will be explored with implementing partners.

Component Description

The project will consist of the following four components:

Component 1 - Capacity building and institutional development

This will include:

(i) Training and capacity building programs for agencies' staff and management: Develop and implement a capacity building, training and education program including: (i) personnel training and retraining; and (ii) professional orientation for senior staff. Modalities of training would include in-situ training, education at universities, study tours, distance learning program and training in WMO regional and other relevant training centers. Areas of technical training will include at least basic meteorology, hydrology & ICT, maintenance and operation of newly acquired equipment, information and communication technology, data processing, analysis & management, geographical information systems and remote sensing. Targeted training programs will also be developed for specific agency needs, such as simulation exercises for the DGPC, forecasting models for Mali Metéo and DNH, and food security and livelihood impact analysis methodologies for SAP. Twinning arrangements with developed hydro-meteorological services and South-South cooperation will be a key aspect of the training and capacity building program, with countries facing similar weather hazards as those in Mali and with advanced level of expertise to share. The design of the project has been informed by previous smaller single-purpose projects in Mali, which have successfully invested in capacity building without achieving a paradigm shift. In addition to select high-level individual training provided abroad for key experts and engineers (hydrologists, meteorologists), most training activities are planned to be delivered in-country, as joint activities bringing together service providers and their users. In addition, training is also planned as field "on-the-job" training sessions, taking advantage of all available national, regional and international expertise. Each activity will be considered as a training opportunity, and firms hired to provide guidance on institutional development, equipment, software and hardware will all contribute to training of staff with a sustainable approach. The planning of activities will ensure regular support to trainees all along the duration of the project.

(ii) Enhancing institutional and regulatory frameworks: Strengthen institutions of hydro-meteorology, food security and civil protection through institutional development and strategic planning, and development of adequate legal and regulatory frameworks, including development of Standard Operating Procedures to ensure early action in relation with early warnings.

(iii) Providing support for system integration of project activities: This activity includes developing detailed project design, ensuring integration and interoperability of systems and providing implementation support including development of technical specifications/tender documents.

Component 2 – Improvement of hydromet and early warning infrastructure

This will include:

(i) Expanding and upgrading hydromet observation networks: This activity will support expanding and upgrading the surface meteorological network (Automatic Weather Stations, rain gauges, lightning detectors, standard equipment, power supply, telecoms for field stations, etc.), the agro-meteorological network, hydrological stations (automatic stage recorders) and specialized hydrological equipment (Acoustic Doppler Current Profiler, bathymetric instruments, sediment measurement instruments, current meters, boat) for rivers and small flood-prone watersheds.

(ii) Enhancing data collection & transmission, forecasting and decision support systems: Upgrading data collection and communication equipment and devices, data storage and management systems, and computers and software for remote sensing, as well as software and customized tools for GIS and modelling and forecasting.

(iii) Strengthening preparedness and emergency response facilities and operations: To enable agencies to carry out their operational mandates for disaster preparedness and response, this activity will include the design, building and equipment for a national Operational Center for Crisis Monitoring, Activation and Management to withstand all disaster scenarios; the design, building and equipment of national office for SAP, specialized emergency vehicles and search and rescue equipment.

Component 3 - Enhancement of service delivery and warnings to communities

This will include

(i) Establishing a national framework for climate services: To broaden and strengthen stakeholder engagement and provide a platform for the exchange of knowledge and climate information needs, which will guide the improvement of services by DGPC, SAP, DNH and Mali Metéo, this activity will support the development of a National Framework for Climate Services with sectoral Working Groups. South-South cooperation with countries like Indonesia having successfully established a national framework for climate services could be used to share best practices and help Malian civil servants establish regular contacts for guidance with foreign nationals that designed, implemented and followed up on the framework. The activity will also develop a digital library of climate-relevant information for priority climate sensitive sectors. An information exchange platform will be developed between key Government stakeholders (DGPC, SAP, DNH, and Mali Metéo) to enhance disaster risk assessment, preparedness and crisis management.

(ii) Improving flood and drought forecasting and warnings: The objective of this activity is to improve the lead time and accuracy of weather, climate and hydrological forecasts and develop timely and actionable warning services through improved numerical weather prediction, flood modelling and weather forecasting, including participation in WMO Severe Weather Forecasting Demonstration Project (SWFDP), and development of impact based warnings. Forecast accuracy verification system will be developed and operationalized. The activity will also include field campaigns for validation of stage/discharge rating curves and collection of topographic data.

(iii) Developing new products for sector specific needs: This activity supports the development of specialized weather, climate and hydrological products and services tailored to sector specific needs (agriculture, health, energy, transport, water resources management, disaster risk management, etc.). The emphasis is placed on the user driven process to define new services and the activity will also institutionalize a mechanism to provide user feedback.

(iv) Strengthening “last mile” connectivity to ensure appropriate understanding and use of information: Enhancing end-to-end early warning systems reaching down to the municipal and community level. Strengthening last mile connectivity includes mobilization and sensitization of the community, and importantly, establishing effective feedback mechanisms for communities at risk (detailed below). Given this design, warning systems will not only disseminate information to appropriate users, but also allow input from farmers and vulnerable communities into climate service delivery. The activity will engage the end user community and implement training activities (workshops, roundtables, etc.) for major users. A communication strategy will be developed

within the first year of the project start and implemented to support the dissemination of products to end users (bulletins, forecasts, warnings and advisories).

(v) Mobilization and sensitization of communities at risk: Indigenous knowledge is already used in several ways in Mali in both formalized and informal manners. Mali Metéo together with the Multi-Disciplinal Working Group (GTP) produces 10-day agro-meteorological bulletins with active engagement of farmers, whereby they take part in reading gauges and interpret information to help with the forecasting process. In some municipalities, farmers employ a cropping strategy that creates an opportunity for mid-season adjustment based on real-time environmental observations. Indigenous knowledge will continue to be a priority in the Project, which has a strong focus on community engagement Community capacity building and gender and youth group sensitization will take place through workshops, operational training and drills involving populations at risk, local governments and other relevant stakeholders. SOPs, warning protocols and signals will be developed and agreed with community members in pilot areas. The activity will also support the integration of disaster and climate risk management into school and university curricula. Community preparedness and climate readiness will be informed by municipal multi-hazard risk assessments for targeted high risk areas.

(vi) Service Delivery enhancement through community collaboration: The Mali agro-meteorological system is considered a best practice in Africa with regards to collaboration between Mali-Météo and the Ministry of Agriculture, and with regards to participation of voluntary farmers in the data collection and knowledge dissemination. The project would strengthen the agro-meteorological services, while in parallel support similar approaches for warnings related to extreme events (rainfall, pluvial flooding, fluvial flooding, storms, wildland fire, etc.). In addition to traditional training, workshop and roundtables, the project will support (i) operational drills with communities' at-risk, (ii) on-the-job training involving operational agro-/hydro-meteorologists, observers as well as end-users and (iii) municipal multi-hazard risk assessments based upon combination of scientific and participatory methods.

Component 4 - Project management

This component will include support for all four entities for project coordination, monitoring and evaluation, reporting, financial management, procurement and environmental and social safeguards, technical and financial audits, development of project implementation manuals, and communication materials.

C.4. Background Information on Project / Programme Sponsor (Executing Entity)

Describe the quality of the management team, overall strategy and financial profile of the Sponsor (Executing Entity) and how it will support the project/programme in terms of equity investment, management, operations, production and marketing.

The **Directorate General of Civil Protection** (DGPC) is attached to the Ministry of Security and Civil Protection, and is the coordinating body for emergency preparedness and response as well as disaster and climate risk adaptation and prevention activities. It is responsible for issuing early warning to populations at risk, supporting communities to prepare and respond to warnings, sharing lessons learned from past disasters, and ensuring inter-ministerial coordination for mainstreaming disaster risk reduction and climate change adaptation.

The DGPC is a public service targeting populations of Mali vulnerable to anthropogenic and climate risks, and organized at the central level with the following units:

- Prevention and adaptation
- Early warning and emergency response
- Administration and financial management
- Civil protection school
- Communication
- Internal audit

DGPC is a public service contribution to the resilience of the people of Mali, and does not have a strategy for equity investment, production and marketing. However, its capacities for project management and inter-ministerial operations is strong and have been strengthened through a recently completed World Bank project (March 2012 - June 2015).

DGPC has an annual budget of about US$1 million for investment and operation, and is supported in addition by 1,172 civil servants. An additional batch of 500 civil protection officers are currently being recruited to support the implementation of the disaster risk reduction and climate adaptation strategy adopted by the Government on December 28th, 2015.

The project will be executed through a Grant Agreement between the World Bank and the Government of Mali, which will detail all project management arrangements to be complied with by DGPC.

C.5. Market Overview (if applicable)

Describe the market for the product(s) or services including the historical data and forecasts.

The hydromet and climate data, information, forecasts, warnings and other products are provided by as a "public good", because of their public safety value and cross-cutting socio-economic benefits.

At the same time, there is a strong demand for the products and services from improved hydromet services, particularly in the civil aviation, transport, tourism, energy, agriculture, water resources management and health sectors. These products and services are critical to (i) providing early warning to reduce the economic and social impacts of floods, drought and other adverse weather events; (ii) developing water resources for agriculture, hydropower and water supply; and (iii) informing safer air, marine and road transportation. Improved hydromet services will enhance governance by providing information for making and implementing evidence based, accountable decisions, including those related to adaptation to climate change.

However, selective commodification of the products and services of this Project for the profit-making sectors has been envisaged only for the subsequent stage when hydromet services have graduated into more advanced self-sustaining business models. Options to strengthen sustainability include partial cost recovery from institutional end users, public-private partnership to strengthen the revenue base of hydromet services and residual budget support from beneficiary governments for O&M, including human resources.

Describe the competitive environment including the list of competitors with market shares and customer base and key differentiating factors (if applicable).

Hydro-meteorological and warning services are regulated official public services and have no significant competition today in Mali.

Provide pricing structures, price controls, subsidies available and government involvement (if any).

The Government of Mali, as other governments, supports hydro-meteorological and warning services from the national budget, including from taxes collected by the civil aviation authority. While basic services contributing to the safety of lives and livelihoods should remain exchanged and disseminated free of charge, some value-added services could be developed on a commercial basis with pricing structures and price controls determined so as to contribute to the O&M of the hydro-meteorological services. However, it is not expected to be achieved through this project. It can be considered feasible in the longer-run, however, as Mali Metéo already sells long-term climate data series to businesses interested in long-term rainfall patterns for example.

In addition to revenues from the sale of services to the private sector, the respective government departments and agency, may also be able be subsidized by other government users, such as is the case for Mali Metéo earning a percentage of all airport taxes, since air-traffic control uses Mali Metéo forecasting services.

C.6. Regulation, Taxation and Insurance (if applicable)

Provide details of government licenses or permits required for implementing and operating the project/programme, the issuing authority, and the date of issue or expected date of issue.

The Government of Mali will execute the Project and will issue all licenses or permits if required. The only permit anticipated to be required is an environmental permit. The World Bank mission in November 2015 has an explicit understanding with the government that this will be issued by the institution in charge of environmental and social safeguards (DNAPCN) under the Ministry of Environment), following due process.

The Grant Agreement will be established with Standard Conditions for Grants made by the World Bank out of Various Funds dated July 31, 2010 ("Standard Conditions", available as Annex 15) and with reference to the World Bank Guidelines on Preventing and Combating Fraud and Corruption (January 2011, Annex 16), the World Bank Disbursement Guidelines (May 2006, Annex 17), the World Bank Guidelines on Selection and Employment of Consultants (January 2011, Annex 18), the World Bank Guidelines on Procurement of Goods, Works and Non-Consulting Services (January 2011, Annex 19), including the guidance on Anti Money Laundering and Combating Financing of Terrorism.

Describe applicable taxes and foreign exchange regulations.

Investment operations for hardware and infrastructure are envisaged for government execution under the Project. As such, the Government itself will remain the beneficiary and proponent of such investment programs, which require the procurement of goods, services and works. Government of Mali will waive applicable taxes and provide foreign exchange concessions to such publicly funded Project investments.

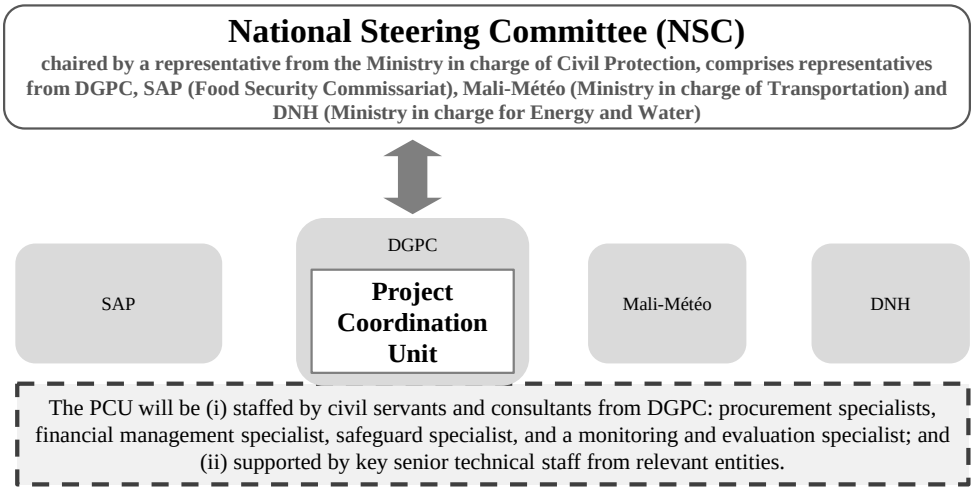
Provide details on insurance policies related to project/programme.

Not applicable.

C.7. Institutional / Implementation Arrangements

Please describe in detail the governance structure of the project/programme, including but not limited to the organization structure, roles and responsibilities of the project/programme management unit, steering committee, executing entities and so on, as well as the flow of funds structure. Also describe which of these structures are already in place and which are still pending. For the pending ones, please specify the requirements to establish them.

The Director-General for Civil Protection will coordinate project implementation, with support from technical staff from all four entities supported by the project. The Administration and Accounting Unit (DAC) of the DGPC will support fiduciary aspects, and the Operational Unit (DOSA) will support technical and safeguards aspects. The Project will be managed by civil servants and with support from external consultants, including for procurement and safeguards. More detailed breakdown of responsibilities is provided in section F4. The World Bank, as the GCF-accredited entity, will oversee appropriate implementation of the Project, in line with World Bank procedures standards and requirements in the AMA/FAA to be agreed with the GCF. The DGPC acts as the chair of the National Platform for Disaster Risk Reduction, which brings together relevant government and non-governmental actors that play a role in disaster risk management in the country. This platform will be used as a consultative body throughout the design and implementation of the Project to ensure that the needs of both the central Government, the Municipalities and civil society users are taken into account. The platform also includes a formal inter-ministerial coordination body, chaired by the Prime Minister and consisting of ministers across all relevant ministries, which can also be used to ensure enhanced inter-governmental coordination and information sharing.



All activities will be directly executed by the DGPC under the direct supervision from the World Bank. DNH, Mali-Météo and CSA/SAP will participate in the project implementation by providing resources for operation, maintenance and investment, providing staff to support project implementation, developing terms of reference and participating in selection committees for procurement. However, DGPC is alone responsible for project implementation and reporting. This model has been successfully tested in 2012-2015 for the implementation of the Disaster Risk Reduction and Climate Adaptation project, which included 7 partner institutions. DGPC, Mali-Météo, DNH and SAP were all EE and IPs (with similar setup) for the World Bank - GFDRR-supported project between 2012 and 2015. The project was successfully implemented with satisfactory collaboration and data sharing for effective mainstreaming of climate change in national and sector planning and coordination in information sharing and project implementation. This will also be reflected in the subsidiary agreements with the Implementing Partner Mali – Metéo.

The Recipient will carry out the Project in accordance with the provisions and requirements set forth or referred to in the Project Implementation Manual (PIM), which will be developed consistent with the provisions of the Grant Agreement. Most recipient-executed projects in Mali use country systems coupled with a dedicated software for financial management, and follow Bank procedures for procurement, audits and safeguards, and monitoring and evaluation.

The core project team will include (i) a project coordinator (civil servant: Director-General of Civil Protection) to oversee activities and track financial and operational project performance; (ii) an assistant to the project coordinator (civil servant) to support implementation and ensure smooth coordination on a day to day basis; (iii) a procurement specialist (civil servant); (iv) a financial management specialist (civil servant); (v) a procurement consultant; (vi) a safeguard consultant; (vii) a monitoring and evaluation consultant; (viii) an internal auditor (civil servant) and (ix) an external auditor (firm). The core team will be supported by experts from DGPC, SAP, DNH and Mali-Météo, and will have the capacity to recruit experts for short term consultancies, in order to implement activities with good understanding of technical and local contexts.

A Project Steering Committee (PSC) will be established, with representation from all four entities (DGPC, SAP, DNH, and Mali-Metéo). The AEDD will also be invited on the Committee. The PSC will meet on a regular basis to oversee and coordinate project implementation and report on progress. The Project Steering Committee will have responsibility for internal controls over the project. The World Bank will participate as an observer in the PSC meetings and provide guidance as needed.

The Recipient will carry out the Project in accordance with the provisions and requirements set forth or referred to in the Project Implementation Manual (PIM), which will be developed consistent with the provisions of the Grant Agreement (see Standard Conditions as Annex 14).

To date, most recipient-executed projects in Mali use country systems coupled with a dedicated software for financial management, and follow Bank procedures for procurement, audits, safeguards, and monitoring and evaluation.

The option of using the Mali Climate Fund to manage the proposed project was discussed as an option with the NDA, the WB and implementing partners, however it was considered that the Fund's capacity was not adequate for implementing a project of such technical and institutionally complex nature.

Project Monitoring, Reporting and Evaluation

As detailed in Annex 14 Section 2.06, the DGPC on behalf of the Government of Mali will: (a) ensure the maintenance of policies and procedures adequate to enable it to monitor and evaluate on an ongoing basis, in accordance with indicators acceptable to the World Bank, the progress of the Project and the achievement of its objectives; and (b) if so required in accordance with the provisions of the Grant Agreement: (i) (A) ensure the preparation and delivery to the World Bank of one or more project reports ("Project Reports"), in form and substance satisfactory to the World Bank, integrating the results of such monitoring and evaluation activities and setting out measures recommended by the Recipient to ensure the continued efficient and effective execution of the Project, and to achieve the Project's objectives; each Project Report to cover the period specified in the Grant Agreement and to be furnished to the World Bank not later than the date specified for that purpose in the Grant Agreement; and (B) afford the World Bank a reasonable opportunity to exchange views with the Recipient on such report, and thereafter implement such recommended measures, taking into account the World Bank's views on the matter; and (ii) ensure the preparation and delivery to the World Bank, not later than the date specified for that purpose in the Grant Agreement, of one or more completion reports ("Completion Reports"): (A) of such scope and in such detail as the World Bank shall reasonably request, on the execution of the Project, the performance by the Recipient and the World Bank of their respective obligations under the Grant Agreement and the accomplishment of the purposes of the Grant; and (B) a plan designed to ensure the sustainability of the Project's achievements.

Financial Management; Financial Statements; Audits

As detailed in Annex 14 Section 2.07, the DGPC on behalf of the Government of Mali will ensure that: (a) a financial management system is maintained and financial statements ("Financial Statements") are prepared in accordance with consistently applied accounting standards acceptable to the World Bank, both in a manner adequate to reflect the operations, resources and expenditures related to the Project; (b) if so required in accordance with the provisions of the Grant Agreement: (i) the Financial Statements are periodically audited by independent auditors acceptable to the World Bank, in accordance with consistently applied auditing standards acceptable to the World Bank; and (ii) the Financial Statements, as so audited, are furnished to the World Bank not later than the date specified in the Grant Agreement for that purpose, together with such other information concerning the audited Financial Statements and such auditors, as the World Bank may from time to time reasonably request; and (c) the Financial Statements audited pursuant to paragraph (b) of this Section are made publicly available in a timely fashion and in a manner acceptable to the World Bank.

Operation and Maintenance

In accordance with section 2.04 of Annex 14, all beneficiary agencies on behalf of the Government of Mali shall ensure that: (a) except as the World Bank shall otherwise agree, all goods, works and services financed out of the proceeds of the Grant are used exclusively for the purposes of the Project; and (b) all facilities relevant to the Project are at all times properly operated and maintained and all necessary repairs and renewals of such facilities are made promptly as needed.

Sensors of hydro-meteorological instruments (except those of barometers) are installed outdoors, and are exposed to rain, wind and sunshine. Regular maintenance is therefore necessary to achieve stable operation and

obtain accurate data. Rain gauges, for example, sometimes become clogged with leaves or dirt, and defective contacts of connectors, water infiltration, strong winds or lightning is likely to cause damage to instruments. In addition to regular maintenance, special maintenance also needs to be carried out after extreme weather events. Even if an observation environment is favorable at the time of initial installation, changes such as the growth of trees and weeds may change the observation conditions. Accordingly, necessary maintenance such as trimming and mowing during regular inspections should be carried out as appropriate. An instrument maintenance schedule for regular inspections and part replacement will be drawn up in consideration of the inspection procedures recommended by the manufacturers.

A detailed operations and maintenance plan will be developed by the Government of Mali as part of the project implementation manual which will be a condition of effectiveness for the Grant. The maintenance for hydro-meteorological equipment will comply with WMO recommendations available in the Guide to Meteorological Instruments and Methods of Observation (publication WMO #8). The manual will be reviewed by the World Bank to ensure financial and technical feasibility and sustainability, and will be updated according to the detailed technical specifications of equipment as it becomes available. The only Condition of effectiveness anticipated for the Grant will be the adoption of a project implementation manual, and this is not expected to delay implementation since DGPC has already implemented a project with similar implementation arrangements and is able to develop this manual before effectiveness. The Conditions of effectiveness and dated covenants guarantee compliance with all WB conditions and guidelines, and are proposed by WB legal department.

Each of the four recipient entities will be responsible for operation and maintenance of equipment, works and systems under their area of competence. For the purposes of the economic model, a high cost for O&M was used (15% of project costs) in order to ensure long-term sustainability and viability of the modernization.

While there is potential in the future for Mali-Météo to commercialize and sell some of its services to users to recover costs, as mentioned in the proposal, this is not expected to be directly achieved during the life of this project. In the context of the preparation of this project, operation and maintenance is fully covered from public financing from key benefiting ministries (transportation, water, energy, food security, civil protection).

List of Main Contracts Anticipated

A simplified procurement plan listing key expected contracts has been prepared and provided as Annex 9. This document lists contracts for recruitment of services, equipment and works. Works are considered as essential to the effective delivery of development objectives of the project, and integral part of the project, **however none are expected to be funded by the GCF**. Please note that according to the classification of documents protocol of the World Bank, this is a confidential document and cannot be made public.

The Grant Agreement is the only legal agreement anticipated to be established between the World Bank and the Government of Mali for the implementation of the project. This Grant Agreement will include as annexes the World Bank Standard Conditions for Grants (July 2010, Annex 15), the World Bank Guidelines on Preventing and Combating Fraud and Corruption (January 2011, Annex 16), the World Bank Disbursement Guidelines (May 2006, Annex 17), the World Bank Guidelines on Selection and Employment of Consultants (January 2011, Annex 18), the World Bank Guidelines on Procurement of Goods, Works and Non-Consulting Services (January 2011, Annex 19), and the Anti Money Laundering and Combating Financing of Terrorism guidelines.

The Government of Mali will also enter into one subsidiary Agreement, satisfactory to the World Bank, with the Mali Metéo official national meteorological agency, which is a public technical and scientific service with legal personality and financial autonomy under the Ministry of Transport and supported by the State Subsidiary Budget. As the other Implementing Partners are government departments, no separate Implementation Agreements between the Executing Entity and Implementing Partners would be required.

C.8. TIMETABLE OF PROJECT/PROGRAMME IMPLEMENTATION

Please provide a project/programme implementation timetable in section I (Annexes). The table below is for illustrative purposes. If the table format below is used, please refer to the activities as numbered in Section H. In the case of outputs, please mark when all the required activities will be completed.

	2016		2017				2018				2019				2020	
TASK	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2
Component 1 Capacity building and institutional development																
(i) Training and capacity building programs for agencies' staff and management	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
(ii) Enhancing institutional and regulatory frameworks		X	X	X	X	X	X	X	X	X						
(iii) Providing support for system integration of project activities		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Component 2 Improvement of hydromet and early warning infrastructure																
(i) Expanding and upgrading hydromet observation networks				X	X	X	X	X	X	X	X	X	X			
(ii) Enhancing data collection & transmission, forecasting and decision support systems				X	X	X	X	X	X	X	X	X	X	X	X	X
(iii) Strengthening preparedness and emergency response facilities and operations						X	X	X	X	X	X	X	X	X		
Component 3 Enhancement of service delivery and warnings to communities																
(i) Establishing a national framework for climate services			X	X	X	X	X	X	X	X	X	X	X			
(ii) Improving flood and drought forecasting and warnings			X	X	X	X	X	X	X	X	X	X	X	X	X	
(iii) Developing new products for sector specific needs					X	X	X	X	X	X	X	X	X	X	X	
(iv) Strengthening "last mile" connectivity to ensure appropriate understanding and use of information			X	X	X	X	X	X	X	X	X	X	X	X	X	X
(v) Mobilization and sensitization of communities at risk				X	X	X	X	X	X	X	X	X	X	X	X	X
Component D Project Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

D.1. Value Added for GCF Involvement

Please specify why the GCF involvement is critical for the project/programme, in consideration of other alternatives.

GCF support for the Mali Hydromet Modernization and Strengthening Project under the Africa Hydromet Program is crucial. Most NMHSs in Africa are unable to meet the basic needs for weather and climate information. Less than 20 percent of Sub-Saharan African countries are capable of providing reliable hydromet services to their people and economies. A recent WMO survey shows that 54 percent of the surface and 71 percent of the upper air weather stations in Africa did not report data. Only 10 NMHSs in Africa provide adequate forecast and warning services. The investment needs for system-wide modernization of hydromet services in Sub-Saharan Africa are substantial, and also at the core of building climate adaptation capacity as well as climate-resilient development.

Funding from governments and development partners is insufficient. In addition, it pays limited attention to the system architecture and sustainability aspects of NMHSs. Meeting operating and maintaining costs remains a challenge, despite the benefits provided by hydromet and early warning services. Even as the cost benefit ratio of investing in hydromet services is between 1:3 and 1:15 in different contexts, providing sufficient resources over a number of years, necessary for effecting transformative change, is difficult for most African governments.

Coordination, sustainability and 'last mile connectivity' are major challenges in the optimal performance of NMHSs and EWSs. In some cases, projects provide equipment, which cannot be utilized and/or maintained because of lack of trained staff and/or operating budget. Often, the support is small-scale and has a project-approach, while the financing must be substantial and have a systems-approach to be transformative.

Mali is facing the impacts of climate change. With projected increases in climate variability, and desertification, it is one of the most vulnerable countries in the world to future impacts. It is therefore imperative that the country takes urgent action to cope with shocks and stresses such as drought, flooding and food security.

Without GCF involvement, the Government of Mali cannot take adequate steps to help vulnerable communities and the economy adapt to climate-related disaster risks. GCF involvement is critical to ensure programmatic continuity and adequacy of support to Mali for hydromet strengthening. Investment needs for system-wide modernization of hydromet services in Mali are significant. As a least developed country, the financial needs in Mali are significant. The Government is struggling to set aside resources from its stretched national budget. Even as the cost benefit of investing in hydromet services is high, providing sufficient resources over a number of years is difficult for this least developed country. Because funding is insufficient, it pays limited attention to the system architecture and sustainability aspects of national systems. Investments in climate information and early warning will have life-saving impacts, and provide economic benefits through increased productivity and reduced losses.

As the Project will yield adaptation benefits that reduce the impacts of floods and droughts (including secondary impacts on food security) on vulnerable populations, it is fully in line with GCF's objective to invest in climate resilient development and to help vulnerable societies adapt to the impacts of climate change. With a focus on strengthening hydromet services, institutional capacity building and end user connectivity, the Project will enable durable systemic change with a potential for scalability and replicability.

The Project builds upon Mali's experience in implementing climate-related disaster risk management projects in the past. The strategies and policies, such as NAPA, the national climate change strategy, and the national disaster risk management strategy, underscore the need for hydromet strengthening. By reducing economic losses and increasing productivity, the Project will directly support climate resilient development. Investment in hydromet services is a "no regret" climate adaptation investment, particularly for a vulnerable LDC like Mali.

D.2. Exit Strategy

Please explain how the project/programme sustainability will be ensured in the long run, after the project/programme is implemented with support from the GCF and other sources, taking into consideration the long-term financial viability demonstrated in E.6.3. This should include a description of strategies for longer term maintenance of physical assets (if applicable).

Note: Hydromet is a technology-intensive and human-resource intensive sector, which continues to evolve very rapidly and, therefore, a total exit is not feasible to be strategized in the short or medium-term.

In order to ensure sustainability after the life of the Project and to make a smooth exit, interventions will emphasize three key critical aspects learned from past investments.

(i) Strengthened Institutional capacity

- The Project will strengthen institutional capacity of national agencies to ensure sustainable policy making, as well as strategic and budget planning, which will go a long way towards efficient and effective management, as well as elevating agency relevance.
- Technical assistance and capacity building will see an intensive phase during Project implementation, which will require substantial resource deployment. After the peak, it is expected that technical assistance and capacity building needs will plateau out to a low equilibrium, which will be sustainable through normal public sector allocation by the Government, supported, if necessary, through development assistance channels from development partners.
- Major policy-institutional support for enabling environment generation will be a one-time investment. It is not a recurring charge, and does not require an exit strategy.

(ii) Ensure cost effectiveness of the system and operations and maintenance of the system

- Cost effectiveness will be partly realized through improved cooperation between government agencies, stakeholders and users. The Project will ensure a commitment from the participating relevant national institutions to cooperate and collaborate with each other and to open data regime leading to efficiency and better service delivery.
- It is also important to note that investment operations will cover the capital cost of equipment and infrastructure as one-time costs. There is no inherent dependence in this component, and exit is relatively easy and straightforward.

(iii) Create end user demands and put in place a user feedback mechanism to ensure the provision of sustained service that meets user demands.

- The Project will help to improve service delivery to key national and sub-national stakeholders, thus creating additional demand and facilitating increased budget support.
- The Project will institutionalize a user feedback mechanism in the service development cycle to ensure the hydromet service continues to evolve as user demands change, which will contribute to long-term sustainability through keeping the relevance of hydromet services.
- The Project will engage community and sectoral users from the onset of the project design. One of the main interventions will be joint training activity with user groups to strengthen user's capacity to utilize hydromet information products for decision-making and also to increase NMHS's understanding of user requirements.

(iv) Ensure financial sustainability through improved business models and services.

- The Project will improve business models and services to reach critical size and quality to attract private interest and investments towards the development of specialized user-based needs. Agencies have already identified

new markets for services as well as potential clients for hydro-meteorological services, information and analysis. With the help of the Project it is expected agencies will become able to meet part of this demand.

- The agencies benefiting from the Project will comply with a covenant to build sustainable, long-term business models from the reliable operation of strengthened hydromet systems in order to meet the costs of operation and maintenance of the services from their internal revenues and through national budget support. O&M, including maintaining qualified staff for operation, will be an agreed function, which will meet such costs from its own revenues, and/or through innovative financing mechanisms such as private sector engagement or public private participation, and/or through pricing of the hydromet products for profit-generating sectors, both public and private. More importantly, this Project will help to improve service delivery to key national and sub-national stakeholders, thus creating additional demand and facilitating increased budget support.
- The World Bank would encourage the Government, through existing country and policy dialogue, to allocate sufficient resources for operation and maintenance of the hydro-meteorological and warning services in Mali.

USAID is currently starting to explore, through the engagement of an individual consultant, avenues for developing a long-term (10-year) cost recovery strategy and business plan for Mali-Météo. There is indeed high demand for Mali-Météo products and services from the general public, the government and the private sector. While some user groups are not prepared to pay for Mali-Météo weather and advisory services, costs can be recovered from subsidies for provision of public services (food security, early warning) and from commercial revenues (aviation, infrastructure design, insurance, etc.). USAID engagement will provide a preliminary market analysis of who can pay how much for which services. Mali-Météo is not the only meteorological service in Africa that has become an autonomous services delivery agency for weather information and analysis. In 1999, the Tanzania Meteorological Agency (TMA) has gone through much the same history as Mali-Météo. The Tanzanian government assessment of the impact of “semi-independent public institutions that are designed to operate at arm’s length from their parent Ministries” shows that services improved, staff became more professional, and state subsidies increased because government confidence in the agencies led to more business.

In this section, the accredited entity is expected to provide a brief description of the expected performance of the proposed project/programme against each of the Fund's six investment criteria. Activity-specific sub-criteria and indicative assessment factors, which can be found in the Fund's Investment Framework, should be addressed where relevant and applicable. This section should tie into any request for concessionality made in section B.2.

E.1. Impact Potential

Potential of the project/programme to contribute to the achievement of the Fund's objectives and result areas

E.1.1. Mitigation / adaptation impact potential

Specify the mitigation and/or adaptation impact, taking into account the relevant and applicable sub-criteria and assessment factors in the Fund's investment framework.

Most benefits from the proposed project result from the delivery of services, Component C, and can only be realized with appropriate institutional strengthening (Component A) and acquisition of specialized equipment and infrastructure (Component B). The benefits below are therefore considered impacts from the integrated approach of the project, and have not been segregated by component. The economic analysis has been performed over a 10-year period, which is spanning over the project lifetime and taking into account the investment is institutionally sustainable, economically viable, and technically feasible and has string social, environmental and economic co-benefits.

Expected total number of direct and indirect beneficiaries, (reduced vulnerability or increased resilience); number of beneficiaries relative to total population (PMF-A Core 1), particularly the most vulnerable groups: While improved hydromet and early warning services will potentially benefit all population, in particular, about 5.3 million people who are vulnerable to one or more hydro-meteorological hazard in Mali, it is considered that about half of this vulnerable population, or 2.7 million people, will be direct beneficiaries of improved or new early warning services by the end of the Project. In addition to the direct beneficiaries which are either directly targeted by the food security early warning services, the agro-meteorological program and the civil protection flood early warning systems, indirect beneficiaries will have access to enhanced hydro-meteorological information which they will be able to take advantage on a voluntary basis.

Benefits would span across the following areas: i) receiving advice from agro-meteorological information systems about the optimal date for cropping, the most profitable crops, how to avoid crop losses from drought, pests and diseases, as well as yield and post-yield conservation techniques; ii) being identified more accurately as vulnerable through the food security and nutrition warning system, and subsequently receive support in terms of cash, vouchers, free food or subsidized food; or (iii) receiving flood warnings along with various types of support, ranging from preventive evacuation, and protection of livelihoods from flooding damages, to emergency rescue and humanitarian support.

Mali's agrometeorological advisory program was established to address food insecurity linked to droughts in the late 1970s and early 1980s, focused on rain-fed millet, sorghum, peanuts, cotton, and maize. None of the communities are currently covered already by sufficient quality warnings and climate information. Current rates of use by farmers of agrometeorological advisories are still very low (less than 20% of farmers in villages participating in the program) and current resolution, anticipation and precision of the agro-meteorological services are not sufficient. Early warning for flooding do not exist yet.

The Project will dramatically enlarge the number of users from hydromet services, enhancing use of hydromet information by rain-fed farmers (women and men), and extending it to livestock herders (with support from the Sahel Regional Pastoralism project effective in Mali since Nov 2015), to food insecure households (with support from the reformed national food security mechanism adopted since Jan 2016 and supported by a large number of partners) as well as to populations vulnerable to flooding (with support from the new national risk reduction strategy and national emergency response planning (ORSEC) adopted by the Government in Dec, 2015).

Field data collection in Mali is already participatory, with contributions from civil servants, individual contractors, voluntary farmers and paid observers. A large proportion of the equipment has not been replaced since the 1960's. The project will modernize the equipment (with some degree of automation) while still relying upon ownership and participation of communities (mostly farmers) and civil servants (teachers, agronomists) for vulnerability monitoring, gauge reading (important for verification purposes even with automatic stations), protection of equipment and monitoring of reliability of the equipment

Since 2011, the food insecure population varies between 3 and 4.5 million (up to 30% of the population). This population receives about $150-250 million of food, cash vouchers and cash-for-work assistance per year, out of which about $30-50 million is from the Government. In addition, about 2.3 million people live in flood-prone areas and are expected to be able to leverage more optimal benefits from the floods, while reducing related damages and losses, in relation with enhanced rainfall monitoring, hydrological forecasting and early warning under the Project.

Details about how number of expected beneficiaries have been estimated by regions, by activity, and by gender and social disaggregation are available in the feasibility study (Annex 2). The section title *3.4.1. Social Benefits to User Groups* specifically identifies the climate sensitivity, requirements for hydro-meteorological information and expected benefits for different user groups. The poorest and most climate sensitive groups are typically among (i) food insecure households; (ii) rain fed crop producers; (iii) small livestock herders; (iv) artisanal fishermen; (v) artisanal miners and (vi) urban and peri-urban flood-prone dwellers. The users will be supported for optimal use of improved hydromet services for resilience through strengthening the capacity of existing delivery mechanisms including civil protection (primarily targeting flood-prone households in urban areas) and food security early warning system (primarily targeting poorest households in rural areas).

The targeting methodology to reach the poorest and most vulnerable segments of the population will be adapted from the ongoing food security national surveys (conducted annually) combined with rigorous targeting methodologies used by social protection and safety net projects in Mali (supported by EU and World Bank).

Expected strengthening of institutional and regulatory systems for climate-responsive planning and development (PMF- A 5.0 and related indicator(s)): The Project will place emphasis and resources towards the servicing of communities through institutional and regulatory systems. This will be achieved by focusing on the transformation of 'last-mile' community early warning systems. The Project will also support capacity development at the government and community levels for local level risk communication, disaster preparedness, response and recovery planning. This will entail support for the development and implementation of standard operating procedures, contingency plans (for evacuation or food storage for instance), and community risk maps for targeted flood-prone communities.

Expected increase in generation and use of climate information in decision-making (PMF- A 6.0 and related indicator(s)): Hydromet data can be regarded as a currently underutilized public good, but with the potential of being used more effectively for decision making, both at a country and regional levels. Examples could include services that improve decisions for resiliency in the short- and long-term, such as early warning systems for climate related disaster risk management, area planning, and provision of services critical for sustaining economic growth (e.g. information for civil aviation or offshore oil production).

Expected strengthening of adaptive capacity and reduced exposure to climate risks (PMF- A 7.0 and related indicator(s)), focusing particularly on the most vulnerable population groups and applying a gender-sensitive approach: The Project will have a strong focus on reducing community vulnerability. This will be achieved by focusing on the transformation of 'last-mile' community early warning systems, so that these systems have the absorptive capacity, communication means and dissemination outreach to much more efficiently relay the more systematic and reliable information produced by hydro-meteorological services supported under the Project. In order to effectively reduce community vulnerabilities, the Project will take the pathway of "gradual but certain" institutional reform and capacity development initiatives at various inter-government and community levels, and will target in priority most vulnerable groups including women. Accordingly, the Project will aim to start small but retain a strong focus on actual delivery of results that can be gradually scaled up. In addition, there are large benefits from having a long record of hydro-meteorological data. Rainfall data is an input into the modeling work needed to design

infrastructure, develop preparedness plans, prioritize investments and propose weather insurance products. River flow data is needed to design and estimate the benefits from irrigation systems or hydropower plants in a resilient and sustainable manner. In addition, all forms of climate data help improve the calibration and validation of long-term climate models. The knowledge and information generated by the hydro-meteorological services supported by the Project will get used in decision-making under both frameworks of the Mali 2015 Food Security Mechanism Reform and upcoming Mali 2016 Disaster Risk Reduction Strategy and Law.

Expected strengthening of awareness of climate threats and risk-reduction processes (PMF- A 8.0 and related indicator(s)): The Civil Protection, Food Security and Agriculture stakeholders (government, NGOs, other civil society) undertake regular public awareness raising activities with communities in flood-prone areas to enhance preparedness in anticipation for rainy seasons and optimize yields in relation with climate variability. Many NGOs undertake public awareness raising actions as part of their disaster risk management community-focused projects. Despite efforts across the spectrum, public awareness campaigns of all hazards in priority risk areas are not yet systematically undertaken and would be supported by the project in order to enhance benefits from using hydro-meteorological information.

When applicable, specify the degree to which the project avoids lock-in of long-lived, climate-vulnerable infrastructure.

Not applicable – however the infrastructure (three buildings and some hydro-meteorological stations) and equipment will be designed in order to sustain all hazards including storms and flooding.

E.1.2. Key impact potential indicator

Provide specific numerical values for the indicators below.

GCF core indicators	*Expected tons of carbon dioxide equivalent (t CO_2 eq) to be reduced or avoided (Mitigation only)*	*Annual*	Not applicable
		Lifetime	Not applicable
	• *Expected total number of direct and indirect beneficiaries, disaggregated by gender (reduced vulnerability or increased resilience);* • *Number of beneficiaries relative to total population, disaggregated by gender (adaptation only)*	*Total*	5.3 million beneficiaries out of which: - 2.7 million direct (male and female) - 2.6 million indirect (male and female)
		Percentage (%)	DIRECT: 18% of total population 50% of vulnerable population INDIRECT: 17% of total population 50% of vulnerable population GENDER: 50% male, 50% female

	Indicator	Means of Verification (MoV)	Baseline	Mid-term Target	Final target	Assumptions
Other relevant indicators	1.1 Change in expected losses of lives and economic assets (US$) due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention	Estimate from DGPC and CSA/SAP	n/a	Baseline - 1%	Baseline - 5%	Expected losses are modeled, not observed, to allow for year-to-year comparability.
	2.2 Number of food-secure households (in areas/periods at risk of climate change impacts)	Estimate from CSA/SAP	2 million	2.05 million	2.2 million	Food security reform is implemented and information provided by hydro-meteorological services is informing decisions
	3.1 Number and value of physical assets made more resilient to climate variability and change, considering human benefits	Estimate from NPDRR and SAP	US$0 0 people	US$35 million 1.5 million people	US$100 million 5.3 million people	Investment projects use information provided by hydro-meteorological services
	5.1 Degree of integration/ mainstreaming of climate change in national and sector planning and coordination in information sharing and project implementation	Assessment from DRR National Platform	Regulatory documents are inadequate or insufficient		Appropriate regulatory documents are in place	Collaboration arrangements are in place via the National Platform for institutional coordination
	6.1 Evidence that climate data is collected, analyzed and applied to decision-making in climate-sensitive sectors at critical times by the government, private sector and men/women	Scorecards from MMA and DNH	0	1 public sector services (food security, civil protection)	2 public sector services (food security, civil protection)	SOPs in place between Metéo, hydro, civil protection and food security
	6.2 Perception of men, women, vulnerable populations, and emergency response agencies of the timeliness, content and reach of early warning systems	Surveys by DGPC and SAP	TBD		Baseline + 20%	The surveys will be conducted with samples exposed to both food security and flood risks
	7.1 Use by vulnerable households, communities, businesses and public-sector services of Fund-supported tools to respond to climate change and variability	Estimate from MMA/AMIS	0	0.5 million farmers	2 million farmers	The agro-meteorological information service (AMIS) continues to provide services to farmers
	7.2: Number of males and females reached by	Estimate from DGPC and SAP	1 million males	1.5 million males	2.6 million males	The legal framework for issuance of flood

	climate-related early warning systems		1 million females	1.5 million females	2.7 million females	warnings gets adopted
	8.1: Number of males and females made aware of climate threats and related appropriate responses	Estimate from AMIS, SAP and DGPC	1 million males 1 million females	1.5 million males 1.5 million females	2.6 million males 2.7 million females	Partnership in place between the National Platform, media and civil society

E.2. Paradigm Shift Potential

Degree to which the proposed activity can catalyze impact beyond a one-off project/programme investment

E.2.1. Potential for scaling up and replication (Provide a numerical multiple and supporting rationale)

Describe how the proposed project/programme expected contributions to global low-carbon and/or climate-resilient development pathways could be scaled-up and replicated including a description of the steps necessary to accomplish it.

In 2010, the African Union (AU) and the WMO established the African Ministerial Conference on Meteorology (AMCOMET) to highlight the importance of the national hydro-meteorological services for risk reduction and climate change adaptation and called for substantial investments and transformational support to reinforce their service delivery. The Integrated African Strategy on Meteorology formulated by AMCOMET in 2012 specifically calls to "strengthen and sustain National Meteorological Services by providing them with all necessary resources and adequate institutional frameworks to enable them to fully perform their roles as a fundamental component of the national development infrastructure of our countries and of the continent and a contributor to security and sustainable development, particularly poverty reduction efforts, climate change adaptation and disaster risk reduction". The Africa Hydromet Framework Program, a joint partnership of WMO, the African Development Bank and the World Bank, responds to this call by providing support at scale to national meteorological and hydrological services (NMHSs) in Africa. The proposed Mali Project represents the first investment of this Project, envisioned to scale up across several other countries in the region.

Strengthening the NMHSs at scale will have a transformative impact on managing climate and weather risks in the immediate future, facilitate growth in key climate sensitive sectors and enable a better understanding of long-term climate change impacts. In the past, many projects have provided support to hydromet services with piecemeal approaches with size of investments too small to have a transformative impact. Experience from financing hydro-meteorological services around the globe has shown that hydro-meteorological services should be strengthened in a holistic manner, supporting monitoring infrastructure, IT network infrastructure, as well as forecasting and service delivery at the same time.

The Mali Project will therefore provide funding at scale to "turn around" the NMHSs. The Project aims to achieve sustainable budget allocations and operation models to secure their operation. The Project will support Mali in strengthening the institutional set up of the NMHSs and incorporating the services provided to aviation. Supporting Mali to transform and strengthen its policies and legislation related to NMHSs and disaster preparedness and early warning will be an important building block of the Africa Hydromet Framework Program and will contribute to sustaining the support to the national hydro-meteorological services.

The Project will furthermore close the loop between the national hydro-meteorological services and user communities of weather and climate services, such as farmers, women, hydro-power operators and others. The Mali Project will put communities and stakeholders first to enable short and long-term adaptation planning of households, farmers, communities, as well as local and national government. This will include the identification of forecasting services needed by local communities, identification of the right ways of communicating (e.g. with regard to language, culture, technology) forecasts and information with beneficiaries, establishing a feedback mechanism,

piloting and product development jointly with beneficiaries as well as discussion on cost recovery. The Project will furthermore identify appropriate ways of involving communities in weather and climate monitoring, e.g. as voluntary gauge readers and provide direct incentives for mobile money payments.

The Project also aims to involve the private sector. In several countries, this has already been successfully tested, e.g. MTN Ghana cell phone provider involved providing services on weather information to farmers in Ghana. The Project will build upon these lessons learnt and will establish partnerships with local private sector players, such as cell phone providers, IT firms or insurance companies.

Strategy for Scaling-up and Replication: This initial activity strategically focuses on Mali, which has significant climate-related risks – drought and floods respectively. Though this initial investment could have encompassed a wider range of countries and types of risks, the Project currently has a narrower and more concentrated focus on one countries and fewer risks in order to allow a thorough testing of the systemic reforms of hydromet systems proposed to be implemented. Following the successful implementation of this first investment in Mali, the Project will be in a robust position to be replicated across other countries and to other types of climate-related risks, far beyond its initial scope. This will be achieved by establishing hydromet networks through open data and information sharing. This approach will enable the Project to realize and maximize economies of scale and regional integration.

Key Partnerships for Project Broadening and Scaling-up: This scaling up will also be facilitated and supported by key partnerships. The WMO and GFCS, for example, are major partners in looking to scale up support to hydro-met services. The WMO's members and regional centers are already working alongside the World Bank in supporting and strengthening the NMHSs across the region and they will feature heavily in expanding this Project to other countries. AfDB is also an important partner of WBG and WMO in the rollout of the Africa Regional Hydromet Program. The Africa Hydromet Framework Program has obvious operational synergies with the Climate Risk Early Warning System (CREWS) initiative supported by the governments of Australia, Canada, France, Germany, Luxembourg and The Netherlands, which will complement the outputs and outcomes of the Program and projects under it.

E.2.2. Potential for knowledge and learning

Describe how the project/programme contributes to the creation or strengthening of knowledge, collective learning processes, or institutions.

All project components are largely aimed at strengthening knowledge, collective learning processes and institutions. In recognition of the fact that sustainable change does not only requires the modernization of hydromet instrumentation, a significant proportion of the Project is targeted at building institutional capacity, cross-institutional support, and connectivity with end user services. Modernization of the observation networks will enhance generation and use of collective knowledge through weather and climate data analysis, as well as forecasting and decision support infrastructure. Capacity building, training and education programs will be developed and implemented across all of the recipient agencies, with a focus on ensuring knowledge transfer across the workforce and down to successors. The Project will promote coordination and knowledge sharing among the hydromet agencies and line ministries through the proposed interventions to develop tailored products for specific use. Additional efforts to institutionalize learning and build adaptive capacity will be completed by integrating disaster and climate risk management into the school and university curricula and training.

A critical aspect of the Project is to ensure end user connectivity so that community members most vulnerable to climate and disaster risks benefit from the improved weather and climate data. In this regard, specialized information products will be developed to improve warning and response capacity for flood, drought and issues of food insecurity. At the municipal level, risk assessments and analysis will be completed to support the development of communal-level disaster risk management plans and priorities.

Given the potential for scaling up through the larger Africa Hydromet Framework Program, for which the Mali Project represents the first investment, knowledge from the Project will contribute to cross-learning at regional and global levels. Continuous monitoring and evaluation throughout the duration of the Project will support the sharing of

lessons learned and best practices. In this regard, the monitoring and evaluation plan (described in Section H), will not only support adaptive project management but also contribute to collective learning for other countries in the region that aim to strengthen their climate information and services.

E.2.3. Contribution to the creation of an enabling environment

Describe how proposed measures will create conditions that are conducive to effective and sustained participation of private and public sector actors in low-carbon and/or resilient development that go beyond the program.

Describe how the proposal contributes to innovation, market development and transformation. Examples include:

- *Introducing and demonstrating a new market or a new technology in a country or a region*
- *Using innovative funding scheme such as initial public offerings and/or bond markets for projects/programme*

The Project will directly contribute to the creation of an enabling environment for more informed policy making for resilient development. While many of the public entities already have several baseline activities in regards to climate information and early warning, these existing projects need to be harmonized and scaled up for lasting impact. In order to ensure effective and sustained participation, the Project has a strong focus on institutional strengthening and capacity building, as well as improvements in services. Hydromet services are critical for providing information that supports economic development across many sectors, including disaster risk reduction and management, water, agriculture, transport, energy, public health and aviation safety and security. The Project will therefore aim to build cooperation across agencies to connect national hydromet services with expertise, data, and forecasting products. Such measures will ensure that the resilient development benefits extend beyond the life of the Project.

In terms of innovation and market development, the Project will lay the foundation for a subsequent stage when hydromet services will have graduated into more advanced sustaining business models. One of the main objectives of the Project is to give momentum to the hydromet sector so it reaches critical size and quality to attract private interest and investments towards the development of specialized user-based needs. For example, with its new legal status created in 2012, Mali Metéo is required and empowered to raise its own financial resources from both the public and private sectors. However, the current state of inadequate monitoring networks and limited internal capacity severely limits its ability to provide basic information and analysis to both public and private users demanding and willing to pay for increasingly sophisticated weather and climate services. While the agency has already identified new markets for services as well as clients willing to pay for weather information and analysis, it is currently unable to meet these demands. The Project will therefore play a timely role to increase capacity, develop end user products and enhance service delivery to a wide spectrum of audiences.

E.2.4. Contribution to regulatory framework and policies

Describe how the project/programme strengthens the national / local regulatory or legal frameworks to systematically drive investment in low-emission technologies or activities, promote development of additional low-emission policies, and/or improve climate-responsive planning and development.

The Project supports the implementation and operationalization of several key national policies, including the NAPA, the National Climate Change Policy (PNCC), the National Climate Change Strategy (SNCC), and the draft National Strategy for Disaster Risk Reduction. In all of these policies, strengthening climate information and warning services is stated as a priority area required to improve climate-responsive planning and development. The Project includes specific components to augment the review and reform of regulatory frameworks, policies and SOPs for several of the national agencies. Through development of an information exchange platform between key government stakeholders (DGPC, SAP, DNH, and Mali Metéo), the Project will enhance coordination for disaster risk assessment, preparedness and crisis management. With project components that span across both the disaster risk reduction and climate change agendas, the Project will also strengthen synergies across these domains for long-term sustainability of project activities.

In addition to such national-level activities, the Project will support local regulatory frameworks to improve climate responsive planning and development. Municipal level risk assessment and analysis will identify specific

vulnerabilities at the local level and support the development of communal-level disaster risk management plans and priorities. Building upon the risk knowledge at the local level will allow communities to better prepare for and adapt to climate change.

E.3. Sustainable Development Potential

Wider benefits and priorities

E.3.1. Environmental, social and economic co-benefits, including gender-sensitive development impact

Economic Co-benefits

Significant economic gains are anticipated through implementation of this Project in Mali, both from reduced losses and enhanced productivity, particularly in agriculture. From a user perspective, the Project would provide an opportunity to substantially improve key services. Those include: i) the country's early warning system, which currently does not issue any official severe weather or flood warnings, and thus leaves enormous scope for reducing the loss of lives, livelihoods and assets; ii) seasonal forecasts and planting and harvesting advisories to enhance the productivity of farmers; and iii) the food security system, which although already functioning, could also be improved substantially.

Based on these improvements in the forecasting and early warning services, the main benefits that this economic analysis include:

a) The **reduction of economic losses caused by floods** was calculated to be US$2.6 million annually, over 10 years. This was based on the assumption that early warning systems provided by the DGPC would give households additional lead time to evacuate and move main household assets (cars, motorbikes, televisions, etc.) to higher ground, therefore reducing flood losses by 5%. Due to very little and unreliable data on previous flood loss events, this estimate was derived from other studies, such as Schröter, et al. 2008, who based on a survey of early warning system users estimate that a twelve hour lead time provides a potential 60% reduction in damage, while a one hour lead time could reduce flood losses by 20%. Since this project will not uniformly increase early warning system lead times throughout the country down to the local level, and may not be perfectly accurate, a conservative estimate of 5% was selected for the purposes of this calculation. Average annual flood losses (US$52 million) was calculated based on a combined average of two data sources: (i) average annual losses reported by the Government between 2005 and 2012 (US$60 million) and (ii) average annual losses estimated by UNISDR using probabilistic method based upon Government estimates between 2005 and 2014 (US$45 million).

b) **Reduced drought losses, combined with increased agricultural productivity**, were calculated to total US$19.5 million annually. This was based on the assumption that improved seasonal forecasting, agro-meteorological information systems and enhanced food security early warning system would improve farmer productivity and reduce crop losses. Since crop loss data was not available, the calculation was made on existing agricultural production to say that the combined increase in farmer efficiency, as well as the reduced agricultural losses due to droughts, would increase the overall national agricultural output by at least 0.5%. This estimation is based on a study by Hallegatte (2012), which employed a benefit-transfer approach to develop estimates of the benefits and costs of improving met/hydro information and early warning systems in developing countries. In terms of productivity increase, Hallegatte determined that in Europe, weather forecasts have led to value-added gains of between 0.1% and 1.0% in weather-sensitive sectors. The mid-point of this estimate was therefore applied to Mali for the agriculture sector, which can be considered quite conservative, since (a) Hallegatte's estimation does not include avoided losses, only productivity gains, and (b) since Mali is starting from a very under-developed early warning system, small improvements to the system could have far more significant impacts, than in developed countries. World Bank data, which estimated the value of agricultural production as US$3.9 billion in 2012, was used for this calculation.

c) The **increase in efficiency of humanitarian food relief interventions**, due to enhanced preparedness and accuracy of targeting, was calculated to amount to US$0.7 million per year, over 10 years. The assumption was that the efficiency of such operations would be augmented by 0.5%, including avoiding wastage, due to enhanced accuracy of food security targeting system, combined with increased coordination and prepositioning of food relief assets. The government's estimated food security needs for 2015 at US$142 million, both in terms of government reserves and international donor support, was used as the baseline. Consistent figures for such food security aid needs cannot be traced back over the years to get an average, but previous years have also seen very high humanitarian and food aid being provided to Mali. According to AidData.org the average humanitarian and food aid that went to Mali was 200 million between 2011 and 2013, and since not all of the humanitarian aid provided will have been for food relief, the figure of 142 seems appropriate. This is also the case when comparing to other data related to losses in previous drought years, such as 2011, where losses were estimated at US$ 150 to 200 million; while the 2004/5 drought resulted in US$ 380-480 million (16.4% productivity reduction). Food aid is provided to Mali even in years without major droughts, which is why an increase in efficiency of only 0.5% was chosen.

Other economic co-benefits were identified, but could not be quantified due to their more indirect causality:

- With hydropower producing about half of the country's electricity, efficiency gains in production can be anticipated due to river flow forecasting information, resulting in improved management and operation of hydropower dams
- More efficient water resources management will support irrigated agriculture, water supply, watershed management, including support to environmental flows, erosion control, etc.
- Potential for improved hydromet information and modeling to inform infrastructure design, such as roads.
- Hydromet services provide data and products that contribute to the safety of aviation and the economical operation of the sector, both nationally and internationally. The measurements and forecasts of conditions en route and at, or on the approach to, terminal aerodromes are useful for minimizing aircraft operating costs.

Cost-Benefit Analysis

By comparing the costs and benefits of the Project, over time an understanding of the relative value of the planned investments can be generated. While cost-benefit analysis provides a useful process and resultant metrics to help steer investment decision-making, it should however not be the only factor considered.

While the implementation phase of the Project is 4 years, for this analysis, it is assumed that the project impact is 15 years. This is based on the assumption that equipment such as computers and tablets would have an average life of 3-4 years, vehicles and hydromet stations would have an average life of 7-10 years, while new buildings would have a much longer life-span, in the range of 30-40 years. An average of 15 years is therefore appropriate. Operations and maintenance (O&M) costs are assumed at 15% of project investments. O&M costs thus increase linearly over the first 4 years as cumulative project investments are made, reaching a constant 15% of total capital costs during years 5-15. Benefits in terms of reduced disaster damages and increased production are assumed to increase linearly starting from year 2, reaching a constant maximum for years 5-15.

Since Mali's GDP growth rate has been on average 4.5% in the past decade, a discount rate of 5% is used to calculate the Net Present Value (NPV). This is justified by the fact that although there is high potential for future growth in the country, there are also high risks caused by potential climatic, political and price shocks. A 5% discount rate represents an understanding that future costs and benefits are relatively important in comparison to the current situation – concurrent with concerns regarding climate change.

The NPV, which is the difference between the discounted total benefits and cost, was calculated to be US$124.4 million, with a discount rate of 5%. This represents a benefit-cost ratio of 1 to 5. The Internal Rate of Return (IRR), which is the discount rate that zeroes out the NPV, or the interest rate that makes the NPV of all cash flows equal to 0, was calculated to be 65%.

Since it is impossible to accurately predict future per capita consumption growth, a sensitivity analysis was conducted to illustrate the benefits of the Project at lower and higher rates of return. At a discount rate of 10%, NPV

is equal to US$78.9 million, and with a discount rate of 15%, NPV equals US$51.6 million. This demonstrates that the Project would be viable even with much higher discount rates.

Additional sensitivity analysis was carried out, as illustrated in the table below. The below analysis demonstrates that even with both a decrease in benefits by 20%, combined with an increase in operations and maintenance (O&M) costs by 20%, the internal rate of return remains high (60%). And even when combining this with the highest (15 percent) discount rate, the Net Present Value exceeds the costs of the project by 34%, demonstrating a benefit-cost ratio of 1.3 to 1. Keeping in mind that not all benefits could be accurately quantified, this still presents a compelling case to invest in this project.

Sensitivity Analysis:

	NPV (0%)	NPV (5%)	NPV (10%)	NPV (15%)	IRR
Baseline	$203.60	$124.39	$78.88	$51.55	65%
20 % decrease in benefits	$148.88	$89.29	$55.23	$34.90	49.64%
20 % increase in O&M costs	$194.60	$118.62	$74.99	$48.81	62%
20% decrease in benefits & 20% increase in O&M costs	$139.88	$83.52	$51.34	$32.16	47%

Social Co-benefits

The potential lives saved thanks to the strengthening of early warning systems due to this Project is potentially significant. Recent weather and climate-related disasters have resulted in a heavy burden of fatalities in Mali. On average, there are 27 annual fatalities due to floods, which would likely be diminished through improved end-to-end early warning systems. Data on deaths from droughts is limited, and cannot be fully disaggregated from other causes of death. However, it is very likely that strengthened seasonal forecasting and agro-meteorological information systems would strengthen the productivity of farmers and therefore reduce the number of people which are food insecure in the country and risk starvation (this number is currently 1.5 million people). Improved food security will in turn improve nutritional status of children, and indirectly enhance access to education.

Temperature and rainfall conditions influence the spread of communicable diseases. Outbreaks of certain diseases, such as meningitis and malaria, that are highly sensitive to weather conditions can be better tackled and mitigated with enhanced hydromet information services.

The strengthened capacities of communities and linkages to sub-national systems can empower and enhance decision-making among community members. Communication channels established through the proposed Project can be used for other aspects of community life, and thereby improving quality of life. For instance, ICT/mobile platforms can be used for health and market services. Community radios can also be used for arranging medical evacuations. The flood early warning systems will provide downstream communities with information that may in the past not have been forthcoming due to district disputes. With this knowledge, communities can take proactive steps to ensuring the protection of their assets through moving their belongings, animals etc. to higher ground. This has a significant social benefit as it allows residents to be aware of the actions they need to take and builds resilience within the communities. Furthermore, it also provides a sense of community if individuals are able to help others during these events.

Environmental Co-benefits

NMHSs provide forecasts and warnings of floods, water levels and discharge within river basins, and watersheds. These products are critical for safeguarding the environment, and for efficient management of water resources as a contribution to sustainable development. Once farmers are more aware of impending events such as droughts and floods, they can undertake alternative farming practices that will potentially use less water for any irrigated crops. Farmers will be able to store water and not degrade the environment to get them through drought events. Furthermore, with additional knowledge, farmers can better plan their activities, which will result in a reduction of

sediment loss (and any nutrients that may be used on their crops) into riverine environment. This will have environmental benefits to those living downstream as well as to the water quality.

Hydromet services often contribute to air and water quality management by maintaining water and air quality monitoring network in collaboration with environmental agencies, research institutions and universities. Moreover basic meteorological data is an integral part of air and water quality management and provides the technological basis for better watershed management, erosion control, river bank protection and ecosystem preservation. Hydromet data is also an integral part to the long-term monitoring of basic indicators of the state of the environment. It is also critical for addressing major global environmental issues, including climate change.

Gender-sensitive Development Impact

As women are disproportionately impacted by severe weather and climate conditions, improvements in forecasting and early warning will help minimize the negative impacts on women. Moreover, women and their participation are critical to effectively managing climate and disaster risks in a gender-sensitive manner. The National Federation of Women's Organizations Collectives of Mali (FENACOF) is a key stakeholder in the National Platform for Disaster Risk Reduction. They were included as a key stakeholder in consultation workshops for the preparation of this project proposal, and will continue to be consulted throughout the design and implementation of this Project.

In agriculture, women are represented along the entire value chain and yet, they lack necessary resources, such as access, control, and property of land as well as production methods. The predominantly masculine labor migration influences household structures and, in many cases, increases women's burdens. In general, women in Mali are responsible for small livestock keeping, fish processing, and sale of processed food. These activities are mostly not given much credit nor accounted for; yet they are vital to tackling food insecurity. At the same time, they are vulnerable to climate change effects because of their high dependence on resources.

People-centered community-based early warning systems will directly address women's vulnerabilities and exposure to disaster risk. Women are often the caretakers and homemakers and have limited access to resources to protect their lives and property. During community-sensitization as well as design and implementation, women beneficiaries will be targeted for their engagement and ownership of the community-based early warning systems.

E.4. Needs of the Recipient

Vulnerability and financing needs of the beneficiary country and population

E.4.1. Vulnerability of country and beneficiary groups (Adaptation only)

Describe the scale and intensity of vulnerability of the country and beneficiary groups, and elaborate how the project/*programme addresses the issue (e.g. the level of exposure to climate risks for beneficiary country and groups, overall income level, etc.).*

Poverty and climate change vulnerability are strongly correlated. The poor have fewer resources and receive less support from family, community, the financial system and social safety nets to prevent, absorb and adapt to climate change shocks. Poverty remains high in Mali today, with over half (50.6%) of the population living on less than $1.90 a day. Prior to the political and security crisis of 2012, Mali had been successfully reducing its poverty level, decreasing from 60% to 51% between 2000 and 2010. The Gini coefficient also dropped during the same period from 0.40 to 0.33 and malnutrition rates improved. In the wake of the 2012 crisis, however, Mali is today one of the poorest countries in the world, ranked 176th on the 2015 Human Development Index. About 90% of poor people live in rural areas, relying on rain-fed agriculture and agro-pastoralism to make a living. Such households are highly vulnerable to shocks such as drought, which can significantly erode their productive assets and output (livestock, crop production, amongst others).

Mali is exposed to a number of weather and climate related hazards, but is particularly vulnerable to droughts, floods and locust invasion. The Sahelian climate presents high variability, with sequences of drought and intense rainfall.

Two thirds of Mali's land area is classified as desert or semi-desert, thus the country is one of the most drought-prone in the world. Physical vulnerability is accentuated by socioeconomic and environmental factors, mainly: (i) the dependence on rain-fed agriculture; (ii) a high rate of poverty and a low Human Development Index; (iii) people settling in flood plains due to weak urban planning and land use planning; and (iv) environmental degradation and soil deterioration. Furthermore, population displacement as a result of both natural hazard induced disasters and conflict have had significant impacts on food security. From 1980 to 2014, more than 7 million people were affected by 28 drought and flood events. More than 3.5 million people were affected by the drought event of 2011. Floods are also increasingly taking place in both urban and rural areas. In August 2013, torrential rains provoked flash floods in the capital Bamako, resulting in 37 casualties and displacing more than 20,000. On average, flood and drought result in an annual economic impact of approximately US$140 million. Such impacts are expected to worsen with projected climate changes and the increasing severity and intensity of flood and droughts in the country.

In terms of food security, children are most impacted, with Global Acute Malnutrition among children under 5 reported as 15% according to the last Demographic and Health Survey in Mali. In March 2014, 3.7 million people were estimated to be in moderate and severe food insecurity, with 1.5 million in immediate need of food assistance. While the Government is currently supporting several baseline activities, there remains significant institutional, technological, informational and financial barriers, which prevent the development and dissemination of climate and early warning information and the capacity to use this information for local planning.

Weather, climate and hydrologic monitoring and forecasting are essential to inform decision making for climate resilience and provide critical inputs to early warning systems for flood, droughts and food security. Improved access and utilization of hydromet information and early warning can greatly reduce the climate related disaster risks through an increase community preparedness for response and recovery. The outcomes of the project are expected to contribute to strategic mobilization of resources in advance of climate related disasters, enabling targeted support to most vulnerable communities and stronger coordination and cooperation in disaster management for drought and flood events. Improved hydromet services will also significantly contribute to the enhanced productivity in weather sensitive socio-economic sectors such as agriculture, health, energy and water resources management.

E.4.2. Financial, economic, social and institutional needs

Describe how the project/programme addresses the following needs:

- *Economic and social development level of the country and the affected population*
- *Absence of alternative sources of financing (e.g. fiscal or balance of payment gap that prevents from addressing the needs of the country; and lack of depth and history in the local capital market)*
- *Need for strengthening institutions and implementation capacity.*

Mali has a total population estimated at 14.5 million people, predominantly rural, with an average annual population growth rate of about 3.4 percent. The average population density is 11 people per km^2 (ranging from 2 inhabitants per km^2 in the North to 25 inhabitants per km^2 in central and southern areas). The country is divided into five main ecosystems, presenting a wide range of agro-ecological environments (roughly estimated at 40). General economic trends are moderately good, and despite a difficult international environment in 2008, macroeconomic stability has been maintained (for instance, between 1999 and 2009, GDP increased from US$2.6 billion to US$ 9billion) till the socio-political crisis of March 2012, and cross-border trade data show that Mali performed better than the average for Sub-Saharan Africa in most indicators. However, the relatively good economic performance has not translated into improved human development outcomes. Poverty is more prevalent in rural areas (57.6%) where most people continue to derive their livelihoods from agriculture and livestock, and food insecurity and malnutrition are high. The recent socio-political crisis in early 2012 set Mali back to fragile and highly vulnerable conditions. Population growth and the migration of population southward resulted in increased pressure on the remaining land, water and forest resources. The high population density in these high potential agro-pastoral areas has increased the threat of natural resource degradation.

There are substantial funding needs, as the Government does not have the resources to support disaster risk management, hydromet forecasting and early warning systems, and therefore requires external donor support to

enhance disaster and climate resilience. As climate change begins to manifest itself and as populations and communities become more exposed to increased climate variability, the need to address climate risks is becoming urgent in Mali. This is particularly the case for vulnerable rural households dependent on subsistence farming and livestock herding.

While the Government of Mali has been developing platforms for climate and disaster risk management over the past several years, there remains significant needs to strengthen institutional and implementation capacity across Mali Metéo, DNH, SAP, and the DGPC. There are substantial hydromet system modernization needs in order to increase the accuracy and timeliness of forecasting and modeling services. The capacity of Mali Metéo is inadequate for the provision of forecasting and warning services related to extreme weather and climate events. Currently the country does not issue official severe weather or flood warnings, which leaves significant potential for diminishing the loss of lives, livelihoods and assets. Similarly, seasonal forecasts and planting and harvesting advisories could be significantly improved to enhance the productivity of farmers. A food security system in the country does exist, and while it functional, it could also be improved significantly, and expanded to the growing urban areas of the country. Despite the strong DGPC and sectoral actors' commitment, major challenges remain to be addressed in terms of disaster risk management and civil protection. The DGPC's current organization and human resources are primarily oriented towards relief operations, rather than risk reduction. They need strong support to lead and implement more conceptual, multi-sectoral and systemic visions and approaches. There also exists challenges in coordination and collaboration, with difficulties in collecting and sharing data between ministries, agencies and organizations.

E.5. Country Ownership

Beneficiary country (ies) ownership of, and capacity to implement, a funded project or programme

E.5.1. Existence of a national climate strategy and coherence with existing plans and policies, including NAMAs, NAPAs and NAPs

Please describe how the project/programme contributes to country's identified priorities for low-emission and climate-resilient development, and the degree to which the activity is supported by a country's enabling policy and institutional framework, or includes policy or institutional changes.

By signing and ratifying the UNFCCC, Mali has committed to the adoption and implementation of policies and measures to adapt to climate change and to manage existing climate risks. Mali is also a signatory to the Hyogo framework of Action 2005–2015 and its successor, the Sendai Framework for Disaster Risk Reduction 2015–2030. The proposed Project is well aligned with national priorities and measures identified in the CSCRP (2012-2017), the NAPA, the national climate change strategy and the draft disaster risk management strategy. Many of the priority areas defined in these relevant policies and plans can thus be operationalized.

The Summary of the costs assessment for mitigation and adaptation needs in the area of Climate Change in Mali. The Mali Vulnerability and Needs Assessment[15] confirms the 19 projects identified in the 2007 NAPA as relevant national development priorities, including provision of agro-meteorological services for rural populations and development of monitoring and warning services for flooding and extreme weather events.

The Government of Mali recognizes that strengthening the country's economic growth and addressing poverty reduction in a meaningful manner will require addressing climate and disaster risk. The CSCRP adopted by the Council of Ministers of Mali on 28 December 2011 is the reference document for the formulation and implementation of economic and social policies. The framework specifically identifies flood and drought hazards and the resulting food insecurity as significant barriers to addressing poverty reduction in the country. Mainstreaming climate change also has a prominent place within the framework. Following the political and security crisis of 2012, the CSCRP was supplemented by the Plan for the Sustainable Recovery of Mali (PRED, 2013-2014) and the Government Action Plan (PAG, 2013-2018). As part of its goal to strengthen economic growth in the country, one of the stated measures of the PAG is to develop and implement a plan to reduce the risk of flood and other natural hazards.

[15] https://unfccc.int/files/adaptation/application/pdf/malineedsenglish.pdf

The government of Mali submitted its Intended Nationally Determined Contributions (INDCs) in September 2015, which includes action for both climate change mitigation and adaptation. In terms of mitigation, the country commits to reducing emissions to an average reduction of 27% across sectors by 2030 in comparison to a business-as-usual scenario. This is conditional upon international support, although around 40% of this can be met unconditionally.

The INDC also emphasized that adaptation actions are crucial to Mali's vision for building a green economy and climate resilient country. Specifically it describes the importance of the continuation and intensification of ongoing programs and priority areas described in Mali's statement at the Global Climate Summit in 2014 and in the country's NAPA. **The need to build capacity for and ensure appropriate usage of meteorological products and information is re-iterated as one of the priorities to enhance the resilience of vulnerable communities.** The total cost to meet all adaptation needs for the period 2015 – 2020 is estimated at US $ 1.062 Billion.

In 2007, Mali put in place a NAPA to identify its urgent and immediate needs for adaptation. One of the priority projects identified in the NAPA consisted of the need to improve climate and weather information and early warning systems, including for food security. With support from donor partners, the AEDD is also in the process of formulating a NAP to complement the short-term focus of NAPAs and consider medium- and long-term adaptation needs. In 2011, the national climate change policy (PNCC), the national climate change strategy (SNCC), and the action plan for implementation (PANC) were adopted. The SNCC identifies reinforcing national capacity and strengthening climate information and monitoring services as some if its national strategic areas for action. Specifically, it identifies gaps in hydrological and climate monitoring systems, expertise in modeling and weather forecasting, and needs to strengthen early warning systems.

Complementary to the climate change policy framework is the disaster risk management strategy. The draft National Strategy for Disaster Risk Reduction identifies as one of its five priority areas, the need to identify, assess and monitor disaster risks and enhance early warning systems. Specifically this is described as strengthening the effectiveness of hazard monitoring and warning systems, coordinating existing warning systems for different hazards, improving the quality of information and hazard analysis, particularly in relation to flood and drought, and improving weather and climate forecasting capabilities for decision making.

E.5.2. Capacity of accredited entities and executing entities to deliver

Please describe experience and track record of the accredited entity and executing entities with respect to the activities that they are expected to undertake in the proposed project/programme.

The World Bank, as the GCF-accredited entity, will oversee appropriate implementation of the Project, in line with World Bank, procedures and standards, and in addition with any specific requirements in the AMA to be agreed with the GCF. The Project will be implemented and executed by the Government of Mali, namely by the DGPC, SAP of the Food Security Commission (CSA), DNH, and Mali Metéo. The AEDD, as the designated authority of the GCF, is supportive of this Project and for the entities identified to implement these activities.

The project will be executed by the Government of Mali. Having implemented a small World Bank trust-funded operation, the coordination unit of the DGPC at the Ministry of Security and Civil Protection is familiar with World Bank procedures and standards. Some additional capacity support will be required to manage this proposed larger Project. The DGPC will oversee the financial management aspects of the Project, including the preparation of the financial statements and quarterly Interim Financial Reports, monitoring financial transactions on the Project's accounts, and making the necessary arrangements for the annual financial audit of the Project.

E.5.3. Engagement with NDAs, civil society organizations and other relevant stakeholders

Please provide a full description of the steps taken to ensure country ownership, including the engagement with NDAs on the funding proposal and the no-objection letter. Please also specify the multi-stakeholder engagement plan and the consultations that were conducted when this proposal was developed.

The GCF project has been endorsed by the National Designated Authority of Mali, as evidenced by the No-objection letter dated December 2nd, 2015, and signed by Mr. Aboubacar Diabate, Director General, The Environment and Sustainable Development Agency.

The proposed Project builds on over five years of World Bank engagement with the Government of Mali to take actions towards building resilience to climate and disaster risks. This started in 2010 with the negotiation and endorsement of the Global Facility for Disaster Reduction and Recovery (GFDRR) Country Program for Mali, which benefitted from strong relations established between the World Bank country office and national agencies involved in disaster risk management, including sustainable development, food security, fight against locusts, urban and land use planning, and meteorological and hydrological agencies. The preparation of the joint Country Program generated a strong momentum across stakeholders and helped to improve coordination and information sharing among the Government agencies as well as with donors. Under the first phase of the GFDRR Country Program, a US$1.4 million project on Disaster Risk Management and Climate Adaptation became effective in March 2012. It was implemented by the DGPC and successfully completed in June 2015.

More recently, extensive consultations have been held with the national agencies involved in disaster risk management and climate change adaptation to determine the country's priority needs in these areas and potential next steps. In January 2014, a one-day 'national' workshop was organized at the World Bank Office in Bamako. The workshop brought together the providers of hydro-meteorological and disaster risk management services, users, international development partners and NGOs. A common understanding was reached with the national agencies regarding their priority investments and synergies with other ongoing development programs. In September 2014, a sub-regional consultation workshop was organized by CILSS to discuss how to increase the resilience of Sahel countries to extreme weather events and climate variability and change. The workshop brought together participants from the World Bank, the Agro-Hydro-Meteorological Technical Center of the Permanent Interstate Committee for Drought Control in the Sahel (CILSS/AGRHYMET), the Sahel and Sahara Observatory (OSS), the African Centre of Meteorological Applications for Development (ACMAD) and national meteorological, hydrological, hydrogeological, food security and disaster risk management agencies from six countries (Burkina Faso, Mali, Mauritania, Niger, Senegal and Chad). Representation of women was ensured through participation of a gender focal point from each of the countries.

A series of consultations with the NDA – the AEDD – were conducted to gather feedback and obtain buy-in on the proposal. Active participation by the NDA also facilitated the consultation process with other national agencies involved in disaster risk management and climate change adaptation. Joint discussions were held with the AEDD, Mali Metéo, the DNH, SAP and DGPC in November 2015. The objectives of the meetings were to discuss, review and finalize the project objective, components and implementation arrangements. All agencies involved, including AEDD, requested that project management be entrusted to the DGPC, the agency that successfully implemented the GFDRR funded project that closed in June 2015.

In November 2015, the DGPC hosted a workshop with users of hydro-meteorological and warning services to ensure participation of Civil Society Organizations in the development of the Project. Participants included representatives from the National Framework for Climate Services (CNSC), the National Federation of Women's Organizations Collectives of Mali (FENACOF), the Network of Traditional Communicators (RECOTRAD) and the Youth Union of the West African Economic and Monetary Union (UJUEMOA). Workshop findings highlighted that the quality of hydro-meteorological data collected in Mali is currently insufficient to meet specific user needs, including the institutions and people involved in areas such as: i) early warning for food security and nutrition; ii) early warning for extreme events (heavy rains, urban floods, winds, etc.); iii) implementation of contingency plans and relief distribution planning; iv) livestock; v) rainfed and irrigated agriculture; vi) management of dams; vii) design of infrastructure; viii) land use planning; ix) public health; x) sanitation; xi) drinking water supply; xii) navigation; xiii) and fishing. In some cases,

data exists but is not provided to potential users in a timely manner. And while national services are investing in data collection, the use of such information to provide various public services is operating far below its potential. The Project should therefore focus not only on modernizing data collection infrastructure but also on management and access to information systems for optimal utilization. These consultative and fact-finding works have underpinned the design considerations of the proposed Project.

Since a number of projects and technical and financial partners support the structures in charge of meteorology, hydrology and early warning in Mali, the proposal has been developed using a coordinated approach. It is critical to enhance donor coordination not only to avoid duplication but also to maximize opportunities to synergize activities. For this reason, development partners have been included in discussions and consultations throughout the past several years since the Project was initiated. This has consisted of meetings with the EU, USAID, UNDP, GIZ, WMO, the Institute for Research and Development (IRD), the French Development Agency, African Development Bank and Bamako University. A detailed list of planned and ongoing projects is described in Section C.2 Baseline scenario.

E.6. Efficiency and Effectiveness

Economic and, if appropriate, financial soundness of the project/programme

E.6.1. Cost-effectiveness and efficiency

Describe how the financial structure is adequate and reasonable in order to achieve the proposal's objectives, including addressing existing bottlenecks and/or barriers; providing the least concessionality; and without crowding out private and other public investment.

Please describe the efficiency and effectiveness, taking into account the total project financing and the mitigation/ adaptation impact that the project/programme aims to achieve, and explain how this compares to an appropriate benchmark. For mitigation, please make a reference to E.6.5 (core indicator for the cost per tCO2eq).

The proposed GCF grant does not impact the national public debt of the country and will be instrumental to increasing the resilience of communities to extremes and climate variability.

Targeted institutions are public services providing public goods and services. The private market in Mali is not developed to compete with the public sector for provision of such public goods. Yet, a number of goods and services within the Project will be strengthened using the services provided by the private sector and will be acquired within the context of the capacity building process (e.g., models, training, equipment, etc.). The initiative has been envisaged as a public service that will have benefits in multiple development sectors to build overall climate resilience, there is no risk of the investment crowding out private investments.

Strengthening hydromet services has indeed been considered cost effective in many cases. Recent overview of the socio-economic studies have clearly indicated that the benefit to cost ratio of investing in hydromet is high, with returns of 3:1 to 15:1. It's important to note that achieving benefits with hydro-meteorological services requires a minimum level of capacities, which can only be achieved in relation with a sizeable and multi-year investment program. The benefit to cost ratio of investments in hydro-meteorological services overpasses 1 only when these investments are enough to secure improvements critical for delivery of customized services responding to the requirements of different user groups from different sectors. A more detailed analysis of expected benefit to cost ratio of the proposed project is provided in section E.6.3.

E.6.2. Co-financing, leveraging and mobilized long-term investments (mitigation only)

Please provide the co-financing ratio (total amount of co-financing divided by the Fund's investment in the project/programme) and/or the potential to catalyze indirect/long-term low emission investment.

Please make a reference to E.6.5 (core indicator for the expected volume of finance to be leveraged).

Not Applicable

E.6.3. Financial viability

Please specify the expected economic and financial rate of return with and without the Fund's support, based on the analysis conducted in F.1.

Please describe financial viability in the long run beyond the Fund intervention.

Please describe the GCF's financial exit strategy in case of private sector operations (e.g. IPOs, trade sales, etc.).

By comparing the costs and benefits of the Project, over time an understanding of the relative value of the planned investments can be generated. While cost-benefit analysis provides a useful process and resultant metrics to help steer investment decision-making, it should however not be the only factor considered.

While the implementation phase of the Project is 4 years, for this analysis, it is assumed that the project impact is 15 years. This is based on the assumption that equipment such as computers and tablets would have an average life of 3-4 years, vehicles and hydromet stations would have an average life of 7-10 years, while new buildings would have a much longer life-span, in the range of 30-40 years. An average of 15 years is appropriate. Operations and maintenance (O&M) costs are assumed at 15% of project investments. O&M costs thus increase linearly over the first 4 years as cumulative project investments are made, reaching a constant 15% of total capital costs during years 5-15. Benefits in terms of reduced disaster damages and increased production are assumed to increase linearly starting from year 2, reaching a constant maximum for years 5-15.

Since Mali's GDP growth rate has been on average 4.5% in the past decade, a discount rate of 5% is used to calculate the Net Present Value (NPV). This is justified by the fact that although there is high potential for future growth in the country, there are also high risks caused by potential climatic, political and price shocks. A 5% discount rate represents an understanding that future costs and benefits are relatively important in comparison to the current situation – concurrent with concerns regarding climate change.

The NPV, which is the difference between the discounted total benefits and cost, was calculated to be US$124.4 million, with a discount rate of 5%. This represents a benefit-cost ratio of 1 to 5. The Internal Rate of Return (IRR), which is the discount rate that zeroes out the NPV, or the interest rate that makes the NPV of all cash flows equal to 0, was calculated to be 65%.

Since it is impossible to accurately predict future per capita consumption growth, a sensitivity analysis was conducted to illustrate the benefits of the Project at lower and higher rates of return. At a discount rate of 10%, NPV is equal to US$78.9 million, and with a discount rate of 15%, NPV equals US$51.6 million. This demonstrates that the Project would be viable even with much higher discount rates.

E.6.4. Application of best practices

Please explain how best available technologies and practices are considered and applied. If applicable, specify the innovations/modifications/adjustments that are made based on industry best practices.

The proposed Project constitutes a scaling up and consolidation of hydro-meteorological modernization approaches that have been tested by client countries with World Bank operations over the last 20 years (1995-2015). A recent World Bank portfolio review of hydromet projects and/or project components shows that weather and climate information services have changed dramatically in the last 15 years. Hydromet programs implemented with a systems approach (involving institutional development, infrastructure and service delivery for multiple sectors) have been found more successful.

Russia hydromet modernization is a good example of the systems approach. The project's objective was to increase the accuracy of forecasts provided to the Russian people and economy by modernizing key elements of the technical base and strengthening Roshydromet's institutional arrangements. The project began in 2005 and ended in 2013. At US$173 million, it was the World Bank's largest hydromet modernization project. The project was a success, leading to: a) increased lead time and accuracy of global and regional forecasts; b) improved data collection and transmission; c) drastic reduction of response time for requests of archived data, and; d) Increased reliability of seasonal flow forecasts in the pilot river basins. A recent World Bank publication[16] lists the key lessons from the experience with modernizing NMHSs: a) taking an inclusive end-to-end approach that is transformative; b) giving NMHSs the authority to issue or directly support issuance of warnings; c) wherever possible, avoid waiting until the NMHSs are obsolete to undertake modernization, because this approach makes the job more costly and complex; and d) engaging staff and external stakeholders to provide better public weather, climate, and water services.

Moreover, a recent review of World Hydrological Cycle Observing System (WHYCOS) stresses the need for a holistic approach to strengthen national hydrological services (NHSs) by focusing on sustainable outcomes (such as the provision of flood forecasts and warnings) and not solely on outputs (such as the acquisition and distribution of hydrological data)[17]. Otherwise, long-term support is difficult to maintain.

E.6.5. Key efficiency and effectiveness indicators

[16] Weather and Climate Resilience: Effective Preparedness through National Meteorological and Hydrological Services, Tsirkunov and Rogers, World Bank, 2013.
[17] Pilon and Asefa 2011.

<table>
<tr><td rowspan="4">GCF core indicators</td><td>Estimated cost per t CO_2 eq, defined as total investment cost / expected lifetime emission reductions (mitigation only)</td></tr>
<tr><td>(a) Total project financing US$_____
(b) Requested GCF amount US$_____
(c) Expected lifetime emission reductions overtime _____ tCO_2eq
(d) Estimated cost per tCO_2eq (d = a / c) US$_____ / tCO_2eq
(e) Estimated GCF cost per tCO_2eq removed (e = b / c) US$_____ / tCO_2eq

Describe the detailed methodology used for calculating the indicators (d) and (e) above.
Not applicable

Please describe how the indicator values compare to the appropriate benchmarks established in a comparable context.
Not applicable</td></tr>
<tr><td>Expected volume of finance to be leveraged by the proposed project/programme and as a result of the Fund’s financing, disaggregated by public and private sources (mitigation only)</td></tr>
<tr><td>Describe the detailed methodology used for calculating the indicators above.
Not applicable
Please describe how the indicator values compare to the appropriate benchmarks established in a comparable context.
Not applicable</td></tr>
<tr><td colspan="2">Other relevant indicators (e.g. estimated cost per co-benefit generated as a result of the project/programme)</td><td></td></tr>
</table>

**** The information can be drawn from the project/programme appraisal document.***

F.1. Economic and Financial Analysis

Please provide the narrative and rationale for the detailed economic and financial analysis (including the financial model, taking into consideration the information provided in section E.6.3). ***BASED ON THE ABOVE ANALYSIS, PLEASE PROVIDE ECONOMIC AND FINANCIAL JUSTIFICATION (BOTH QUALITATIVE AND QUANTITATIVE) FOR THE CONCESSIONALITY THAT GCF PROVIDES, WITH A REFERENCE TO THE FINANCIAL STRUCTURE PROPOSED IN SECTION B.2.***

Investment in hydromet services is rapidly becoming a priority "low regret" climate adaptation investment[18], particularly in countries like Mali that are climate vulnerable. While methodologies to assess the economic benefits of hydromet investments are still evolving, the literature suggests that such activities can be extremely beneficial in terms of averting losses associated with climate hazards and enhancing the productivity of climate-dependent sectors such as agriculture, water resources management, hydropower, and transport.

A hydro-meteorological value chain shows that value, in economic and social terms, starts with observation of climate through to decision-making and outcomes. As such, the value of an accurate, timely and relevant forecast can only be realized if a beneficial value is achieved at the end of the process. Often, it is assumed that by merely improving observation – through enhanced technologies for example – an end economic value will be secured.

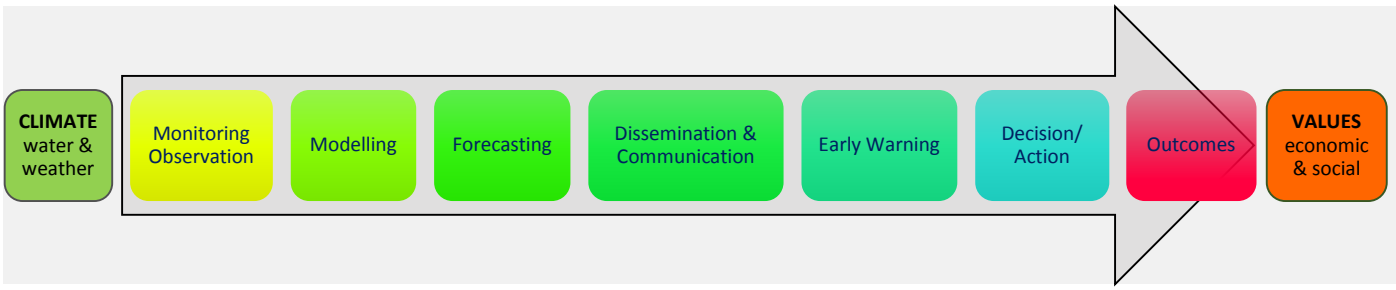


Figure 2: Simplified Hydro-Meteorological and Early Warning Systems Value Chain

Studies have found high returns on investment in hydromet. Hallegatte (2012)[19] estimated the potential benefits of upgrading all developing countries' hydro-meteorological information production and early warning capacities to developed-country standards. Benefit-cost ratios between 4 and 36 were calculated. Country specific analyses find benefit-cost ratios across a similar range:

- China: benefit-cost ratio of 35-40 for 1994-1996[20]
- US: benefit-ratio of 6 for forecasting[21]
- Russia: benefit-cost ratio of 4.5-10[22]
- Kyrgyz Republic: benefit-cost ratio of 2[23]
- Tajikistan: benefit-cost ratio of 2.2[24]
- Ethiopia: benefit-cost ratios range from 3 to 6[25]

[18] IPCC (2012): Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Special Report, WG I & II, Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. **582.**
[19] Hallegatte, Stéphane, 2012. *A Cost Effective Solution to Reduce Disaster Losses in Developing. Countries: Hydro-Meteorological Services, Early Warning, and Evacuation*, World Bank Policy Research Working Paper #6058.
[20] Guocai, Z and H. Wang, 2003. *Evaluating the Value of Meteorological Services in China*. WMO Bulletin 53(4): 383-7.
[21] Rogers and Tsirkunov, 2010. *Costs and Benefits of Early Warning Systems*. Global Assessment Report on Disaster Risk Reduction. ISDR and World Bank.
[22] World Bank, 2005. *Russia National Hydromet Modernization Project*. Project Appraisal Document.
[23] World Bank, 2009. *Improving Weather, Climate and Hydrological Services Delivery in Central Asia.* Kyrgyz Republic, Republic of Tajikistan and Turkmenistan.
[24] Ibid.
[25] World Meteorological Organization, 2015; Valuing Weather and Climate: Economic Assessment of Hydromet Services.

Identified Benefits

In Mali, significant gains are anticipated to be made through this Project, both from reduced losses and enhanced productivity, particularly in agriculture. Mali is starting from a very low base. From the hydromet information production standpoint, the majority of river and weather stations are manually operated and do not provide accurate readings. The Project will significantly increase the number of automated weather and hydraulic stations operating in the country, thereby having a major impact on the accuracy of weather and flood forecasting capacity. The Project will also enhance collaboration between the respective hydrology and meteorology agencies, which is currently very limited.

From a user perspective, the Project would provide an opportunity to substantially improve key services. Those include: i) the country's early warning system, which currently does not issue any official severe weather or flood warnings, and thus leaves enormous scope for diminishing the loss of lives, livelihoods and assets; ii) seasonal forecasts and planting and harvesting advisories to enhance the productivity of farmers; and iii) the food security alert and targeting system could also be further improved.

Based on these improvements in the forecasting and early warning services, the main benefits that this economic analysis focuses on are: (a) reduction in economic losses caused by floods; (b) reduction in drought losses and increased agricultural productivity; and (c) increased efficiency of civil protection and humanitarian interventions due to enhanced preparedness and accuracy of targeting.

The reduction in deaths was not included in the cost-benefit analysis, due to the obvious limitations in valuing human lives. Other factors that were considered, but not quantified, include environmental destruction, disease and social stress, due to the difficulty of valuing total benefits accruing over time after the investments are performed. In addition, some more marginal development benefits, such as the improved efficiency of air-traffic control and the increased efficiency of hydropower operations due to improved weather forecasting accuracy, were not included, since there is no direct link to the aviation or energy sector in the Project. Therefore, the valued benefits are considered very conservative and could increase several folds based on the intensity of future events.

The potential lives saved thanks to the strengthening of early warning systems due to this Project is potentially significant. Recent weather and climate-related disasters have resulted in a heavy burden of fatalities in Mali. On average there are 27 annual fatalities due to floods, which would likely be diminished through improved end-to-end early warning systems. Data on deaths from droughts is limited, and cannot be fully disaggregated from other causes of death. However, it is very likely that strengthened seasonal forecasting and agro-meteorological information systems would strengthen the productivity of farmers and therefore reduce the 1.5 million people that are currently food insecure in the country and risk starvation.[26]

Due to limited data availability, a number of assumptions and proxy indicators had to be designed in order to perform the analysis. The main benefits are explained below, along with the main assumptions of the Project.

a. The reduction of economic losses caused by floods was calculated to be US$2.6 million annually, over 10 years. This was based on the assumption that early warning systems provided by the DGPC would give households with additional lead time needed to evacuate and move main household belongings (such as cars, motorbikes, televisions, etc.) to higher ground, therefore reducing flood losses by 5%. Average flood losses (US$52 million) was calculated based on the combined average of two data sources: (i) losses reported by government (US$60 million), and (ii) losses estimated by UNISDR using probabilistic method (US$45 million).[27]

b. Reduced drought losses, combined with increased agricultural productivity, were calculated to total US$19.5 million annually. This was based on the expectation that an improved seasonal forecasting and agro-meteorological information systems to farmers provided by Mali Metéo, combined with enhanced food security early warning system provided by SAP, would enhance farmers' productivity and reduce crop losses. Since crop loss data was not available, the calculation was made on existing agricultural production to say that the

[26] World Food Program: https://www.wfp.org/countries/mali
[27] http://www.preventionweb.net/countries/mli/data/

combined increase in farmer efficiency, as well as the reduced agricultural losses due to droughts, would increase overall national agricultural output by at least 0.5%. World Bank data, which estimated that the value of agricultural production in 2012 was US$3.9 billion, was used for this calculation.

c. The increase in efficiency of humanitarian food relief interventions, due to enhanced preparedness and accuracy of targeting, was calculated to amount to US$0.7 million per year, over 10 years. The assumption was that the efficiency of such operations would be augmented by 0.5%, including avoiding wastage, due to enhanced accuracy of food security targeting system, combined with increased coordination and prepositioning of food relief assets. The government's estimated food security needs for 2015 at US$142 million, both in terms of government reserves and international donor support, was used as the baseline.

Cost-Benefit Analysis

By comparing the costs and benefits of the Project, over time an understanding of the relative value of the planned investments can be generated. While cost-benefit analysis provides a useful process and resultant metrics to help steer investment decision-making, it should however not be the only factor considered.

While the implementation phase of the Project is 4 years, for this analysis, it is assumed that the project impact is 15 years. This is based on the assumption that equipment such as computers and tablets would have an average life of 3-4 years, vehicles and hydromet stations would have an average life of 7-10 years, while new buildings would have a much longer life-span, in the range of 30-40 years. An average of 15 years is therefore appropriate. Operations and maintenance (O&M) costs are assumed at 15% of project investments. O&M costs thus increase linearly over the first 4 years as cumulative project investments are made, reaching a constant 15% of total capital costs during years 5-15. Benefits in terms of reduced disaster damages and increased production are assumed to increase linearly starting from year 2, reaching a constant maximum for years 5-15.

Since Mali's GDP growth rate has been on average 4.5% in the past decade, a discount rate of 5% is used to calculate the Net Present Value (NPV). This is justified by the fact that although there is high potential for future growth in the country, there are also high risks caused by potential climatic, political and price shocks. A 5% discount rate represents an understanding that future costs and benefits are relatively important in comparison to the current situation – concurrent with concerns regarding climate change.

The NPV, which is the difference between the discounted total benefits and cost, was calculated to be US$124.4 million, with a discount rate of 5%. This represents a benefit-cost ratio of 1 to 5. The Internal Rate of Return (IRR), which is the discount rate that zeroes out the NPV, or the interest rate that makes the NPV of all cash flows equal to 0, was calculated to be 65%.

Since it is impossible to accurately predict future per capita consumption growth, a sensitivity analysis was conducted to illustrate the benefits of the Project at lower and higher rates of return. At a discount rate of 10%, NPV is equal to US$78.9 million, and with a discount rate of 15%, NPV equals US$51.6 million. This demonstrates that the Project would be viable even with much higher discount rates.

F.2. Technical Evaluation

Please provide an assessment from the technical perspective. If a particular technological solution has been chosen, describe why it is the most appropriate for this project/programme.

Technical evaluations of hydro-meteorological and food security services were conducted in 2014 respectively by USAID and the EU. Hydro-meteorological services are at a crossroads, and urgently need an updated long-term business strategy and action plan for capturing and effectively meeting the demand for services from public and private sector clients. Even though the Government of Mali at this time cannot cover the entire recurrent and capital improvement costs of these strategic public services' agencies and departments, it remains strongly engaged and very supportive. Food security services are undergoing a critical reform, and modernization of the food security early warning system with an enhanced use of hydro-meteorological information can potentially optimize the use of about

US$230 million of food aid annually. Flood warning services are not operational in Mali. However, the pipeline strategy and law on disaster risk reduction provides potential for quick demonstration of benefits for populations and productive sectors.

A recent World Bank portfolio review of hydromet projects and/or project components shows that the potential to deliver hydro-meteorological services has increased dramatically over the last 15 years, with huge associated potential benefits in various sectors. Forecasting capacities are growing rapidly with enhanced lead time and spatial resolution, with considerable potential economic benefits.

In general, assessment of World Bank hydromet projects shows that a systems approach (with a mix of institutional strengthening, infrastructure and service delivery) is needed for successful outcomes. A recent World Bank publication[28] lists the key lessons from the experience with modernizing NMHSs: a) taking an inclusive end-to-end approach that is transformative; b) giving NMHSs the authority to issue or directly support issuance of warnings; c) wherever possible, avoid waiting until the NMHSs are obsolete to undertake modernization, because this approach makes the job more costly and complex; and d) engaging staff and external stakeholders to provide better public weather, climate, and hydrological services.

The proposed mix of institutional strengthening, investment and support to service delivery among the four institutions responsible for meteorology, hydrology, food security, as well as early warning and flood early (rapid) warning comes from a careful analysis of needs and potential benefits from an end user perspective. A number of innovations in information and knowledge management would ensure realization of benefits through the delivery of value-added public services relevant to two priority areas, namely food security and civil protection.

The technology proposed for infrastructure, equipment and information management systems responds to the following priorities: a) low O&M costs; b) robust design fit for purpose to withstand power outages and unreliable communication systems dependent on grid electricity and internet; and c) resistance to specific Sahelian climate.

F.3. Environmental, Social Assessment, including Gender Considerations

Describe the main outcome of the environment and social impact assessment. Specify the Environmental and Social Management Plan, and how the project/programme will avoid or mitigate negative impacts at each stage (e.g. preparation, implementation and operation), in accordance with the Fund's Environmental and Social Safeguard (ESS) standard. Also describe how the gender aspect is considered in accordance with the Fund's Gender Policy and Action Plan.

Environmental and social impacts were assessed and widely consulted with stakeholders in Mali – including women groups – and are reflected in a draft Environmental and Social Management Framework (ESMF) and a draft Resettlement Policy Framework developed by the Government for similar activities. These two documents are summarized in an Environmental and Social Impact Assessment (ESIA) attached as Annex to this proposal. The Project is considered a social and environmental "category B" project with potentially low to medium impacts.

The Project's environmental impacts are not of significant importance or irreversible. The potential minor negative environmental and social impacts of the Project could result mainly from certain physical interventions associated with the construction of new weather and water monitoring stations. For example, the installation of water level recorders may include some punctual and very short-term disturbance of the river slopes and sediments during construction. The water level recorders itself will not have any impact on the hydraulic regime of the stream nor have any impact on the aquatic ecosystems. Access to sites, including access roads will be very limited and will be remediated during construction.

[28] Weather and Climate Resilience: Effective Preparedness through National Meteorological and Hydrological Services, Tsirkunov and Rogers, World Bank, 2013.

To mitigate risks and negative impacts, the Government has prepared a draft Environmental and Social Management Framework (ESMF) as well as a draft Resettlement Policy Framework (RPF) for activities envisaged under this project. The documents, summarized in the Environmental and Social Impact Assessment (ESIA), provide guidance and measures with clear roles and responsibilities, along with capacity strengthening measures for effective implementation and monitoring (Please refer to Annex V). This plan has been consulted with stakeholders in Mali during preparation. It also provides cost outlays and a timetable for preventing and mitigating potential impacts. In particular, the draft ESMF: i) provides steps for screening all potential sites for the installation of hydromet equipment; and ii) outlines procedures for preparing, reviewing, clearing, disclosing and monitoring infrastructure-specific assessments, if deemed necessary. As a condition, it has been agreed that no civil works will commence without proper compliance with the above procedures.

Since social impacts will be limited to the installation and operation of hydro-meteorological stations, it is very unlikely that formal or informal access of people to land will be restrained through the Project. However, even if they are limited in time and space, the Project will carefully address any impacts on access to resources due to the rehabilitation and installation of weather stations and river gauges. The draft Resettlement Policy Framework (RPF) includes the guidelines and procedures for compensation and/or resettlement in the event that future activities under the Project should require land acquisition, involuntary resettlement or cause restriction of access to livelihoods or assets and resources. It is, however, very unlikely that the Project will involve any land acquisition and / or involuntary resettlement for the installation of hydromet stations or related services.

The national legal framework for environmental management in Mali specifies the roles and responsibilities of government ministries, departments, and agencies, as well as other stakeholders. While environmental management and outcome improved somewhat in recent years, institutional and technical capacity for environmental management still needs to be strengthened at many levels.

The project team will ensure the provision of technical support to develop and improve understanding of the GCF's safeguard polices and the effective implementation of the World Bank's environmental and social safeguard guidelines. The World Bank supervision teams will include environmental and social safeguard experts. Regular monitoring reports (two per year) on the implementation of environmental and social safeguards provisions will be provided to the World Bank for approval. These reports will be verified during project supervision missions, which will include environmental and social safeguard experts. At the national level, the DGPC, executing entity, will be in charge of the monitoring and evaluation of safeguards.

Gender Considerations

Men and women are often differently affected by climate change, extreme weather and climate events, whereas women have higher disaster mortality then men. According to UNFPA women are 14 times more likely to be killed by disasters then men. In Mali the gender gap is particularly higher than Sub-Saharan Africa's average, which is characterized by high fertility rates (6.3 birth per women), high illiteracy rates (66% versus 51 % for men), and particularly in rural areas a low net primary enrolment of girls (14% versus 55% for boys). Physical vulnerability, but also social and financial vary according to entitlement, agency, and opportunities given to men and women, boys and girls. Gender specific vulnerability to climate shocks and disasters can be understood under three major axes: (i) production and reproduction responsibilities; (ii) gender based and other forms of violence; and (iii) lack of agency.

- Production related vulnerability is among others often related to the dependency of women on natural resources (e.g. fuel wood access) and role of women in small scale subsistence agriculture, work and income in informal sectors, insecure or limited access to land as well as insurance products and services. Gender norms also influence the skills, strategies, and survival mechanisms such as food intake. Livestock, typically owned by women and youth, is sold first in hard times.
- Violence is a universal phenomenon, however, it tends to spike in the context of natural disasters. Domestic violence, early and forced marriage; gender based violence (GBV) tend to increase in times of insecurity and when social structures experience failures.
- Lack of agency related vulnerability refers to the understanding and perceiving of risks as well as coping and response strategies. Gender imbalance in level of education and literacy, limited rights and political representation, limited access to social infrastructure. Limited rights and low social status for women limits their knowledge of risks.

Hydro-met services and effective early warning systems can play an important role to reduce the vulnerability of women to climate change and extreme weather and climate events leading to gender equity. The project is therefore committed to a gender sensitive development. The project will implement, monitor and constantly improve its gender actions in line with the national policies of Mali. The project's gender actions are informed by the existing World Bank gender assessments in Mali (*Mali – Poverty and Gender Notes*, 2013; *Strategic Gender Assessment*, 2006), which will be updated during project preparation. It will make concrete recommendations for ensuring active participation of women and vulnerable groups during project design and implementation. Examples of relevant user needs include for example providing hydro-meteorological series and forecasting for women farmers communities, small women owned business as well as involving schools in hydro-met monitoring.

In preparation of the project, a gender focused assessment of hydro-met information user needs was conducted in the Sahel countries focusing notably on the three major axes of gender related vulnerability for key livelihood groups – livestock herders, farmers, fishing and artisanal mining. Similarly on the disaster preparedness site, actions will be undertaken to ensure early warning messages to women as well as vulnerable groups including disabled are well targeted. A *Gender Action Plan* will be formulated and monitored. The Gender Action Plan will be implemented according to the following timeline – for a tentative approval in June and start in August - which can be adjusted based on the actual project approval and start date:

	Aug	Sept	Oct	Nov
Bridging Knowledge Gaps				
Finalizing Gender Action Plan				
Setting M&E indicators				

The project will support Mali Metéo, DNH and DGPC to target and communicate weather forecasts and climate outlooks to the specific needs of women. This can for example be activities, which ensure that weather and climate information is communicated through dedicated communication channels, which are relevant for women and men, and that the forecast information is relevant for women user groups enabling them to get a more resilient product from wood lots or household gardens. Similarly, the project would support the government to better target their disaster response to the particular needs of women in line with their national policies. This could for example be the identification of flood shelters, which are safe and secure for women or that contingency plans and women specific simulation exercises include relevant gender actions. The project will thereby maximize the reach of early warning systems and minimize the potential negative impact of disasters on women.

The project will implement the following gender actions throughout the entire project cycle:

i. Update the socio-economic and *gender assessment*, building upon the existing World Bank gender assessments during the initial phase of the project including a baseline survey to (a.) determine how the project can best respond to the needs of women and men of the specific climate change issue, (b.) identify gender dynamics to achieve the project goals, (c) identify and design project actions, (d) monitor gender actions and number of beneficiaries gender disaggregated, (e) select output, outcome and impact indicators, and (f) guide project institutional arrangements.
ii. Regularly monitor gender actions through a *Gender Action Plan*, including the number of beneficiaries gender disaggregated as well as gender sensitive project output, outcome and impact indicators. The number of gender-disaggregated beneficiaries is targeted at 50% women beneficiaries across all six beneficiary countries. To effectively keep track of gender related both qualitative and quantitative surveys of beneficiaries (gender disaggregated) will be conducted annually. This gender action plan is currently being formulated and will be consulted and completed before signature of the grant agreement.

iii. Conduct gender actions and support the government to implement the gender action plan. Gender actions may include a large number activities stipulated above, including, but not limited to, working with women user groups to identify and develop suitable weather and climate services design risk assessments, prepare gender sensitive early warning systems or design specific gender sensitive flood shelters for communities.
iv. Ensure women participation in community based planning committees, e.g. related to community based contingency planning;
v. In the project implementation unit a gender and social development specialist will support monitoring and implementing gender actions throughout the project. Capacity building on monitoring and implementation of gender actions and indicators for all project staff will ensure a high level of awareness and quality of monitoring.
vi. Establish a project grievance redress mechanism allowing access of women to report gender related issues and the project taking action accordingly ensuring gender equity.

F.4. Financial Management and Procurement

Describe the project/programme's financial management and procurement, including financial accounting, disbursement methods and auditing.

The Grant Agreement will be established between the World Bank and the Government of Mali with Standard Conditions for Grants made by the World Bank out of Various Funds dated July 31, 2010 ("Standard Conditions"). The World Bank, as the GCF-accredited entity, will oversee appropriate implementation of the Project, in line with World Bank procedures standards and requirements in the AMA/FAA to be agreed with the GCF.

The coordination unit of the DGPC at the Ministry of Security and Civil Protection previously implemented a World Bank operation of a smaller scale. However, although the unit has experience in following World Bank procurement procedures, capacity support is required to manage a larger project.

Financial Management

The DGPC Director-General, coordinator of the project, will oversee the financial management aspects of the Project, including the preparation of the financial statements and quarterly Interim Unaudited Financial Reports, monitoring financial transactions on the Project's accounts and making the necessary arrangements for the annual financial audit of the Project. The overall financial management risk is low.

DGPC has satisfactorily implemented a World Bank-funded project from 2012 until June 2015, involving exact same partners (meteo, hydro, food security). The financial management institutional capacity has been assessed on an ongoing basis (with reports every 6 months), and strengthened with (i) acquisition of a dedicated software (TomPro), (ii) training of staff for financial analysis, accounting and archiving and (iii) development of a financial management manual which takes into account Bank's Financial Management guidelines.

Given the large amount of transactions anticipated to be processed compared to average, it is anticipated that the Grant Agreement will state the following as financial covenants:
a) Opening a designated account in a in a financial institution acceptable to the Bank;
b) Implementing separate and adequate financial accounting system including record keeping of financial transactions, funds received and paid;
c) Producing interim financial reports on a quarterly basis;
d) If needed, updating of the current manual of procedures in order to take in account the grant specificities;
e) Recruit a part-time Chief Financial Officer providing training services as well as support to the team with flexible workforce in order to address variable workloads;
f) Recruiting an external auditor based on ToR acceptable to the Bank not later than four months after effectiveness;
g) Maintaining of a financial management system including records, accounts and preparation of related financial statements in accordance with accounting standards acceptable to the Bank;

h) The Financial Statements will be audited in accordance with international auditing standards. The Audited Financial Statements for each period shall be furnished to the Association not later than six (6) months after the end of the project fiscal year;
i) The Recipient shall prepare and furnish to the Association not later than 45 days after the end of each calendar quarter, interim un-audited financial reports for the Project, in form and substance satisfactory to the Association.

This is summarized in the financial management action plan as follows:

No	Action	Deadline
1	Open a designated account in a financial institution acceptable to the Bank	Not later than one month after effectiveness
2	Upgrade of the current manual so as to take into account the grant specificities (if needed)	Not later than two months after effectiveness
3	Recruit a part-time Chief Financial Officer providing training services as well as support to the team	Not later than two months after effectiveness
4	Recruit an external auditor	Not later than two months after effectiveness

The following measures will help strengthen capacity in this area, including having: i) the Administrative and Accounting Unit (DAC) and a dedicated accountant from the Ministry of Security and Civil Protection trained on Bank procedures; ii) the DAC and accountant supported by an experienced consultant; iii) a Project Implementation Manual developed to provide detailed guidance on World Bank budgeting, accounting and financial procedures.

Disbursement will be transaction-based. Subject to satisfactory assessment of the quality of Interim Financial Reports 12 months after effectiveness, the Project could shift to the report-based disbursement method. The Designated Account (DA) will be maintained in a commercial bank. All supporting documents will be provided for Statement of Expenditures (SOEs) for all transactions submitted to the World Bank prior review. The others will be retained at the DGPC and be made available for periodic reviews by the World Bank's missions and external auditors.

The budgeting process will be clearly defined in the Financial Management Manual and the budget will be adopted before the beginning of the year and monitored through the project accounting software. Project accounts will be maintained and supported with appropriate records and procedures to track commitments and to safeguard assets. Annual financial statements will be prepared by the DAC.

The DGPC will elaborate a Project Implementation Manual before effectiveness, including accounting administrative and financial procedures. The manual will need to be cleared by the Bank (FM, procurement and safeguard departments as well as the Task Team Leader) and officially adopted by the Government The Manual will ensure roles and responsibilities are clearly defined and adequate internal controls are in place for the preparation, approval and recording of transactions as well as segregation of duties, to ensure compliance with all WB conditions and guidelines. The Manual will be subject to updates as needed. The Internal Controller of the Ministry of Finance will carry out ex-ante review during project implementation. In addition, the Project will consider the Controle Général des Services Publics (CGSP) to carry out internal auditing twice a year (or on other agreed periodicity) based on Terms of Reference acceptable to the Bank. The only Condition of effectiveness anticipated for the Grant will be the adoption of a project implementation manual, and this is not expected to delay implementation since DGPC has already implemented a project with similar implementation arrangements and is able to develop this manual before effectiveness. The Conditions of effectiveness and dated covenants guarantee compliance with all WB conditions and guidelines, and are proposed by WB legal department.

Interim Unaudited Financial Reports would be prepared on a quarterly basis. The Interim Financial Reports will include sources and uses of funds by project expenditures classification. They will also include a comparison of budgeted and actual project expenditures (commitment and disbursement) to date and for the quarter. The DGPC will submit the Interim Financial Reports to the Bank within 45 days following the end the calendar quarter.

The Financial Agreement will require the submission of Audited Financial Statements from the DGPC to the World Bank within six months after each year-end. An external auditor acceptable to the World Bank will be recruited. The external auditor will prepare a Management Letter to provide observations, comments, and recommendations for improvements in accounting records, systems, controls and compliance with financial covenants in the Financial Agreement.

Reimbursement of advances will be conditioned to compliance with conditions and guidelines including: Standard Conditions for Grants made by the World Bank out of Various Funds dated July 31, 2010 ("Standard Conditions", available as Annex 15) and with reference to the World Bank Guidelines on Preventing and Combating Fraud and Corruption (January 2011, Annex 16), the World Bank Disbursement Guidelines (May 2006, Annex 17), the World Bank Guidelines on Selection and Employment of Consultants (January 2011, Annex 18), the World Bank Guidelines on Procurement of Goods, Works and Non-Consulting Services (January 2011, Annex 19), including the guidance on Anti Money Laundering and Combating Financing of Terrorism. Non-compliance with any of these conditions and guidelines could not only jeopardize the proposed project, but could also freeze disbursement for the entire portfolio of the World Bank, which is over US$800 million. The Minister of Finance, Governor of the World Bank, is fully committed to ensure full compliance of all projects supervised by the World Bank.

Procurement

The DGPC has adequate procurement capacity to carry out procurement under the Project. The main procurement risks relate to the fact that DGPC staff lack experience with large Bank-funded operations, and have only dealt with smaller World Bank administered grants. To strengthen the DGPC's capacity on World Bank procedures, a procurement training program will be carried out during the life of the Project. In addition, the DGPC will hire a procurement consultant with qualifications and terms of reference satisfactory to the Bank, who will provide both support and training services to the civil servants. The overall procurement risk is low.

Recommendations to further strengthen procurement capacity and accountability include: i) develop procurement codes and manuals for National Competitive Bidding Procedures; ii) prepare a procurement plan for the Project; iii) separate evaluation and grant committees for contract awards; iv) establish an archiving system independent from the DGPC conventional system to enable prompt access to documents; v) train at least two people to the use of Bank's procedures; and iv) submit the first two contracts in each procurement category for prior review.

THESE RECOMMENDATIONS WILL BE OVERSEEN BY THE WORLD BANK AS PART OF THE SUPERVISION OF THE PROJECT TO ENSURE EFFECTIVE IMPLEMENTATION.

G.1. Risk Assessment Summary

Please provide a summary of main risk factors. Detailed description of risk factors and mitigation measures can be elaborated in G.2.

The risks identified below include key policy, institutional, and implementation risks. These risks include: (1) environmental and social safety related risks; (2) lack of adequate institutional capacity for implementation; (3) constraints in financial management capabilities; and (4) limited procurement experience with World Bank projects and (5) security and vandalism. Though some of these risks are rated moderate to high, strong mitigation measures will be established to ensure that they do not interfere with the successful implementation of the Project. Ongoing dialogue with the government and intermittent workshops as well as training will also be arranged in order to make sure that the Project is implemented in a risk-informed manner and meets client demands and needs.

In relation with security concerns, conflict in the North of the country will be a challenge for project implementation. However, since there are no rivers and very no significant agricultural production in the North, this will not affect the project significantly, as very few stations will be needed in the North. Simple meteorological data could be obtained through alternative sources such as remote sensing calibrated with historical datasets. Security of staff is taken very seriously by government. The main project management entity is the Directorate General for Civil Protection, which has well trained security personnel, with appropriate experience and the necessary equipment required to protect the project staff and assets.

G.2. Risk Factors and Mitigation Measures

Please describe financial, technical and operational, social and environmental and other risks that might prevent the project/programme objectives from being achieved. Also describe the proposed risk mitigation measures.

Selected Risk Factor 1

Description	Risk category	Level of impact	Probability of risk occurring
Environmental and Social Safety Related Risks	Social and environmental	Low (<5% of project value)	Low

Mitigation Measure(s)

Please describe how the identified risk will be mitigated or managed. Do the mitigation measures lower the probability of risk occurring? If so, to what level?

The Project's environmental and social impacts are not of significant importance or irreversible. The potential minor negative environmental and social impacts of the Project could result mainly from certain physical interventions associated with the construction of new weather and water monitoring stations and two buildings on Government-owned land. It is also very unlikely that formal or informal access of people to land will be restrained through the Project. To mitigate small risk of negative impacts, the Project will adopt an Environmental and Social Management Framework (ESMF), which provides guidance and measures with clear roles and responsibilities, along with capacity strengthening measures for effective implementation and monitoring, as well as a Resettlement Policy Framework (RPF) so that the Project can carefully address the unlikely impact on access to resources due to the rehabilitation and installation of weather stations and river gauges.

Selected Risk Factor 2

Description	Risk category	Level of impact	Probability of risk occurring
Lack of Adequate Institutional Capacity for Implementation	Technical and operational	Low (<5% of project value)	Low

Mitigation Measure(s)			
Please describe how the identified risk will be mitigated or managed. Do the mitigants lower the probability of risk occurring? If so, to what level? The four entities (**MALI METÉO, DNH, SAP AND DGPC)** require additional capacity for effective implementation and coordination. Despite strong commitment and the significant progress made by the country, institutional challenges remain to be addressed. DGPC's current capacity remains focused on disaster relief operations, and they require additional support and training to develop the capacity to promote disaster preparedness and early warning, as well as coordination for disaster risk management. Capacity building is a significant part of project design, to mitigate this risk, across all four project components – via capacity building, trainings, workshops, modernization of key equipment, and enhancement of service delivery.			
Selected Risk Factor 3			
Description	Risk category	Level of impact	Probability of risk occurring
Constraints in Financial Management Capabilities	Financial	Low (<5% of project value)	Low
Mitigation Measure(s)			
Please describe how the identified risk will be mitigated or managed. Do the mitigants lower the probability of risk occurring? If so, to what level? In order to ensure provision of quality and timely budget reports and annual financial statements, effectiveness of external audits, and legislative scrutiny of the annual budget law, the DGPC and an accountant from the Ministry will be supported by an experienced consultant. Additional targeted training and consultant support will be provided to strengthen the financial management capacity of the government. A project implementation manual will be developed to provide detailed guidance on World Bank budgeting, accounting and financial procedures. Reimbursement of advances will be conditioned to compliance with conditions and guidelines including: Standard Conditions for Grants made by the World Bank out of Various Funds dated July 31, 2010 ("Standard Conditions", available as Annex 15) and with reference to the World Bank Guidelines on Preventing and Combating Fraud and Corruption (January 2011, Annex 16), the World Bank Disbursement Guidelines (May 2006, Annex 17), the World Bank Guidelines on Selection and Employment of Consultants (January 2011, Annex 18), the World Bank Guidelines on Procurement of Goods, Works and Non-Consulting Services (January 2011, Annex 19), including the guidance on Anti Money Laundering and Combating Financing of Terrorism. Non-compliance with any of these conditions and guidelines could not only jeopardize the proposed project, but could also freeze disbursement for the entire portfolio of the World Bank, which is over US$800 million.			
Selected Risk Factor 4			
Description	Risk category	Level of impact	Probability of risk occurring
Limited Procurement Experience with World Bank Projects	Financial	Low (<5% of project value)	Low
Mitigation Measure(s)			
Please describe how the identified risk will be mitigated or managed. Do the mitigation measures lower the probability of risk occurring? If so, to what level?			

In general, the DGPC has adequate procurement capacity to carry out procurement under the Project. The main procurement risks relate to the fact that DGPC staff lack experience with large Bank-funded operations, and have only dealt with smaller World Bank administered grants. To strengthen the DGPC's capacity on World Bank procedures, a procurement training program will be carried out during the life of the Project. In addition, the DGPC will hire a procurement consultant with qualifications and terms of reference satisfactory to the Bank.

Selected Risk Factor 5

Description	Risk category	Level of impact	Probability of risk occurring
Security and Vandalism	Social and environmental	Low (<5% of project value)	Medium

Mitigation Measure(s)

Please describe how the identified risk will be mitigated or managed. Do the mitigation measures lower the probability of risk occurring? If so, to what level?

There is a risk that the project is affected by conflict and vandalism. Tight security procedures will therefore be put in place by DGPC, to ensure the security of staff working on this project.

In order to prevent vandalism and damage to project assets, fences will be erected around hydromet stations to prevent access. Very often it is the solar panels that are stolen from hydromet equipment, one option being considered by the team, is to link the energy source of the hydromet station to that of community drinking water stations, where solar power is used to pump the water. These facilities are closely protected by the community, so the energy source would be more secure. Awareness raising and training of local communities about the importance of these hydromet stations, will be part of component 3, so that the community appreciates the value of the infrastructure to enhance their own wellbeing.

All equipment procured under the project will be included in the national inventory. As it is the case for all government-owned equipment operated by government employees in Mali, the equipment will be covered under self-underwriting option by the Government. In addition, further insurance avenues will be explored with implementing partners.

In relation with security concerns, conflict in the North of the country will be a challenge for project implementation. However, since there are no rivers and very no significant agricultural production in the North, this will not affect the project significantly, as very few stations will be needed in the North. Simple meteorological data could be obtained through alternative sources such as remote sensing calibrated with historical datasets. Security of staff is taken very seriously by government. The main project management entity is the Directorate General for Civil Protection, which has well trained security personnel, with appropriate experience and the necessary equipment required to protect the project staff and assets.

Other Potential Risks in the Horizon

Please describe other potential issues which will be monitored as "emerging risks" during the life of the projects (i.e., issues that have not yet raised to the level of "risk factor" but which will need monitoring). This could include issues related to external stakeholders such as project beneficiaries or the pool of potential contractors.

All risks are reflected in the section above

** Please expand this sub-section when needed to address all potential material and relevant risks.*

H.1. Logic Framework.

Please specify the logic framework in accordance with the GCF's Performance Measurement Framework under the Results Management Framework.

H.1.1. Paradigm Shift Objectives and Impacts at the Fund level[29]	
Paradigm shift objectives	
Increased climate-resilient sustainable development	The underlying paradigm shift for the proposed project is based on a systematic causal chain of inputs, outputs, intermediate outcomes, final project outcomes and long term project impact. The fundamental elements and key indicators of this causal chain are as follows: **Output Level:** The improvement and modernization of its hydromet systems and services, using technological breakthroughs in the industry over the years, will enable Mali to provide communities, national, regional and international users with adapted, accurate and timely weather, climate and hydrological information. The expected output level results include: • Enhanced hydro-meteorological observing, monitoring and impact forecasting services; • Enhanced food security early warning system; • New flood early warning services; • Enhanced civil protection response capacities; **Intermediate Outcome Level:** Taking advantage of these improvements, Météo-Mali, DNH, DGPC and SAP will more systematically and efficiently consider the demands of stakeholders at all levels of the country and adapt their products accordingly. • Increased generation and use of climate information in decision making; • Strengthened adaptive capacity and reduced exposure to climate risks; • Strengthened awareness of climate threats and risk reduction processes; **Outcome Level:** Strengthened and modernized hydro-meteorological institutions and services will increase the use of timely and accurate weather, climate and hydrological information in decision making of the government, communities, civil society and private sector in Mali and thereby strengthen their awareness and adaptive capacity. This will be achieved by focusing on the transformation of 'last-leg' early warning systems, so that these systems have the absorptive capacity, communication means and dissemination outreach to much more efficiently relay the more systematic and reliable information produced under the program. **Impact Level:** Strengthened and modernized hydro-meteorological services in Mali will increase the resilience and enhance the livelihoods of groups, communities and regions vulnerable to climate risks, increase their wellbeing, food and water security and contribute to a more climate resilient infrastructure. The project development impacts will be rather "gradual-but-certain" and build upon improved service delivery capacity, institutional reforms, capacity development and last mile connectivity. This also constitutes another past lesson being applied to the design of the program's theory of change, which is that the reforms introduced under the program will have to be progressively but substantively institutionalized during the life of the project for them to retain their impact and benefits beyond the project. Accordingly, the project aims to start small but retain a strong focus on actual delivery of results that can be gradually scaled up, rather than starting too big which would risk diluting the potential impacts under the proposed project.

[29] Information on the Fund's expected results and indicators can be found in its Performance Measurement Frameworks available at the following link (Please note that some indicators are under refinement):
http://www.gcfund.org/fileadmin/00_customer/documents/Operations/5.3_Initial_PMF.pdf

Expected Result	**Indicator**	**Means of Verification (MoV)**	**Baseline**	**Target**		**Assumptions**
				Mid-term (if applicable)	Final	
Fund-level impacts						
A1.0 Increased resilience and enhanced livelihoods of the most vulnerable people, communities and regions	*1.1 Change in expected losses of lives and economic assets (US$) due to the impact of extreme climate-related disasters in the geographic area of the GCF intervention*	Estimate from DGPC and CSA/SAP	TBD in Dec 2016	Baseline -1%	Baseline -5%	Expected losses are modeled, not observed, to allow for year-to-year comparability.
A2.0 Increased resilience of health and well-being, and food and water security	*2.2 Number of food-secure households (in areas/periods at risk of climate change impacts)*	Estimate from CSA/SAP	2 million	2.05 million	2.2 million	Food security reform is implemented and information provided by hydro-meteorological services is informing decisions
A3.0 Increased resilience of intrastructure and the built environment to climate change	*3.1 Number and value of physical assets made more resilient to climate variability and change, considering human benefits*	Estimate from NPDRR and SAP	US$0 0 people	US$35 million 1.5 million people	US$100 million 5.3 million people	Investment projects use information provided by hydro-meteorological services

H.1.2. Outcomes, Outputs, Activities and Inputs at Project/Programme level

Expected Result	**Indicator**	**Means of Verification (MoV)**	**Baseline**	**Target**		**Assumptions**
				Mid-term (if applicable)	Final	
Project outcomes						
M5.0 Strengthened institutional and regulatory systems	5.1: Institutional and regulatory systems that improve incentives for	Assessment from DRR	Regulato ry documen		Regulator y documen	Collaboration arrangements are in place via the

	climate resilience and their effective implementation	National Platform	ts are inadequate or insufficient		ts are adequate or sufficient	National Platform for institutional coordination
A6.0 Increased generation and use of climate information in decision-making	6.1 Use of climate information products/services in decision-making in climate-sensitive sectors	Scorecards from MMA and DNH	0	1 public sector services (food security, or civil protection)	2 public sector services (food security, and civil protection)	SOPs are in place between Metéo, hydro, civil protection and food security
	6.2 Perception of men, women, vulnerable populations, and emergency response agencies of the timeliness, content and reach of early warning systems	Surveys by DGPC and SAP, with consideration for poorest and most climate-sensitive user groups	TBD		Baseline + 20%	The surveys will be conducted with samples exposed to both food security and flood risks
A7.0 Strengthened adaptive capacity and reduced exposure to climate risks	7.1 Use by vulnerable households, communities, businesses and public-sector services of Fund-supported tools, instruments, strategies and activities to respond to climate change and variability	Estimate from Mali-Météo	0	0.5 million farmers	2 million farmers, households, communities, businesses and public-sector services	The agro-meteorological information service (AMIS) continues to provide services to farmers and additional delivery mechanisms are developed for other climate-sensitive sectors (urban management, water supply, irrigation, hydropower, health, etc.)
	7.2: Number of males and females reached by [or total geographic coverage of] climate-related early warning systems and other risk reduction measures established/ strengthened	Aggregate from DGPC and SAP	1 million males 1 million females	1.5 million males 1.5 million females	2.6 million males 2.7 million females	The legal framework for issuance of flood warnings gets adopted
A8.0 Strengthened awareness of climate threats and risk-reduction processes	8.1: Number of males and females made aware of climate threats and related appropriate responses	Aggregate from Mali-Météo, DNH, SAP and DGPC	1 million males 1 million females	1.5 million males 1.5 million females	2.6 million males 2.7 million females	Partnership in place between the National Platform, media and civil society
Project outputs	**Outputs that contribute to outcomes**					
1. Enhanced hydro-meteorological observing,	End users' combined satisfaction rate and behavior change in	Survey with user groups under	Baseline	Baseline * 1.1	Baseline * 1.5	The targeting of user groups will evolve as customized services

monitoring, and impact forecasting services	relation with improved hydromet information services	National Framework for Climate Services				get delivered to additional groups.
2. Enhanced food security early warning	Number of well-equipped agro-meteorological stations	Agro-meteorological advisory program	0	0	14	Existing "Local Agromet Assistance Groups" would need to be maintained and strengthened
3. New flood early warning services	Number of urban municipalities covered with flood early warning system	DGPC	0	0	15	Some additional flood forecasting and early warning services will be delivered at regional and national level
4. Enhanced civil protection response capacities	Number of Municipal Civil Protection Committees with capacities to use the customized flood early warning interface and engage in early preparedness and response activities	DGPC	0	0	10	The final number of local and community response capacities depends upon support provided by other project (GEF, Caritas, USAID, etc;)

Activities	**Description**	**Inputs**	**Description**
1.1 Training and capacity building programs	Development and implementation of capacity building, training and education program including: (i) personnel training and retraining; and (ii) professional orientation for senior staff	1.1.1.In-situ training, education at universities, study tours, distance learning program and training in WMO regional and relevant training centers 1.1.2.Technical training including at least basic meteorology, hydrology & ICT, maintenance and operation of newly acquired equipment, ICT, data processing, analysis & management, geographical information systems and remote sensing 1.1.3.Simulation exercises for the DGPC, forecasting models for Mali Metéo and DNH, and food security and livelihood impact analysis methodologies for SAP	Personnel training and retraining, professional orientation for senior staff, and targeted trainings for specific agency needs
1.2 Enhancing institutional and regulatory frameworks	Strengthening of institutions of hydro-meteorology, food security and civil protection	1.2.1. Development of Standard Operating Procedures to ensure early action in relation with early warnings 1.2.2. Development or improvement of medium-term and long-term institutional business models and strategic planning frameworks	Institutional development and strategic planning, and development of adequate legal and regulatory frameworks
2.1 Expanding and upgrading hydromet observation networks	Expansion and upgrading of the surface of meteorological network, the agro-meteorological network, hydrological stations and specialized hydrological equipment for rivers and	2.1.1. Expansion and upgrading of the surface meteorological network: Automatic Weather Stations, rain gauges, lightning detectors, standard equipment, power supply, telecoms for field stations; 2.1.2 Expansion and upgrading of the agro-meteorological network: automatic stage recorders	Expansion and upgrading of the surface meteorological network, agro-meteorological network, hydrological stations and specialized hydrological equipment for rivers and small flood-prone watersheds through the

	small flood-prone watersheds	2.1.3. Expansion and upgrading of hydrological stations and specialized hydrological equipment for rivers and small flood-prone watersheds : Acoustic Doppler Current Profiler, bathymetric instruments, sediment measurement instruments, current meters, and boats	buying of new field equipment and refurbishment or renovation of existing ones
2.2 Enhancing data collection & transmission, forecasting and decision support systems	Modernization of data collection infrastructure, management and access to information systems for optimal utilization	2.2.1 Upgrade of data collection and communication equipment and devices 2.2.2. Upgrade of data storage and management systems 2.2.3. Upgrade of computers and software for remote sensing 2.2.4. Upgrade of software and customized tools for GIS and modelling and forecasting	Modernization of data collection infrastructure, management and access to information systems for optimal utilization
2.3 Strengthening preparedness and emergency response facilities and operations	Enabling of agencies to carry out their operational mandates for disaster preparedness and response	2.3.1. Design, building and equipment of a national Operational Center for Crisis Monitoring, Activation and Management to withstand all disaster scenarios; 2.3.2. Design, building and equipment of a national office for SAP, specialized emergency vehicles and search and rescue equipment	Design, building and equipment of emergency response units within existing institutions
3.1 Enhancing of service delivery capacities	The enhancement of service delivery capacities will include (i) establishing a national framework of climate services, (ii) improving flood and drought forecasting and warnings, and (iii) developing new products for sector specific needs	3.1.1. Support to the development of a National Framework for Climate Services with sectoral working groups 3.1.2. Development of a digital library of climate-relevant information for priority climate sensitive sectors 3.1.3. Development of an information exchange between key Government stakeholders to enhance disaster risk assessment, preparedness and crisis management 3.1.4 Support to participation in WMO Severe Weather Forecasting Demonstration Project (SWFDP) 3.1.5. Development of impact based warnings and of a forecast accuracy verification system 3.1.6. Development of field campaigns for validation of stage/discharge rating curves and collection of topographic data 3.1.7. Development of specialized weather, climate and hydrological products and services tailored to sector specific needs (agriculture, health, energy, transport, water resources management, disaster risk management, etc.) 3.1.8.Institutionalizat of a mechanism to provide user feedback	Establishment of a national framework of climate services; Improvement of the lead time and accuracy of weather, climate and hydrological forecasts and development of timely and actionable warning services through improved numerical weather prediction, flood modelling and weather forecasting; Development of specialized weather, climate and hydrological products and services with an emphasis on the user driven process to define new services
3.2 Improved early warning and community preparedness	The improved early warning and community preparedness will include: (i) strengthening “last mile” connectivity to ensure appropriate	3.2.1. Engagement of the end user community with the implementation of training activities, workshops and roundtables for major users 3.2.2 Development and implementation of a communication strategy to support the	Mobilization and sensitization the community, and establishment of an effective feedback mechanisms for

	understanding and use of information, and (ii) mobilization and sensitization of community and establishing effective feedback mechanisms for communities at risk	dissemination of products to end users via combination of modern and traditional communication methods (bulletins, forecasts, warnings and advisories) 3.2.3. Workshops, operational training, on-the-job training and drills involving populations at risk, local governments, hydro-meteorologists and other relevant stakeholders 3.2.4. Development of SOPs, warning protocols and signals in agreement with community members in pilot areas 3.2.5. Conduct of municipal multi-hazard risk assessments (combination of scientific and participatory methods) for targeted high risk areas	communities at risk; Community engagement, capacity building and gender and youth group sensitization as well as support to the integration of disaster and climate risk management into school and university curricula
4 Project management		4.1 Gender action plan 4.2 Communication strategy for user beneficiaries	

H.2. Arrangements for Monitoring, Reporting and Evaluation

Besides the arrangements (e.g. Semi-annual performance reports) laid out in AMA, please provide project/programme specific institutional setting and implementation arrangements for monitoring and reporting and evaluation. Please indicate how the interim/mid-term and final evaluations will be organized, including the timing.

As with all World Bank Investment Project Financing, a detailed results monitoring framework will be developed to assess progress towards the Project Development Objective (PDO) through key indicators; while intermediate indicators will monitor the progress of each component over the life of the Project. The detailed methodology for calculating indicators will be provided in the Monitoring and Evaluation Manual that will be developed by the Government of Mali.

Project progress will be monitored by the Project monitoring and evaluation team based on official data sources monitored directly by Mali Metéo, DNH, SAP and the DGPC, with the assistance of the national platform for disaster risk management and guidance from the PSC. In addition, a number of individual evaluations will gauge progress towards the PDO, assess the impact of the Project on the beneficiaries, assess the quality of the work carried out its different components, and evaluate overall project efficiency.

The Grant Agreement will detail the reporting requirement of the Government of Mali vis-à-vis the World Bank in accordance with the provisions of Section 2.06 of the Standard Conditions and on the basis of the indicators acceptable to the World Bank. Each Project Report shall cover the period of one calendar semester, and shall be furnished to the World Bank not later than one month after the end of the period covered by such report. The Mid-Term and Completion Reports shall be furnished to the World Bank no later than six months after the Mid-Term / Closing Date. The indicative timeline as reflected in the Project Term Sheet is as follows:

Milestones	**Expected Dates**
Start of Project Implementation	01/01/2017
Interim Evaluation	31/07/2019
Project Completion	31/12/2020
Final Evaluation	01/07/2021

PLEASE PROVIDE METHODOLOGIES FOR MONITORING AND REPORTING OF THE KEY OUTCOMES OF THE PROJECT/PROGRAMME.

Supervision, carried out on a regular basis by World Bank teams, will entail routine quality checks at various stages of implementation. Periodic monitoring will include process reviews/audits, reporting of outputs and maintaining updated records. Broad thematic areas that will be supervised and monitored include the following: (i) Social and Environmental

Monitoring, (ii) Regular Quality Supervision & Certification, (iii) Periodic Physical Progress Monitoring & Third-Party Quality Audit, and (iv) Results Monitoring and Evaluation.

Additionally, there will be a project management milestone chart to ensure administrative and implementation related activities are completed on schedule. The project implementation units may also explore the installation and use of a more systematic Critical Path Method (CPM)- based software for the physical and financial progress monitoring of various sub-components and sub-projects within.

Finally, Annual Performance Reports will be duly prepared and shared in a manner compliant with the provisions of the Accreditation Master Agreement and the Monitoring and Accountability Framework of GCF.

I. SUPPORTING DOCUMENTS FOR FUNDING PROPOSAL

- ☒ Annex 1 - NDA No-objection Letter
- ☒ Annex 2 - Feasibility Study
- ☒ Annex 3 - Integrated Financial Model that provides sensitivity analysis of critical elements (xls format, if applicable)
- ☒ Confirmation letter or letter of commitment for co-financing commitment (If applicable)
- ☒ Annex 4 - Project/Programme Confirmation/Term Sheet (including cost/budget breakdown, disbursement schedule, etc.) – *see the Accreditation Master Agreement, Annex I*
- ☒ Annex 5 - Environmental and Social Management Framework
- ☐ Annex 6 - Appraisal Report or Due Diligence Report with recommendations (If applicable)
- ☐ Evaluation Report of the baseline project (If applicable)
- ☒ Annex 7 - Map indicating the location of the project/programme
- ☒ Annex 8 - Timetable of project/programme implementation

** Please note that a funding proposal will be considered complete only upon receipt of all the applicable supporting documents.*

No-objection letter issued by the national designated authority

MINISTERE DE L'ENVIRONNEMENT,
DE L'ASSAINISSEMENT ET DU
DEVELOPPEMENT DURABLE

Agence de l'Environnement et du
Développement Durable (AEDD)

REPUBLIQUE DU MALI
Un Peuple - Un But - Une Foi

Bamako, le 11 MARS 2016

N° 0325 /MEADD/AEDD.

To: The Green Climate Fund ("GCF")

Re: Funding proposal for the GCF by The World Bank regarding Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Phase I - Mali Project

Dear Madam/Sir,

We refer to the *Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Phase I - Mali Project* submitted by the World Bank to us on 03/10/2016.
The undersigned is the duly authorized representative of Mr Aboubacar Diabaté, the National Designated Authority of Mali.
Pursuant to GCF decision B.08/10, the content of which we acknowledge to have reviewed, we hereby communicate our no-objection to the program as included in the funding proposal.
By communicating our no-objection, it is implied that:

(a) The government of Mali has no-objection to the program as included in the funding proposal;
(b) The program as included in the funding proposal is in conformity with Mali's national priorities, strategies and plans;
(c) In accordance with the GCF's environmental and social safeguards, the program as included in the funding proposal is in conformity with relevant national laws and regulations.

We also confirm that our national process for ascertaining no-objection to the program as included in the funding proposal has been duly followed.
We acknowledge that this letter will be made publicly available on the GCF website.
Kind regards,

LE DIRECTEUR GENERAL

Aboubacar DIABATE
Ingénieur d'Agriculture et du Génie Rural

Agence de l'Environnement et du Développement Durable
Quartier du fleuve - bp 2357 – rue 311 – porte 328 - Tel. (223) 20 23 10 74 – fax (223) 20 23 58 67 email aedd@environnement.gov.ml
Bamako/Mali

Environmental and social report(s) disclosure

Basic project/programme information	
Project/programme title	Africa Hydromet Program: Phase 1 - Mali Country Project
Accredited entity	World Bank
Environmental and social safeguards (ESS) category	Category B
Environmental and social report disclosure information	
Date of disclosure on accredited entity's website	2016-05-24
Language(s) of disclosure	English and French
Link to disclosure	English: http://documents.worldbank.org/curated/en/2016/05/26403091/mali-first-phase-africa-hydromet-program-environmental-assessment-environmental-social-management-framework French (original): http://documents.worldbank.org/curated/en/2016/05/26399241/mali-first-phase-climate-resilience-sub-saharan-africa-environmental-assessment-cadre-de-gestion-environnementale-sociale
Other link(s)	