Meeting of the Board
27 February – 1 March 2018
Songdo, Republic of Korea
Provisional agenda item 19

GCF/B.19/22/Add.16/Rev.01

25 February 2018

Consideration of funding proposals – Addendum XVI

Funding proposal package for FP074

Summary

This addendum contains the following three parts:

(a) A funding proposal summary titled "Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project";

(b) No-objection letters issued by the national designated authority(ies) or focal point(s); and

(c) Environmental and social report(s) disclosure;

GREEN
CLIMATE
FUND

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: Burkina Faso Country Project
Country/Region:	Burkina Faso (Sub-Saharan Africa)
Accredited Entity:	The World Bank
Date of Submission:	Jan 19th, 2017

GREEN CLIMATE FUND

Contents

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

Please use the following name convention for the file name:
"[FP]-[Agency Short Name]-[Date]-[Serial Number]"

A.1. Brief Project / Programme Information			
A.1.1. Project / programme title		**Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project**	
A.1.2. Project or programme		Project	
A.1.3. Country (ies) / region		**Burkina Faso**	
A.1.4. National designated authority (ies)		**Prime Minister's Office**	
A.1.5. Accredited entity		**The World Bank**	
A.1.5.a. Access modality		☐ Direct ☒ International	
A.1.6. Executing entity / beneficiary		Executing Entity: Permanent Secretariat of the Transport Sector Program (Ministry of Transportation, Urban Mobility and Road Safety) Beneficiary: Directorate General of Meteorology (DGM), Directorate General of Civil Protection (DGPC), Directorate General of Water Resources (DGRE), National Council for Emergency Relief and Rehabilitation (CONASUR), Food Security Early Warning System (SAP)	
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		January 19th, 2017	
A.1.10. Project contact details	Contact person, position	Prashant Singh, Sr DRM Specialist, GSURR, World Bank.	
	Organization	The World Bank	
	Email address	prashant@worldbank.org	
	Telephone number	+1 202 460 6178	
	Mailing address	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.

Burkina Faso is highly vulnerable to a number of weather and climate related hazards, including floods and droughts. Burkina Faso is already experiencing the effects of the changing climate, but has limited capacity and resources to prepare and cope with the increased variability and average changing conditions. To foster and support the development of climate-resilient pathways, the country needs urgently additional financial support for strengthening the scientific base for generating climate and weather information, products and services.

The **Project Development Objective** of the proposed project is to strengthen the adaptive capacity and climate resilience of vulnerable communities and the economy of Burkina Faso. 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.

Burkina Faso already experiences large weather and climate variability. Extreme weather and climate events are also frequent. The urban and rural exposure to flooding and droughts, and the very high level of vulnerability to these events, already cause large impacts to the population and economy of Burkina Faso. Climate change will further exacerbate these impacts, because of the increase in the frequency and magnitude of extreme events. Against this background, improved weather and climate information and services are needed from the national level down to the household level so that government, communities and the private sector can better plan for and adapt to climate projected changes. Hydromet systems and early warning services act as 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 Burkina Faso. 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 and economic activities. In areas of infrastructure development, hydromet information can inform the design of resilient infrastructures 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 7 million people exposed to drought or flooding. The project will consist of four project components with a total budget of US$ 27 million, of which 22.5 would be financed through a grant from the GCF, US$ 2.5 million through a grant from IDA and the remaining resources would be covered by the government.

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) modernizing 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 Permanent Secretariat of the Transport Sector Program (SP/PST), hosted by the Ministry of Transport, Urban Mobility and Road Safety (MTUMRS), which will manage the project in close collaboration with and in support of the Directorate General for Meteorology (DGM), the Directorate General of Water Resources (DGRE), the National Council for Emergency Relief and Rehabilitation (CONASUR), the Directorate General of Civil Protection (DGPC), the Early Warning System (SAP) of the National Food Security Commissariat (CNSA). Since 2014, several consultations were held with the Government of Burkina Faso and users of hydromet information and warning services in preparing this project proposal. The proposed project is fully in line with key national strategies such as the Proposed National Program for Social and Economic Development (PNDES), the Sustainable Development Strategy, the National Civil Protection Policy, and the National Water Resources Strategy. It notably contributes to the implementation of law no 012-2014/AN from April 22 2014, which covers the prevention and management of risks, humanitarian crisis and disasters. The proposed project is also aligned with the National Adaption Plan (NAP) and the Intended Nationally Determined Contributions (INDC) of Burkina Faso to the UN climate convention.

This project is prepared under the framework of the Africa Hydromet Program, which is jointly developed by the World Meteorological Organization, the African Development Bank and the World Bank Group. 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 one of the first project under the Program.

A.3. Project/Programme Milestone

Expected approval from accredited entity's Board (if applicable)	30/09/2018
Expected financial close (if applicable)	31/12/2018
Estimated implementation start and end date	Start: 01/01/2019 End: 31/12/2023
Project/programme lifespan	5 years

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)	GCF financing amount (*USD, Million*)	IDA Grant co-financing amount *(USD, Million)*	Amount (for entire project**) *(USD, Million)*
Component 1 - Capacity building and institutional development	1.1 – Training and capacity building programs	3.22	0.5	3.72
	1.2 – Enhancing institutional and regulatory frameworks	0.25	0.0	0.25
	1.3 – Detailed design and system integration of project activities	1.75	0.0	1.95
Component 2 - Improvement of hydromet and early warning infrastructure	2.1 – Modernizing and upgrading hydromet observation networks	3.1	0.5	4.30
	2.2 – Enhancing data collection & transmission, forecasting and decision support systems	1.85	0.5	2.15
	2.3 – Strengthening preparedness and emergency response facilities and operations	3.5	0.0	4.75
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	4.83	0.5	5.33
	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	2.5	0.5	3.00
Component 4 – Project Management		1.5	0.0	1.55
Total project financing (excluding fee)		22.5	2.5	27

*The table does not include parallel (additional) financing of $ 2 million from government that is included in total project cost column above.
**Includes parallel financing from government.

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

Components	CONASUR	DGM	DGPC	DGRE	SP/PST	SAP	Total
A - Capacity building and institutional development	1,125,000	1,650,000	550,000	795,000		1,100,000	5,220,000
B - Improvement of hydromet and early warning infrastructure	500,000	2,850,000	1,950,000	2,100,000		1,050,000	8,450,000
C - Enhancement of service delivery and warnings to communities	1,600,000	2,250,000	1,350,000	1,280,000		850,000	7,330,000
D - Project Management					1,500,000		1,500,000
Total	3,225,000	6,750,000	3,850,000	4,175,000	1,500,000	3,000,000	22,500,000

CONASUR: National Council for Emergency Relief and Rehabilitation
DGM: Directorate General for Meteorology
DGPC: The Directorate General of Civil Protection
DGRE: The Directorate General of Water Resources
SP/PST: Permanent Secretariat of the Transport Sector Program
SAP: Early Warning System of the National Food Security Commissariat (CNSA)

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

Co-financing sources

1. **US$2.5 million from the World Bank (IDA Grants)**

This co-financing substitutes and identically replaces the earlier grant support from GFDRR, as IDA Grants are more flexible. Although the originally contemplated $2.5M from GFDRR is replaced with IDA Grants, the Project itself remains completely the same (in terms of outcome/geographical areas), as $ 2.5M of IDA grant comes exactly for the same purpose of that of GFDRR without any changes on the project. This is merely a substitution of the financing source with another source at the disposal of the Bank, and does not alter the development objectives, outcomes or geographical focus of the Project in any manner.

Parallel financing sources

1. **Additional US$ 6 million from IDA Grants**
2. **Additional US$ 2 million from Government of Burkina Faso**

Additional IDA grant funding as parallel financing to the tune of $6 million will augment the GCF project financing support to all Components as follows –

Component 1 (Capacity building and institutional development): IDA Grant of $ 1.5 million will bolster the GCF financing of $5.22 million for the development objectives pertaining to this Component.

Component 2 (Improvement of hydromet and early warning infrastructure): IDA Grant of $ 2.35 million will augment the GCF financing of $ 8.45 million to further consolidate and strengthen the hydromet and early warning infrastructure in order to improve the coverage in range and quality.

Component 3 (Enhancement of service delivery and warnings to communities): IDA Grant of $ 2 million will bolster the GCF financing of $ 7.33 million to further strengthen service delivery and warnings to communities.

Component 4 (Project Management): IDA Grant of $ 0.15 million will augment the GCF financing of $ 1.5 million in order to provide the additional project management resources required to administer and utilize the incremental IDA Grant financing.

While it is not expected to alter or increase the geographical area or scope of the project, it will improve the network of observation, monitoring, transmission, service delivery and response preparedness in the geographical areas covered by the project in order to improve the density, accuracy, reliability and efficacy of the services and their impacts. Through increased penetration in the geographical areas, the enhanced financing will ensure that a larger number of project beneficiaries are covered with project benefits within the geographical areas. The IDA Grant will augment the available resources to improve the following networks for observation, transmission and service delivery.

- Enhanced hydro-meteorological observing, monitoring and impact forecasting services;
- Enhanced food security early warning system in chronically food insecure communities in the rural zones of the Central Plateau of Burkina Faso (ZOME 5), north and east (ZOME 7), north (ZOME 8); urban and peri-urban zones of Ouagadougou (ZOME 6) and Bobo-Dioulasso (within ZOME 2);
- Enhanced agrometeorological and climate services, with a particular focus in selected climate sensitive agriculture production areas of Beragadougou, Nangollogo and the Kou valley;
- New flood early warning services in selected areas amongst climate vulnerable communities of Banfora, Bama, Tougouri, Manni, Markoye, Sebba, Solenzo, Ouagadougou and Bobo-Dioulasso, and communities along the main rivers Mouhoun and Nakambe (Black Volta; White Volta)
- Enhanced civil protection response capacities to extreme weather and climate related events;
- Enhanced capacity to adapt infrastructure planning to weather extremes and climate change risks.

Therefore, the IDA Grant financing will serve to scale up resources for optimizing the observation networks, building capacities and institutional delivery mechanisms, and service delivery to ensure project benefits to a larger number of beneficiaries in the project areas, without altering the development objectives of scope of the Project.

The exact details, location and specifications of the supporting interventions to be undertaken with the IDA Grant parallel financing to augment the GCF Financed components and activities will be finalized during appraisal of the project in consultation with the stakeholders, vulnerable populations, beneficiaries and government.

In addition, parallel financing to the tune of US$ 2.00 million has been committed by the Government of Burkina Faso. The Parallel Financing commitments are reflected respectively in Annexes 10-14 (Burkina Faso Government, signed by DGM, DGRE, CONASUR, DGPC and SAP).

Co-financing commitments are reflected respectively in Annexes 10-14 (Burkina Faso Government, signed by DGM, DGRE, CONASUR, DGPC and SAP) and Annexes 15 (signed by GFDRR Manager).

World Bank (IDA) 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.

The government has agreed to continue allocating sufficient funds for the staff, investment and operational budgets of DGM (from an annual budget of about US$3.5 million in 2014), DGRE (annual budget of about US$330,000 in 2014 for DEIE only), CONASUR (annual budget of about US$400,000 in 2014), DGPC (annual budget of about US$2.5 million in 2014) and SAP (annual budget of about US$600,000 in 2014). During the mission in September 2016, the Government has already indicated a commitment to increase overall three separate budget lines for investment, operation and staff across the five institutions. The total US$2 million co-financing represents 7% of the total annual budget of these entities over the 5-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$585,000 from DGM;
- US$480,000 from DGRE;
- US$265,000 from CONASUR;
- US$450,000 from DGPC;
- US$220,000from SAP;

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

(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	3,220,000		80,000	1,920,000	100,000	850,000	270,000	
1.2 – Enhancing institutional & regulatory frameworks	250,000				250,000			
1.3 – Detailed design & system integration of project activities	1,750,000		650,000		1,100,000			
2.1 – Expanding & upgrading hydromet observation networks	3,100,000			265,000			2,835,000	
2.2 – Enhancing data, forecasting & decision support systems	1,850,000			185,000			1,665,000	
2.3 – Strengthening preparedness & emergency response facilities & operations	3,500,000			20,000			3,480,000	
3.1 – Enhanced service delivery	4,830,000			180,000	4,110,000	315,000	225,000	
3.2 – Improved early warning & community preparedness	2,500,000		100,000	105,000	1,820,000	75,000	400,000	
4 – Project Management	1,500,000		367,500	75,000	570,000	300,000	187,500	
Total GCF financing	22,500,000		1,197,500	2,750,000	7,950,000	1,540,000	9,062,500	

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

	Year 1 (million US$)	Year 2 (million US$)	Year 3 (million US$)	Year 4 (million US$)	Year 5 (million US$)	TOTAL (million US$)
Staff						
Individual Consultants	0.24	0.44	0.26	0.14	0.11	1.19
Training	0.40	1.10	0.69	0.28	0.28	2.75
Services (Firms)	0.30	2.30	2.40	1.67	1.25	7.92
Travels and field trips	0.23	0.39	0.39	0.31	0.23	1.55
Goods	0.93	3.17	2.72	1.36	0.91	9.09
Works						
TOTAL	2.10	7.40	6.46	3.76	2.78	22.50

B.2. Project Financing Information

	Financial Instrument	Amount	Currency	Tenor	Pricing
(a) Total project financing	**(a) = (b) + (c)**	27	million USD ($)		

(b) GCF financing to recipient	(vi) Grants *	22.50	million USD ($)	(5) years	
	** Please provide economic and financial justification in section F.1 for the concessionality that GCF is expected to provide, particularly in the case of grants. Please specify difference in tenor and price between GCF financing and that of accredited entities. Please note that the level of concessionality should correspond to the level of the project/programme's expected performance against the investment criteria indicated in section E.*				
	Total requested (i+ii+iii+iv+v+vi)	22.50	million USD ($)		

(c) Co-financing to recipient*	Financial Instrument	Amount	Currency	Name of Institution	Tenor	Pricing	Seniority
*Does not include parallel financing	Grant	2.5	Million USD ($)	World Bank	(5) years		
	Lead financing institution: World Bank (IDA)						
	** Please provide a confirmation letter or a letter of commitment in section I issued by the co-financing institution.*						

(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
Choose an item.	……	Options	( ) 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.

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 the greenhouse gas emissions, but it is bearing the brunt of a disproportionate share of the effects of climate variability and volatility. It is confronted with a range of climate risks that could have far reaching repercussions for its societies, even if warming is limited below 2*C, there is a very substantial risk and projected damages. In Sub-Saharan Africa, the Sahel region is among the most vulnerable hot spots from a climate and disaster risk management perspective due to its pronounced location as a semi-arid climatic transition zone in Africa between the arid Saharan desert to the north and the more humid savanna and grassland zones of the continent to the south.

Stretching from Mauritania to Sudan, the Sahel has faced repeated drought with the most severe occurring during the 1960s and 1980s. Between 2010 and 2012, two large-scale droughts impacted up to 19 million people due to a combination of extreme climatic conditions, poor accessibility to food, high grain prices, environmental degradation and displacement due to conflict. Food security is highly sensitive to rainfall and drought, yet flash floods are a constant threat during heavy rains. The countries' economies are highly exposed to climate risks due to their dependency on agriculture, while food security remains a major concern in the Sahel. West African nations and regional organizations agreed in 2012 in the so-called Ouagadougou declaration on the urgency of increasing resilience in the Sahel (OECD, 2012). In the Sahel, better understanding and consequently managing weather and climate issues is thus a key instrument for reducing the risk of disasters and adapting to climate change, improving food security and achieving resilient growth in key sectors of the economy, which are regularly hit by climate shocks.

As climate change and demographic change increase the number of people exposed to floods, droughts and other hazards, improved early warning systems and greater coordination of disaster management activities will be needed to manage risks, protect lives and property and adapt to climate change. Notably multi-hazard early warning systems can provide a single, cost-effective channel for addressing all types of hazard according to the World Meteorological Organization (WMO, 2015) and are a critical element for adapting to climate change. Early warning systems build upon accurate weather forecasts and climate services, contingency and sector wide planning, effective communication and response.

The Africa Hydromet Framework Program, which is jointly developed by the African Development Bank (AfDB), World Meteorological Organization (WMO) and World Bank Group, responds to this challenge supporting the most vulnerable countries to improve its hydro-meteorological and early warning capacity as a critical element for adapting to climate change and increasing the overall resilience to climate risks. Within the Sahel region Burkina Faso plays a central role due to its location upstream of major river basins (Volta River and Niger River). Burkina Faso has therefore been brought forward to submit a proposal to the Green Climate Fund within the framework of the *Africa Hydro-Met Program*.

Country Context – Burkina Faso

Background

Burkina Faso is a landlocked country located in the middle of the West African Sahel region and occupying over 274,000 square kilometers. Located in the transition zone between the Sahara Desert to the north and the humid coastal areas at the Gulf of Guinea, Burkina Faso is prone to chronic drought, flash floods, windstorms, and disease outbreaks. With limited natural resources and a highly variable climate, Burkina Faso struggles to provide its population with food security and economic opportunity with a population of 18.5 million in 2015. One of the smallest economies in the world, Burkina Faso is deeply dependent on agriculture, with roughly 80% of employment linked to subsistence farming. Agriculture contributes to roughly a third of Burkina Faso's GDP. The country's soils tend to be poor in nutrients, have low water-holding capacity, and are often degraded. When rainfall declines, dust storms occur, or temperature spikes, food supplies/yields are immediately affected. The country suffers from 'quasi-drought' conditions since the early 1970s. Apart

from the Mouhum River (Black Volta) in the western part of the country rivers are intermittent. The impacts of climate change are projected to increase both the frequency and severity of these events.

As a result of this fragility, Burkina Faso remains at the bottom of the UN's Human Development Index, ranking 162 out of 169 countries, with 46% of the population below the poverty line. Still 2.1 million Burkinabe are chronically food insecure and 61.7% of the population is at risk of multiple hazards.

Measures to improve water retention and cultivation resilience to climate variation have started, but remain local and small scale. The improving of weather and climate forecast capacity, the development of early warning systems, environmental monitoring systems, and research on best practices will be essential to better prepare and cope with the impacts of current climate variability and better adapt to climate change. It is predicted that the expected changes in climate variability and average conditions will further exacerbate climate impacts, particularly on rural and poorest populations.

Climate and Disaster Risk Profile

Due to its geographical position, Burkina Faso is characterized by a dry tropical climate, which alternates between a short rainy season and a long dry season. Burkina Faso's climate is prone to strong seasonal and annual variation due to its location in the hinterland and its pronounced location in the Sahel belt. The country has three climatic zones: the Sahelian zone in the north receiving less than 600mm average annual rainfall; the north-sudanian zone in the center receiving an average annual rainfall between 600mm and 900mm; and the south-sudanian zone in the south with an average annual rainfall in excess of 900mm.

In Burkina Faso, droughts and floods are the most severe hazards. Since 1969 Burkina Faso has experienced several major droughts and floods. During the period 1969 to 2014, droughts affected a cumulative number of 12.4 million people (including 4 million in 2014), whereas the most severe years were 1980, 1990, 2011 and 2014 (EMDAT, 2016). In the recent years floods have become more pronounced, whereas a cumulative number of more than 600,000 people were affected since independence (1960) with more than 100,000 people affected in 2007, 2009 and 2010. Often severe floods are following substantial droughts, like in 1994 and 1995 with a multiplied effect on people and livelihoods.

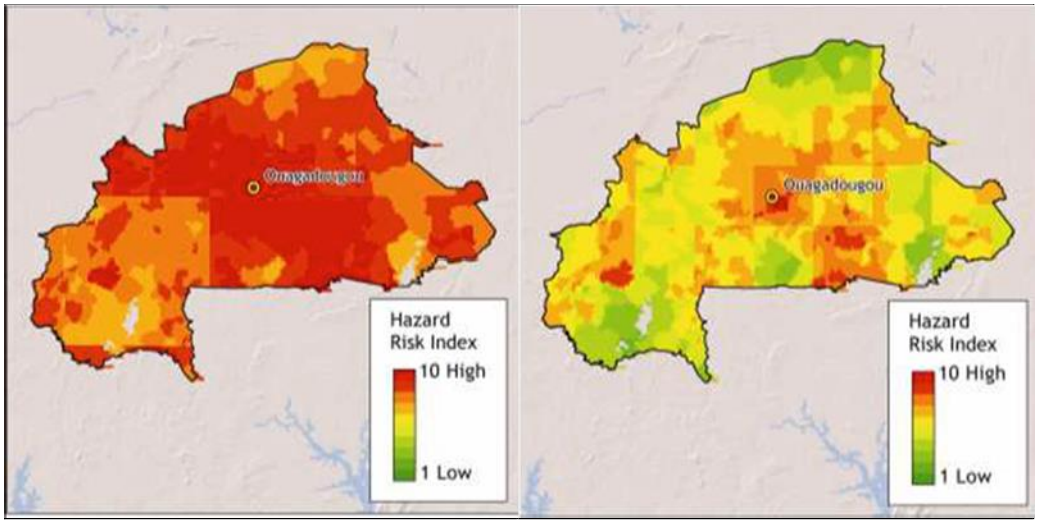

Figure 1: (left) Drought risk distribution; (right) Flood risk distribution[1]

Frequent floods and droughts have severe impacts on lives, livelihoods and the economy of Burkina Faso. The most severe floods, which affected Burkina Faso in September 2009 more than 150,000 people, resulted in estimated damages and losses to the economy of more than US$ 130 million. Frequent floods strongly affect the agricultural sector, with regular impacts on production. For example, in 2007 the National Agricultural Statistics and Forecasting Services reported at least 33,000 hectares of farmland completely inundated by floods between August and September. Two years later in 2009, heavy rainfall once again flooded crops and washed away 22,220 hectares of farmland, breaking 15 dams, and

[1] UNEP's Global Risk Data Platform, Columbia University Center for Hazards and Risk Research (CHRR), and Columbia University Center for
International Earth Science Information Network (CIESIN).

destroying 42,000 homes. The devastating floods of 2009 affected more than 100,000 people and caused damages and losses to the economy of US$ 102 million.

The impacts of climate change are projected to increase both the frequency and severity of these events. Climate change may affect the Sahelian region of Africa through severe variations in rainfall, water shortage and low agricultural yield. This should amplify drought risks and evaporation, and reduce agricultural productivity. Higher temperatures will potentially increase the risk for forest fires and bushfires.

Model simulations adopted by Government under the National Adaptation Program indicate that Burkina Faso will experience the following changes in temperature and precipitation:

- a 0.8°C rise in average temperature by 2025 and a 1.7°C rise by 2050;
- a relatively low drop in rainfall of -3,4% by 2025 and -7.3% by 2050. The decrease in rainfall would be coupled with a very strong seasonal and inter-annual variability of climatic factors.

Based on other models and observations, it is evident that climate variability already affects Burkina Faso economy and society. Climate change effects on variability and average conditions will further exacerbate climate impacts on key economic sectors of Burkina Faso, such as agriculture and livestock, water resource management and water security, forestry, and food security (NAPA, 2007).

Existing National and Sector Policies and Strategies

Adapting to climate change and reinforcing the hydro-meteorological services is anchored in the national development and growth strategies, as well as sector policies related to transport (meteorology), water resources, social protection, agriculture and food security as well as civil protection. These policies underscore the urgency for adapting to climate change and enforcing hydro-meteorological services:

The existing national development strategy (Accelerated Growth and Sustainable Development Strategy/ Stratégie de Croissance Accélérée et de Développement Durable, SCADD) for the years 2011 to 2015 has recognized the frequency of natural disasters and the urgency of key sectors, notably agriculture to adapt to climate change. Climate variability and change has been recognized as one of the key risks to sustainable development in Burkina Faso. SCADD is followed by a new development framework starting in 2016 (National Social and Economic Development Programme / Programme National de Développement Economique et Social, PNDES), which has further recognized the risk of weather and climatic hazards and indicated the key measures for adapting to climate change.

In the face of climate-related crises, the Government of Burkina Faso has developed numerous policy instruments, planning and action programs that often overlap with limited implementation planning.

Over the last years, Burkina Faso devised the National Adaptation Program of Action (NAPA), the Strategic Framework for the Fight against Poverty (CSLP), the Rural Development Strategy (SDR), the National Action Plan for Desertification Control (PAN/LCD), the National Biodiversity Strategy and Action Plan, the Action Plan for Integrated Water Resource Management (PAGIRE), the National Strategy on Food Security, as well as other instruments aimed at regulating energy, cereal and agricultural and food security policies.

Legislative and regulatory instruments were also formulated, including the bill on Agrarian and Land Reforms (RAF), the Environment Code, the Forestry Code, the Orientation Law on Pastoralism, the Orientation Instruments on Decentralization, the Orientation Instruments on Water Management, the decree to establish CONASUR, the National Civil Protection Policy (*Politique Nationale de protection Civile*), and the National Water Resources Strategy (Politique et Strategy en Matiere d'Eau) and the Law no 012-2014/AN from April 22 2014, which covers the prevention and management of risks, humanitarian crisis and disasters.. These legislative instruments are quite often incomplete and some too old, without any implementing instruments; hence the need to raise awareness and enforce their implementability. Most international conventions have been signed or ratified, but their implementation, again, remains low. It is expected that the proposed project will support the monitoring, early warning and response capacity of Burkina Faso and contribute to the successful implementation of the new legal framework of Law no 012-2014/AN.

To address climate change impacts, the government has established the National Council on Environment and Sustainable Development (SP/CONEDD) in charge of promoting environment and sustainable development policies and regulation. Its mission is to ease effective mainstreaming of key environmental management principles into national and sectoral development policies to promote sustainable development. SP/CONEDD is made up of the Focal Point on Climate Change. Though they have the same technical structure, SP/CONEDD and SP/CONASUR address climate change adaptation and mitigation, and disaster risk reduction and management separately. Therefore, there is a lack of communication between the two entities because no functional relationship was installed.

Institutional context

A number of institution are involved in the monitoring, elaboration and forecast of weather and climate information, products and services. In particular, DGM, DGRE, DGPC, SAP and CONASUR are the key agencies responsible for weather, climate and disaster risk management services in Burkina Faso.

The Directorate General for Meteorology (DGM) is responsible for weather and climate services, including agro-climatology. DGM operates a network of 14 manual agro-meteorological stations and two Doppler radars of which only one is operational. Currently, the DGM only serves ordinary weather forecasting as it is unable to provide the mandated extreme weather forecasting and fast-onset weather events because of its low capacity and resources. The Directorate General for Water Resources (DGRE) is responsible for surface and groundwater monitoring. However, out of 95 hydrometric monitoring stations, most discharge data is collected monthly where data transmission, validation and processing is done manually. The National Council for Emergency and Rehabilitation (CONASUR) is the national platform for DRM responsible for distribution of relief material, while Directorate General for Civil Protection (DGPC) is responsible for emergency response in the urban areas and for managing the national fire brigades. The Early Warning System (SAP) is in charge of food security and nutrition monitoring. SAP is part of the National Food Security Commissariat (CNSA). It is responsible for the continuous monitoring of situation regarding food production and availability, determining areas at risk, and identifying vulnerable populations.

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.

Climate vulnerability baseline

Burkina'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 pest 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 these hazards. Burkina'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 weather and climate extremes, as these are likely to become more frequent and severe. With more than 80% of Burkina's population dependent on predominantly rain fed agriculture for their livelihood, the country is extremely vulnerable to the effects of climate change.

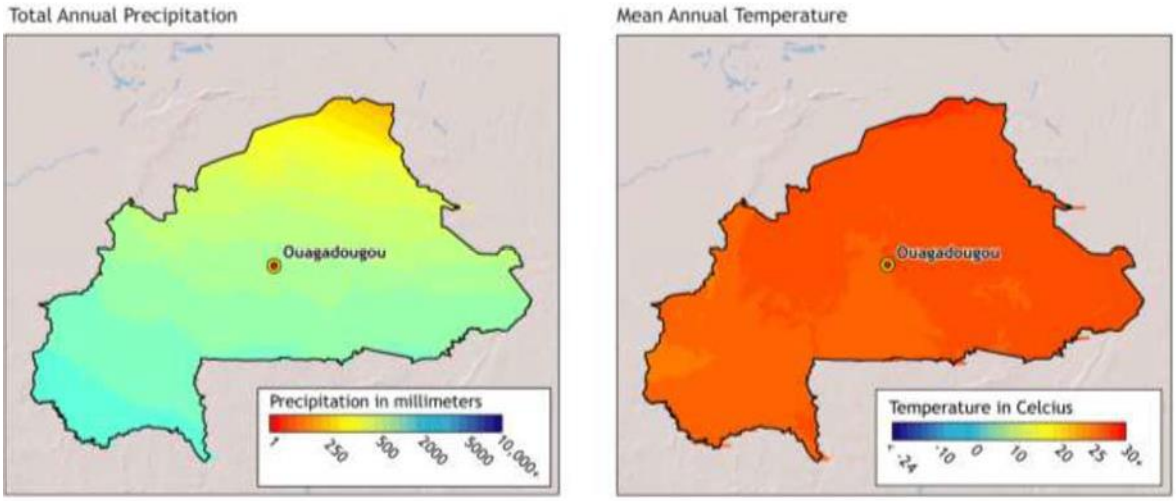

Figure 2: Climate baseline conditions for Burkina Faso[2]

Climate change effects are increasingly felt in Burkina, in the form of higher temperatures, reduced precipitation and a moving desertification front. Weather station observations since 1902 show that the dry zone has been extending southwards over the last century[4] and extremes in temperatures are occurring with monthly high temperature averages now regularly exceeding the previous maximums of 35°C, particularly in the north.

Rainfall

Sahelian rainfall is characterized by high variability on inter-annual and inter-decadal timescales. Rainfall in Burkina 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 this 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). The persistent drought in 1970 has resulted in fairly significant rainfall deficits and a continuous shift of the isohyets to the South.

Figure 2 below illustrates changes in rainfall in Sahelian countries from 1950 to 2005 recorded by the AGRHYMET of the Permanent Interstate Committee for Drought Control in the Sahel in Niamey in Niger.

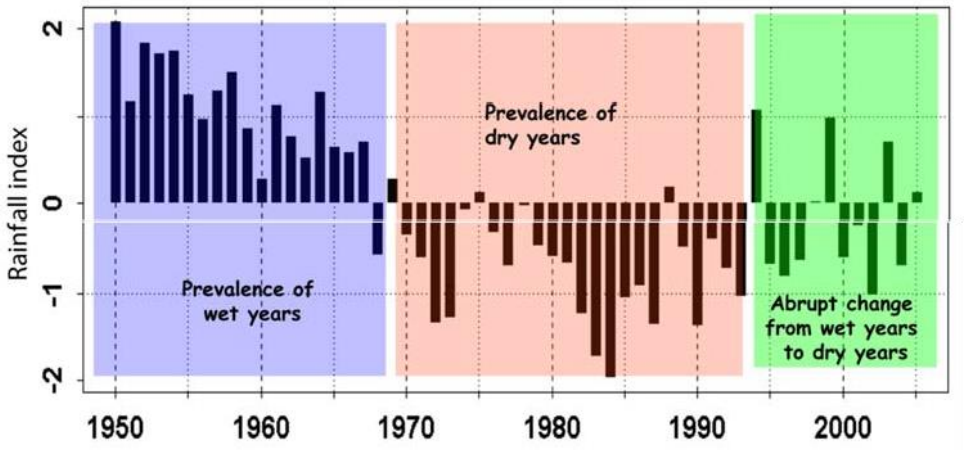

Figure 3: Change in rainfall index in Sahelian countries from 1950 to 2005[3] (Source: AGRHYMET, Niamey (Niger))

There have been three main trends with between 1950 and 1970: prevalence of wet years then between 1970 and 1990: prevalence of dry years and from 1990 onwards: marked shifts between wet and dry years.

DGM records show that rainfall patterns have changed during the 20th century. It was observed a downward trend in total annual rainfall across the entire country; a downward trend in the indicator across the number of rainy days and an

upward trend in the number of consecutive dry days (from 46 to 57 days per decade in the areas of Dédougou, Farakoba and Ouahigouya). Burkina Faso has three climate zones, as illustrated in the Figure below:

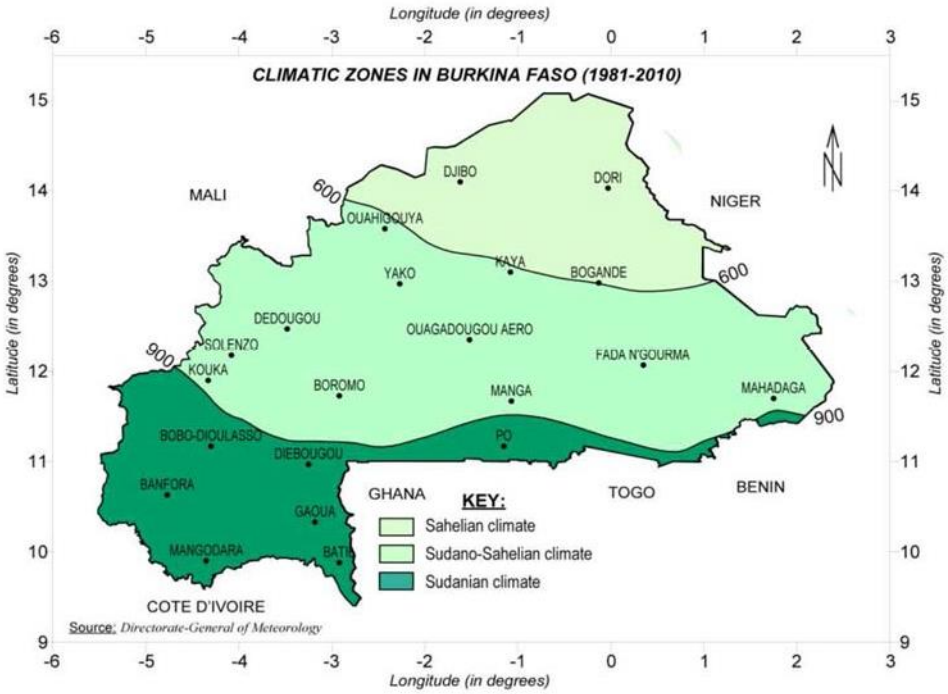

Figure 4: Climate zone map of Burkina Faso

In all three climate zones, there was a downward trend in rainfall at the reference weather stations at Dori (Sahelian zone), Ouagadougou (Sudanian-Sahelian zone) and Bobo-Dioulasso (Sudanian zone) between 1960 and 2011.
Moreover, cumulative rainfall data analysis for thirty-year periods (normal values) indicates that the 600 and 900 mm isohyets migrated about 100 to 150 km from north to south between 1930 and 2010. However, a more detailed analysis for 10-year periods indicates that the isohyets moved back about 50 km between 2001 and 2010 in the southern, central/southern and north-western regions of the country.

Temperature

Long-term data on extreme temperatures indicate an overall upward trend in the number of hot days and hot nights, except in the south-western regions, where there has been a downward trend in the number of hot nights. Detailed analysis indicates that there is generally an upward trend in extreme annual temperatures (minimum annual temperatures and maximum annual temperatures) in both the Sudanian and the Sahelian zones. However, the rise in minimum annual temperatures is more pronounced than the rise in maximum annual temperatures. An increase in maximum temperatures, and probable increase in drought conditions, will affect pastoralist activities by contributing to land degradation and by directly impacting herd mortality rates[4].

[2] WorldClim 1960-1990 averages. Robert J. Hijmans, Susan Cameron, and Juan Parra, at the Museum of Vertebrate Zoology, University of California, Berkeley, in collaboration with Peter Jones and Andrew Jarvis (CIAT), and with Karen Richardson (Rainforest CRC). www.worldclim.org/current
[3] Japan, UNDP, GEF, GWP West Africa, Burkina Faso National Climate Change Adaptation Plan (NAP) May 2015
[4] Ministère de l'Environnement et du Cadre de Vie 2007. Programme d'Action National d'adaptation à la variabilité et aux Changements Climatiques (PANA).

District	Variation in minimum annual temperatures	Variation in maximum annual temperatures
DORI	+0.8°	+0.3°
OUAGA	+0.8°	+0.5°
BOBO	+0.6°	+0.7°

Table 1: Changes in extreme temperatures in °C (1960-2011). Source: Lame, 2012

Extreme events

Projections in future climate change are expected to increase inter-annual variability and the occurrence of extreme weather and climate events.

A climate change projection based on global and regional climate models, which was coordinated by the University of Ouagadougou, identified the following anticipated consequences from climate change: (i) the significant variation in rainfall from one year to the next and the increase in potential evapotranspiration (PET) represent definite risks to the uninterrupted growth cycle of rain-fed crops; (ii) more frequent and more serious flooding, with a destructive impact on infrastructure and makeshift housing, loss of crops and destruction of biodiversity in the lowlands and an increase in waterborne diseases such as cholera and other parasitic diseases; (iii) shortage of pasture land and bodies of drinking water will force pastoralism to move further and further southwards; (iv) faster degradation of ground vegetation and thus a reduction in infiltration for groundwater recharge.[5]

Burkina Faso's vulnerability to droughts and floods is projected to increase as the frequency and intensity of extreme weather events increases[6]. Since the 1970s, Burkina Faso has been gripped by frequent drought. Given the country's dependency on agriculture, droughts and floods can quickly create an emergency situation, and even with continuous foreign aid, food security continues to be an issue. In particular, rain deficiencies in the north have grown dire. Droughts deplete water reserves, reduce or eliminate crop yields, affect the stability of market and financial mechanisms, exacerbate poverty, and decimate livestock. When the wet season finally does come, the torrential rain storms often cause flash flooding and damage to infrastructure. With Burkina Faso's population doubling over the past 25 years and as population continues to increase, additional demand for water resources and added deforestation pressure are expected to be compounded by the increasing climate variability and change.[7]

Droughts

Burkina Faso has experienced 'quasi-drought' conditions since the early 1970s[7]. These conditions are most pronounced between November and December when humidity averages 10%, and in the north where rain only comes during two months out of the year. Many of the country's rivers are intermittent. The country relies on rainfall for almost all of its water needs, including for agriculture; when water supplies dry, populations, especially in the Central Plateau, migrate to the east and west in search of better living conditions. This migration leads to overcrowding and environmental degradation of the receiving areas. Continuous water deficits cause acute water shortages, low yields, food insecurity and under nutrition, desertification, and the decimation of both livestock and wildlife

Floods

Burkina Faso's wet season is characterized by heavy and often relentless rain that can wreak havoc on the country's poorly constructed informal settlements and degraded landscape, disturb the entire water sector, and destroy or reduce infrastructure services. Over the past 30 years, severe flooding has occurred repeatedly especially in the north and center of the country, resulting from successive drought periods. Major events were recorded in 1972/73 and 1983/84, and minor in 1990/91, 1995/96, and 1997/98[8]. In addition to the impact on urban areas and building, flooding leads to extensive impacts on farmlands. In 2007, the National Agricultural Statistics and Forecasting Services reported at least 33,000 hectares of farmland completely inundated by floods between August and September. Two years later in 2009, heavy

[5] LAME, 2013: National Adaptation Programme for Burkina Faso. Climate modelling studies, risk assessment and analysis of vulnerability to climate change. Risk assessment and vulnerability to climate change. Summary report. University of Ouagadougou. BURKINA FASO..

[6] http://sdwebx.worldbank.org/climateportalb/doc/GFDRRCountryProfiles/wb_gfdrr_climate_change_country_profile_for_BFA.pdf

[7] Danida (2008). Appréciation des impacts des changements climatiques sur les programmes de développement de la cooperation Danoise au Burkina Faso.

[8] GFDRR Burnika Faso Country Note 2010 and PNOCSUR 1999.

rainfall once again flooded crops and washed away 22,220 hectares of farmland, breaking 15 dams, and destroying 42,000 homes[9].
The September 2009 floods events caused damages amounting to about FCFA 47billion, i.e. US$105 million, losses amounting to FCFA 15 billion, i.e. US$33 million, and needs for construction, reconstruction and restoration amounting to FCFA119 billions, i.e. US$266 million.

Other hazards

Moreover, Burkina Faso's hot and dry climate is favorable to meningitis outbreaks from October to May and to cholera epidemics. During the dry season, the harmattan winds spread across Burkina Faso, bringing hot, dry air and sand storms across the central Mossi Plateau. When coinciding with locust outbreaks, the harmattan winds can accelerate their spread to communities at a rate up to 200 km per day and cause significant damages to the agriculture sector.[10]

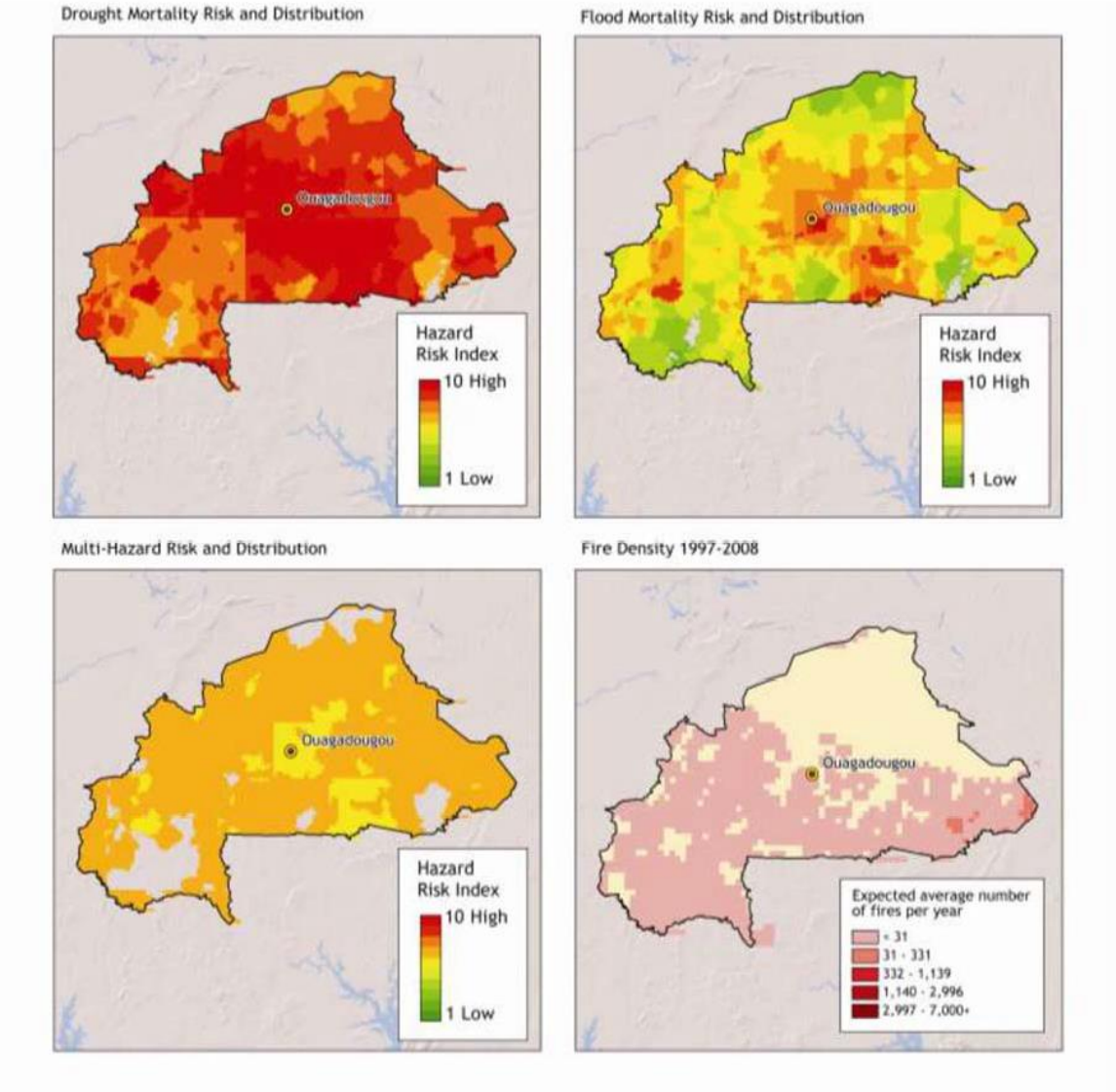

Figure 5: Exposure to climate-related hazards across Burkina Faso[11]

[9] Post-Disaster Needs Assessment (2010). Inondations du 1erSeptembre 2009 au Burkina Faso, Evaluation des dommages, pertes et besoins de construction, de reconstruction et de relèvement.
[10] Locust Crisis deteriorates (http://www.afrol.com/articles/14090).
[11] UNEP's Global Risk Data Platform, Columbia University Center for Hazards and Risk Research (CHRR), and Columbia University Center for
International Earth Science Information Network (CIESIN).

Institutional setting and current capacity - Baseline

Climate change adaptation and disaster risks management is planned and implemented by a number of agencies in the country. This "national platform" brings in a structured institutional scenario. Each agency has different capacity and resources to deliver their mission. Here below are the baseline conditions for each agency that is foreseen as implementing entity of the proposed project. These, are the most relevant entities in the country in relation to weather and climate information and services.

- **Directorate General for Meteorology (DGM)** under the Ministry of Transportation, Urban Mobility and Road Safety. While meteorological observations have been recorded rigorously since 1902, DGM was created as a Directorate-General in 2011, and is in the process of being converted into a publicly funded technical and scientific service with legal status and financial autonomy (following a deliberation of the Council of Ministers dated August 3rd 2016 declaring the National Meteorological Agency ANAM). It 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, DGM meteorological observation network includes: 10 synoptic stations, 2 weather radars in Ouagadougou and Bobo-Dioulasso (the one in Ouagadougou is not working), 60 agro-meteorological stations, 100 rainfall observation stations with GPRS transmission (currently being installed under a GEF-funded UNDP-implemented project). In addition, 2 systems to receive satellite imagery are being delivered to DGM by the MESA project and a previous GFDRR project which closed in 2015 delivered a Synergy forecasting workstation.

  Technical discussions with DGM revealed the overall fragile 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.

  DGM 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, DGM's clients (agriculture, civil protection, water resources, etc.) have expressed great need for improved agro-meteorological services such as extreme weather bulletins based upon cascading forecasting methodology, now-casting for severe rainfall events, regular updates of forecast bulletins to better monitor hazardous events and improved seasonal outlooks. DGM does not have the human, financial and equipment resources to 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 DGM. There is also a significant need to recruit new staff to replace senior technical and administrative staff approaching retirement age, and to increase the salaries to attract and retain competencies. Training and re-training of existing staff is also another priority.

- **The Directorate General of Water Resources (DGRE)** is part of the Ministry of Water and Sanitation. Within DGRE the Directorate for Studies and Information on Water (DEIE) is in charge of all aspects of monitoring water resources, both surface and groundwater, and their uses through the National Information System on Water. It is responsible for the collection, storage and analysis of hydrometric data. Such data is currently based on a network of 100 stations located on rivers, lakes and reservoirs. 47 of these stations are equipped with data loggers. Twenty of these stations have telemetric facilities, which provide real time to near-real-time data to transboundary river basin authorities and DEIE (4 stations from the WMO Volta HYCOS project using satellite transmission through METEOSAT and 16 stations from the SAP-IC project with GPRS transmission). However, the majority of the network is still based on stations where water levels are mostly reported manually on a daily, 10-day or monthly basis, with issues related to precision of instruments and rating curves (the relation between observed water levels and discharges is often outdated or imprecise). 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 is too low to ensure a reliable and consistent monitoring. There is limited hydrological and hydraulic modeling or flood forecasting capability in the country. Also, there is limited operational data exchange with DGM, 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 Ministry of Agriculture. 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, in line with both the Household Economy Approach and the CILSS Harmonized Food Security and Nutrition Household Vulnerability Framework, involves rainfall, crop yield evaluation, livestock, and 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 DGM. 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 although recent actions to include these zones are being developed, (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 for Territorial Administration and Homeland Security, 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 Burkina Faso, 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 sector 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.

- **CONASUR**, the National Council for Emergency Relief and Rehabilitation is the coordination and execution body responsible for disaster prevention, emergency relief management and rehabilitation. It is attached to the Ministry of Social Action and National Solidarity. CONASUR has a Permanent Secretariat, regional (CORESUR), provincial (COPRESUR), district (CODESUR) and village (CODEVI) committees. CONASUR is notably in charge of: (i) the formulation of politics and strategic orientations regarding disaster risk management; (ii) the coordination of humanitarians' activities; and (iii) adoption of plans and strategies for interventions; (iv) implement measures for disaster risk reduction**.** Burkina Faso prepared a National Multi-Risks Contingency Plan as well as a National Prevention and Risk Management Law voted on April 2014. However, CONASUR with a current annual budget of about US$400,000 and limited staff is in need of support in the fields of training, infrastructures and organizational support mainly for: (i) analysis and mapping of events and risks at national level; (ii) implementation of National Action Plan and; (iii) operationalize the information system for early warning.

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 Burkina. While the government is currently supporting several baseline activities, significant barriers remain, 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 Burkina Faso, 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 improved 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 DGM, DGRE, SAP, DGPC and CONASUR 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[12], 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 extreme weather 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 Burkina Faso range from: (i) poor meteorological and hydrological observation networks; (ii) limited technical capacity within agencies to conduct necessary hydrological and hydraulic modeling; (iii) flood forecasting and other climate and weather modeling; (iv) limited range of tailored, demand-based climate information/products/services to enhance 'last-mile' access, including for smallholder farmers; and (v) 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 sector working groups, decision support systems for food security and hydromet services will be developed and/or improved. In regards to food security, Burkina Faso already has an Early Warning System (SAP) that helps Government understand the vulnerabilities and target its response. However, improvements are needed against: (i) restricted early (preparedness) and preventives responses on food security and nutrition, (ii) lack of involvement of end-users (men, women and youth) in the engagement process, and lack of vulgarization of information, (iii) poor communication and learning networks, and (iv) limited synergy between agencies and initiatives on SAP. Moreover, 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.

Synergies with Ongoing Initiatives

The proposed project capitalizes on a number of ongoing projects and initiatives addressing different issues of climate and disaster risks. The proposed project is notably been coordinated with the initiatives and programs of the Africa Hydro-Met program and those supported by the partners of the program, notably initiatives of UNDP, WMO, AfDB, AFD and the

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

World Bank. By building upon these initiatives in the context of the Africa Hydro-Met Program, the proposed project leverages additional funding, maximizes opportunities and synergizes activities. In addition consultations have been held with several donor partners throughout the preparation of the project. Major ongoing initiatives and partnerships within the context of the Africa Hydro-Met Program and partnership with other development partners such as the European Union and USAID, are presented in the table below:

Development Partner	**Ongoing Initiatives**	**Synergies identified**
Activities supported and / or financed by partners of the Africa Hydro-Met Program		
UNDP	a. SAP/IC Early Warning and Climate Information System (*Système d'Alerte Précoce et Information Climatique)*: budget of USD 3.6 million.	a. SAP/IC supports the procurement of monitoring equipment for DGM; the installation of hydrological monitoring equipment and flood studies and reinforcing the disaster risk management capacity of CONASUR. *Synergies within the Africa Hydromet Program: the SAP/IC project provided observation infrastructures, which will be largely complemented and reinforced by the proposed Project. In addition to the infrastructure component, the proposed project will also focus on enhancing the institutional setting and the capacity to deliver services, which will benefit the disaster risk management capacities of CONASUR, DGPC and SAP. Proper coordination with UNDP and other Program's partners financing monitoring infrastructures, will be undertaken for the design of monitoring network for Early Warning Systems*
WMO	a. Global Framework for Climate Services (GFCS); b. Volta HYCOS and Niger HYCOS; c. CREWS	a. WMO has supported the development of the national framework for climate services in Burkina Faso targeted at better understanding the needs and requirements of different sectors and user groups. WMO supports DGM with training scholarships for its staff. b. The HYCOS projects support technical capacity building and the installation of water level monitoring stations across the Volta and Niger River basins. The projects are coordinated through the Niger Basin Authority (NBA) and the Volta Basin Authority (VBA); c. CREWS The Climate Risk and Early Warning Systems is a GFDRR initiative in partnership with France, the World Bank, WMO and UNISDR. The CREWS Initiative will support the improvement of operational capabilities in Burkina Faso to produce and deliver meteorological forecasts, which will be used as an input by the proposed Project in order to develop services for early warning, contributing to risk reduction for relevant national sectors with an emphasis on flood-related risks, agriculture and food security. *Synergies within the Africa Hydromet Program: The World Bank operations in support of the hydromet modernization and climate services are fully aligned with and support the Global Framework for Climate Services, and the development of National Framework for Climate Services within the GFCS model. The GFCS places emphasis on (i) Observation and Monitoring network strengthening; (ii) Modelling and Prediction development; and (iii) Capacity Building, with an equal thrust on user interface and service delivery. The World Bank has operationalized this thematic focus in the proposed project, to achieve the overall objective defined by GFCS and the specific objectives defined in the National Framework for Climate Services in Burkina Faso.* *Trainings, where applicable, will be adapted to the Burkina Faso context from WMO standards and they might be organized in collaboration with WMO. Strong synergies will be realized with WMO additional funding from GCF (to be confirmed) and the CREWS initiatives (around US$2 million). While the proposed project is*

		expected to make a major contribution to infrastructure and services development, providing valuable resources for EWS implementation, CREWS will focus on developing core capacities fundamental to EWS functioning, in areas such as observation network operating procedures, data management, weather and climate forecasting and advanced monitoring tools, as a coordinated effort to raise Africa Hydromet Program support in Burkina Faso.
AFD Agence française de Développement	a. Programme GIRE (closed)	a. The project supported the installation and management of hydrological monitoring data in the Niger and Volta basins.
AfDB African Development Bank	a. ISACIP Institutional Support Project for African Climate Centers (*Projet d'Appui Institutionnel aux Institutions Africaines du Climat*) (closed); b. CLIMDEV Africa	a. The project provided institutional support to DGM between 2011 and 2014. The project was implemented by ACMAD and CLISS / AGRHYMET on the institutional support for climate services; b. The Climate for Development in Africa (CLIMDEV Africa) Program is an initiative of the African Union Commission (AUC), the United Nations Economic Commission for Africa (ECA) and the African Development Bank (AfDB). It is a continent wide initiative in support of national climate services and regional climate centers (ACMAD). *Synergies within the Africa Hydromet Program: WMO and AfDB have substantial expertise in supporting regional climate centers. AfDB in particular is supporting the strengthening of the African Center of Meteorological Application for Development (ACMAD) through system integration and knowledge exchange, and the vertical integration of national, regional and global centers. The proposed project will contribute to the strengthening of the national services and coordinate with WMO and AfDB the regional cooperation with ACMAD, through promoting: (i) trans-boundary cooperation and information exchange, (ii) standard operating procedures and protocols; (iii) development of regional cooperation models for observation of climate and disaster risks, and early warning and response capacity, (iv) joint human resource development.*
Activities supported and / or financed by the World Bank, including trust funds		
IDA International Development Association	a. Adaptive Social Protection Program: US$140 million b. Burkina Faso ECD Nutrition Safety Net IE: US$56 million c. Transport and Urban Infrastructure Development Project: US$100 million d. Decentralize Forest and Woodland Management Project US$16.5 million	a. The project, which is supported through the Sahel Adaptive Social Protection Program, sup-ports the establishment of an adaptive social protection pro-gram for the climate vulnerable households in Burkina Faso, with complementary activities related to early warning and climate information systems; b. The project provides food security and nutrition support interventions, including support to monitoring system; c. Improve mobility and urban infrastructure development, including support crisis response mechanism; d. The objective of the project is to promote national development policies and support the definition and implementation of community-based natural resource management processes in thirty-two, mostly rural, communes, to strengthen sustainable local development practices and contribute to reducing Greenhouse Gas (GHG) emissions from deforestation and woodland degradation.
GEF Global Environmental Facility	a. BRICKS Building Resilience Through Innovation, Communication and Knowledge Services Project	a. The project is a regional knowledge project for the Great Green Wall Initiative, supporting a regional web-portal, information dissemination and ICT applications on desertification, water and climate information. The project is implemented by CILSS, OSS and IUCN;

GFDRR Global Facility for Disaster Reduction and Recovery	*a.* Raincell Africa in collaboration with IRD *Institut de Recherche pour le Développement* b. Strengthening Flood Management in the Volta Basin c. Disaster Risk Management Country Plan (until 2015)	a. Research and development program on the use of cell phone tower signals for the quantification of rainfall; b. Supports the establishing of a flood forecasting and early warning system for the Volta River, notably the Oti River in Togo and Ghana c. Reinforcing the national disaster risk management capacity;
ACP-EU NDRR Program managed by GFDRR	a. Strengthening Disaster Risk Reduction Coordination, Planning and Policy Advisory Capacity of ECOWAS Project: USD 5 million	a. Supporting ECOWAS and its 15 member states in reinforcing regional DRR policies, capacity building and regional flood monitoring
CIWA Collaboration in International Waters in Africa and Global Environmental Facility	Volta River Basin Institutional Development and Strategic Action Program Implementation Project	Institutional strengthening and capacity building to the Volta Basin Authority
Activities financed and / or supported by different development partners		
Millennium Challenge Corporation (MCC)	Hydro-Met support project (closed in 2015)	a. MCC provided 27 automatic water level recorders
UK	a. AMMA2050 Projet d'Analyse Multi-disciplinaire de la Mousson Africaine / Multidisciplinary Analysis of the African Monsoon	a. AMMA2050 is a joint research project to support the comprehension of the future climate variability of the African monsoon. It will provide further knowledge on the development and frequency-cy of extreme climate events;
European Union	a. ECOAGRIS with a budget of EUR 18 million implemented through CILSS b. MESA with a budget of USD 37 million continent wide, building upon earlier initiatives including PUMA and AMESD; c. Food Security and Nutrition Program (*Programme de Sécurité Alimentaire et Nutritionnelle au Burkina Faso*) PSAN) providing EUR 25 million	a. ECOAGRIS supports the regional axis on food security monitoring and early warning and supports CILSS as a regional organization in agro-hydro-meteorology and food security monitoring. b. MESA supports environmental monitoring across Africa; Activities implemented by ACMAD, the African Center for Meteorology and Development, supports knowledge base on climate change and seasonal forecasting in 48 African countries; c. PSAN supports food security early warning and resilience building initiatives targeting some 85,000 households in the different regions of Burkina Faso.
OXFAM, Save the Children	a. Various	a. The projects support food security monitoring and interventions

Table 2: Ongoing initiatives in support of the national hydro-meteorological services and disaster risk reduction

Outcomes and the impact that the project/ programme will aim to achieve in improving the baseline scenario

Strengthening the national hydro-metrological services at scale will have a transformative impact on managing climate and weather risks in the immediate future, facilitate growth in key climate sensitive sectors (for example: agriculture, transport, energy) and enable a better understanding of long term climate change impacts. Getting the weather and climate services right will be an important paradigm shift to help Burkina Faso adapt to climate change. The theory of change explains the causal chains from inputs and outputs to outcomes and fund level impacts.

The underlying theory of change 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 or 'theory of change' are as follows:

a) Output Level: The improvement and modernization of its hydromet systems and services, using technological breakthroughs in the industry over the years, will enable Burkina Faso 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 in chronically food insecure communities in the rural zones of the Central Plateau of Burkina Faso (ZOME 5), north and east (ZOME 7), north (ZOME 8); urban and peri-urban zones of Ouagadougou (ZOME 6) and Bobo-Dioulasso (within ZOME 2);
- Enhanced agrometeorological and climate services, with a particular focus in selected climate sensitive agriculture production areas of Beragadougou, Nangollogo and the Kou valley;
- New severe precipitation and urban flood early warning services in selected areas amongst climate vulnerable municipalities of Banfora, Bama, Tougouri, Manni, Markoye, Sebba, Solenzo, Ouagadougou and Bobo-Dioulasso, and municipalities along the main rivers Mouhoun and Nakambe (Black Volta; White Volta)
- Enhanced civil protection response capacities to extreme weather and climate related events;
- Enhanced capacity to adapt infrastructure planning to weather extremes and climate change risks.

b) Intermediate Outcome Level: Taking advantage of these improvements, DGM, DGRE, SAP, DGPC and CONASUR 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;

c) 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 Burkina Faso 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.

d) Impact Level: Strengthened and modernized hydro-meteorological services in Burkina Faso will increase the resilience and enhance the livelihoods of groups, communities and regions vulnerable to climate risks, increase their well-being, 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.

C.3. Project / Programme Description

Describe the main activities and the planned measures of the project/programme according to each of its components. Provide information on how the activities are linked to objectives, outputs and outcomes that the project/programme intends to achieve. The objectives, outputs and outcomes should be consistent with the information reported in the logic framework in section H.

Project Contribution to Climate Adaptation

An increasing need has been recognized for weather and climate information and translating the existing information into customized tools, products, forecasts and meaningful information for climate vulnerable communities. In fact, hydro-meteorological services have the potential to become an incubator for the transition to climate resilient and low carbon society. Hydro-meteorological services are a key public good and contribute to improved governance by providing

information to facilitate evidence-based and accountable decision-making. These services provide decision makers with the necessary information to increase their climate adaptation capacity, and boost resilience across climate sensitive sectors such as agriculture, hydropower, transport and DRM.

Specifically, Burkina Faso 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 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

The project design is based on two main principles: (i) Investments need to be at scale to support and sustain national hydro-meteorological services, preparedness and response; and (ii) Support needs to be targeted and provide end-to-end improved hydro-meteorological services as well as disaster response along the entire “information value chain” from weather and climate information, to understand the hydrological and hydraulic system to increased disaster preparedness and response capacity. The project will furthermore target its finance towards the addionality costs of improved weather and climate services arising from the increased need of climate services in the context of climate change adaptation.

Lessons learnt from projects and programs targeted at strengthening weather and climate services indicate that support has in the past often been scattered, e.g. by procuring a number of automatic weather stations or building capacity within a specific domain of a project and thus not reaching a scale that enabled national hydro-meteorological services to sustain service these improvements and receive the required recognition from government and beneficiaries. While in the past many projects have been infrastructure focused, those investments can only be sustained where the institutional capacity is reinforced and service delivery has successfully improved. The Africa Hydro-Met Program therefore targets in its project design (i) institutional strengthening and capacity building, (ii) infrastructure and network improvements at scale and (iii) supporting sustainable weather and climate service improvements.

The project will focus on five main “weather and climate information value chains” which are particularly relevant for adapting Burkina Faso’s economy and livelihoods to increased climate risks, which were identified in a workshop with key beneficiaries on September 8th 2016 in Ouagadougou:

- **Early warning for surface runoff related floods** in urban and peri-urban zones highly populated and subjected to recurrent phenomena such as: Ouagadougou the capital with more than 2 million inhabitants and Bobo-Dioulasso (about 500,000), Banfora, Bama, Tougouri, Manni, Markoye, Sebba, Solenzo.. In Ouagadougou and Bobo-Dioulasso it will allow a synergy with ongoing projects for rainfall measurement base upon analysis of attenuation of cellular phone network signal allowing the project to concentrate more specifically on runoff conditions;

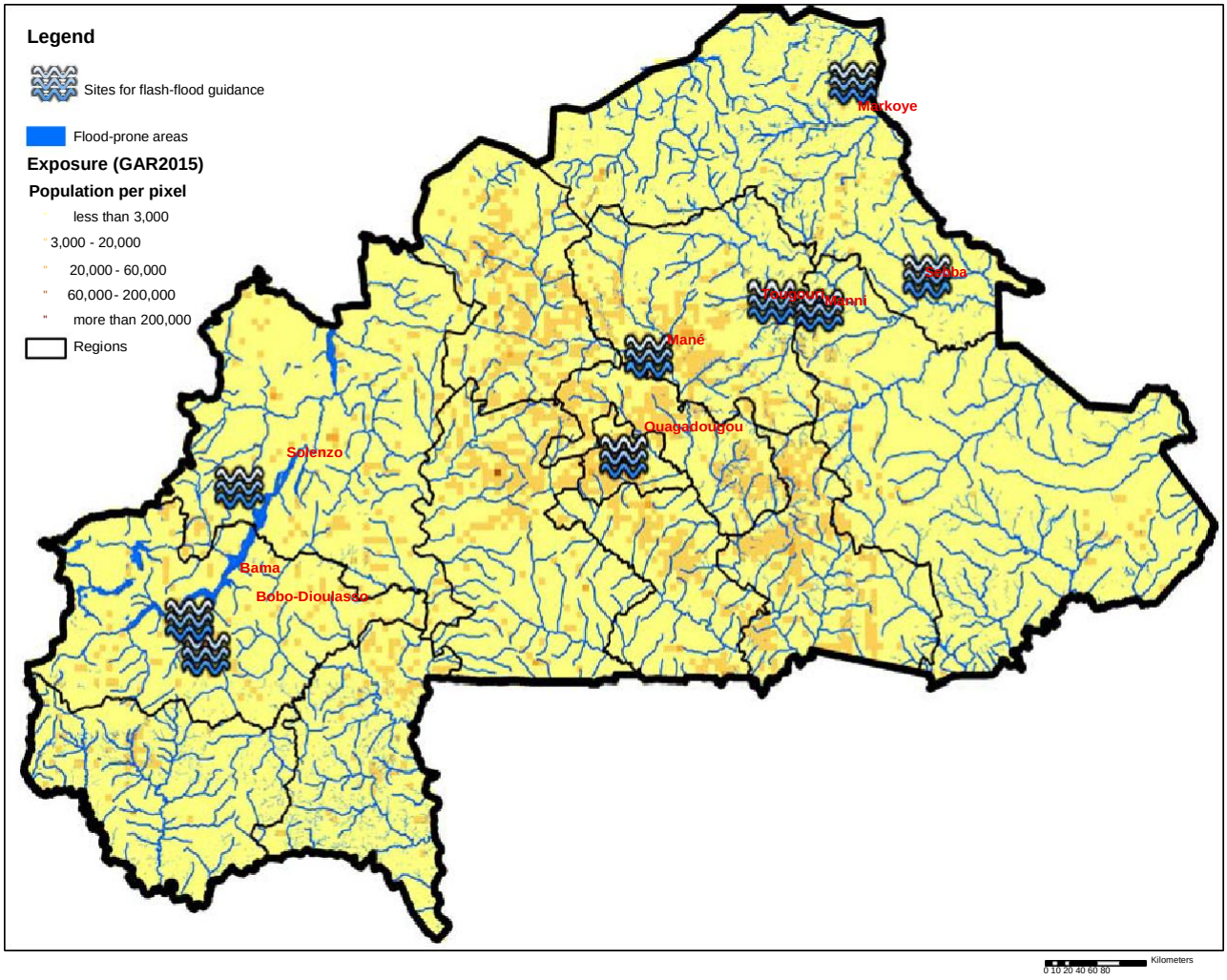

Figure 6: Flash flood priority zones in Burkina Faso

- **Monitoring the food security and nutrition situation** in the rural zones of the Central Plateau of Burkina Faso (ZOME 5), north and east (ZOME 7), north (ZOME 8); urban and peri-urban zones of Ouagadougou (ZOME 6) and Bobo-Dioulasso (within ZOME 2);

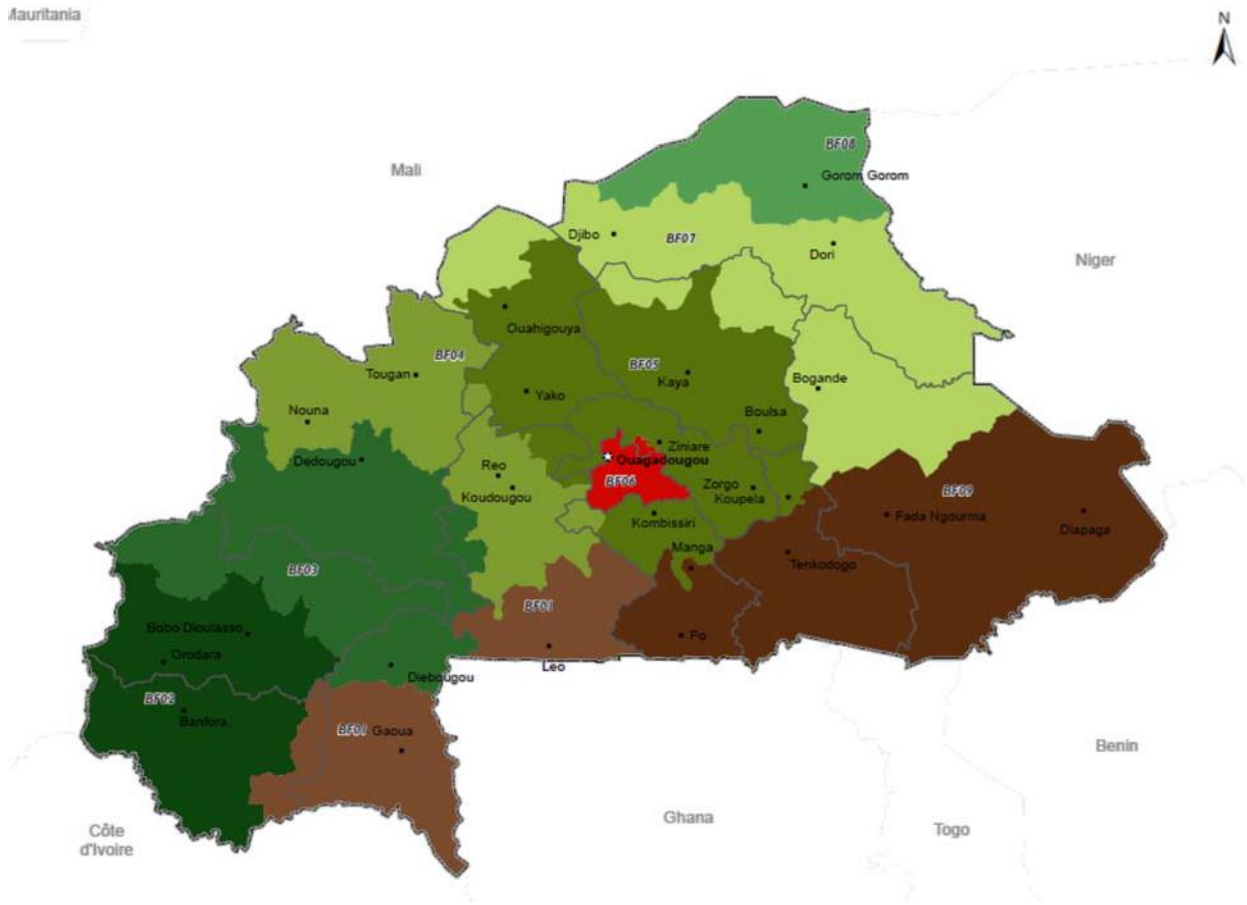

Figure 7: livelihoods zones in Burkina (USAID).

- **Delivery of tailored agro-meteorological services** for highly productive agricultural zones where the relative variability of rainfall is high and where agro-meteorological stations already exist and producers organized to take advantage of the dissemination of agro-climatological services such as: Bérégadougou for sugar cane, Niangologo for staple crops like millet, maize and sorghum, Kou valley for rice cultivation, etc.;

- **Monitoring rivers and reservoirs** in zones subjected to specific risks related to floods and severe low-water levels. Burkina has a very important numbers of reservoirs and although DEIE is trying to follow the water levels in the larger on a monthly basis there is a need to improve follow-up possibilities for more precise management of water resources.

- **Development of knowledge** for better adaptation to climate change for structures sizing and risk management since there is an underlying trend for increased runoff coefficient in Sahel (Sahel Hydrological Paradox) due to soil crusting in relation with notably anthropogenic activities and modifications of rainfall conditions impacting vegetation cover. This leads to reconsider: return periods for extreme events, intensity/duration/frequency (IDF) curves, runoff coefficient in the watersheds, and updating of rating curves for priority hydrological stations**.**

Project Development Objective

The Project Development Objective is to strengthen the adaptive capacity and climate resilience of the vulnerable communities and economy of Burkina Faso. 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.

Expected results and project outcomes

The improvement and modernization of its hydromet systems and services, using technological breakthroughs in the industry over the years, will enable Burkina Faso 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 in chronically food insecure communities in the rural zones of the Central Plateau of Burkina Faso (ZOME 5), north and east (ZOME 7), north (ZOME 8); urban and peri-urban zones of Ouagadougou (ZOME 6) and Bobo-Dioulasso (within ZOME 2);
- Enhanced agrometeorological and climate services, with a particular focus in selected climate sensitive agriculture production areas of Beragadougou, Nangollogo and the Kou valley;
- New flood early warning services in selected areas amongst climate vulnerable communities of Banfora, Bama, Tougouri, Manni, Markoye, Sebba, Solenzo, Ouagadougou and Bobo-Dioulasso, and communities along the main rivers Mouhoun and Nakambe (Black Volta; White Volta)
- Enhanced civil protection response capacities to extreme weather and climate related events;
- Enhanced capacity to adapt infrastructure planning to weather extremes and climate change risks.

Taking advantage of these improvements, DGM, DGRE, SAP, DGPC and CONASUR 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;

Expected Outcomes: 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 Burkina Faso 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.

Expected Results: Strengthened and modernized hydro-meteorological services in Burkina Faso will increase the resilience and enhance the livelihoods of groups, communities and regions vulnerable to climate risks, increase their well-being, 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.

Component Description

The proposed project consists of three main components: (1) Capacity building and institutional development, (2) Improvement of hydromet and early warning infrastructure, and (3) Enhancement of service delivery and warnings to communities. In addition, a fourth component will bundle all project management and implementation support activities. 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. Component 1 (capacity building and institutional development) will contribute to allow the five institutions described in C2 to fulfil their role and reinforce their current institutional capacity at national level. Component 2 (Iimprovement of hydromet and early warning infrastructure) and component 3 (enhancement of service delivery and warnings to communities) will more specifically address specific climate change and disaster risk issues in priority geographical areas. More specifically the project consists of the following components and sub-components:

Component 1 - Capacity building and institutional development – US$5.22 million
(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, severe weather forecasting (including the use of WMO Severe Weather Forecasting model and global and regional specialized centers), 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 and CONASUR, forecasting models for DGM and DGRE, 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 Burkina Faso and with advanced level of expertise to share.

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, notably within the context of the Africa Hydro-Met Program. 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. In this context the project will support among others DGM to pursue the foreseen institutional shift to become a separate, reinforced agency with a stronger mandate and capacity to generate additional income to sustain its operation;

(iii) *Providing support for system integration of project activities*: This activity includes developing detailed project design, including initial and detailed concepts of operations (CONOPS), 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 – US$8.45 million

(i) *Modernization and upgrading of hydromet observation networks*: This activity will support the modernization 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 modeling 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 strengthening of SAP operations, and the provision of specialized vehicles and search and rescue equipment.

Component 3 - Enhancement of service delivery and warnings to communities – US$7.33 million

(i) *Supporting the implementation of the 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, CONASUR, SAP, DGRE and DGM, this activity will support the support the implementation of the National Framework for Climate Services with sector working groups, including local farmers organizations for the vulgarization, transmission and taking actions on climate information and warnings.

(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 modeling 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 (i.e. women, and poor and socially marginalized groups) 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).

Component 4 - Project management – US$1.5 million
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.

Proposed Activities, goods and services

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 result into excessive operation costs. 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.

Equipment anticipated to be procured include:

- Surface meteorological and lighting detection network (AWSs, agro-meteorological 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, 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. DGM and DGRE 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 sector specific users as well as end-users down to the community. The seamless operation and cooperation among key agencies involved (DGM, DGRE, DGPC, SAP and CONASUR) 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.

Beneficiaries and Users

Burkina Faso's national economy is based on agriculture, the exploitation of natural resources and stockbreeding. Together, these three sectors are the livelihood for 92 per cent of the population. Plots cultivated by women are more vulnerable to climate change. The land where they grow their crops, either as part of a group or individually, is usually of poorer quality. Because they do not own these plots, women do not invest in them.
Droughts, floods and a lack of rainfall all damage harvests, meaning families do not have enough to feed themselves throughout the year. Moreover, during the period between harvests, women are responsible for providing food for the family, which means they have to redouble their efforts to seek alternative activities that will bring in income with which to buy the food they need. They spend more time fetching water or wood, which are increasingly scarce as a result of desertification and overexploitation. The increased workload leaves women with very little time to dedicate to income generating activities or take part in community life.
Burkina Faso is subject to vulnerability caused by disaster and risks from flood or droughts, deteriorating natural resources, food insecurity and malnutrition, in addition to the pastoralist lifestyle, which involves increasing competition for water and pasture that sometimes lead to conflict. Food security in Burkina Faso is precarious: insecurity affects over 20 percent of the population (more than 3.5 million people). Periodic droughts lead to food crises, and government uses food reserves to transfer food from surplus to deficit regions. The situation can be exacerbated by the influx of refugees as a result of crises in neighboring countries, such as Mali. According to the Human Development Report 2015, some 85 percent of the population in Burkina Faso is employed in agriculture and only 12 percent in services. The percentage of vulnerable employment is 89.6 percent, and child labor (% ages 5-14 years old) is 39.2.
The dimensions of access to credit, housing, assets, and basic utilities also deeply affect gender equality: according to the Global Findex Index 2014, only 14 percent of the population owns a bank account, as most of the population is unbanked – 3 percent of which via mobile banking. Only 5 percent has formal savings and 9 percent has access to formal credit (see detailed table). Women represent 60 percent of those employed in the informal sector. Their lack of education, vocational training, and access to credit makes it particularly difficult for them to move from the informal to the formal sector. Education represents the second most significant dimension of the gender gap: the difference in literacy rates between men (33 percent) and women (20.2 percent) is more than 10 percentage points.

The country needs to strengthen the population's resilience to natural hazards through investment in Early Warning Systems (EWS), housing, and financial services for the poor. Timely communication on natural disasters can save lives and spur economic growth: for example in Burkina Faso mobile phone penetration is very high with 71.7 percent of the population owning a mobile phone.

Security and Vandalism

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. The community closely protects these facilities, 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 Burkina Faso, the equipment will be covered under self-underwriting option by the

government. The project will also work with the Government of Burkina Faso to ensure that equipment procured under the project is insured over its lifetime.

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 context in Burkina Faso prescribes that multisectoral projects are to be implemented under the technical oversight of the ministry that benefits from part of investments and that implementation responsibility should be attributed to an already existing and effective project implementation unit (if such a unit exists). Based on these instructions, the SP/PST (Permanent Secretariat of the Transport Sector Project - Secrétariat Permanent du Programme Sectoriel de Transport) is charged with project implementation. The SP/PST is hosted by the Ministry of Transport, Urban Mobility and Road Safety (MTUMRS), as the largest financing of the project goes to DGM which is part of the same Ministry. The existing SP/PST is appointed as the Project Implementation Unit (PIU).

It is an existing and well-performing entity and has knowledge of Bank procedures from having implemented, since 2003, a number of projects financed by the Bank and the European Union. In addition, the relevant departments in the other agencies will serve as Implementation Partners.

The SP/PST has qualified staff, as well as adequate funds, facilities, and other resources to be responsible for Project implementation and coordination including, inter alia, procurement, financial management, safeguards management, reporting, and monitoring and evaluation. Additional staff will be required for the management of this project. The SP/PST will ensure that any additional staff financed out of the proceeds of the financing are selected and recruited in accordance with the provisions of the Grant Agreement. The fiduciary, safeguards, and M&E functions will be housed in the SP/PST, because it has a proven track record in managing Bank-funded projects and substantial technical expertise in the transport sector (which include DGM activities).The project will be executed through a Grant Agreement between the World Bank and the Government of Burkina Faso, which will detail all project management arrangements, including hiring of consultants, to be complied with by the SP/PST, and through it, by the Implementing Partners.

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 Burkina Faso.

Provide pricing structures, price controls, subsidies available and government involvement (if any).
Not applicable

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 Burkina Faso 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 September 2016 has an explicit understanding with the government that this will be issued by the institution in charge of environmental and social safeguards (Bureau National des Evaluations Environnementales BUNEE) 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 17) and with reference to the World Bank Guidelines on Preventing and Combating Fraud and Corruption (January 2011, Annex 20), the World Bank Disbursement Guidelines (May 2006, Annex 21), the World Bank Guidelines on Selection and Employment of Consultants (January 2011, Annex 22), the World Bank Guidelines on Procurement of Goods, Works and Non-Consulting Services (January 2011, Annex 23), 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 Burkina Faso will waive applicable taxes and provide foreign exchange concessions to such publicly funded Project investments.

Provide details on insurance policies related to project/programme.

The project will work with the Government of Burkina Faso to ensure that equipment procured under the project is insured over its lifetime.

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.

Describe construction and supervision methodology with key contractual agreements.

Describe operational arrangements with key contractual agreements following the completion of construction. If applicable, provide the credit analysis of key counterparties of key contractual agreements and/or structural mitigants to cover the counterparty risks.

The project will be implemented directly by the Government of Burkina Faso through five Implementing Entities, DGM, DGPC, DGRE, CONASUR and SAP and be supported by a the SP/PST as Project Implementation Unit (PIU) hosted by the Ministry of Transport, Urban Mobility and Road Safety (MTUMRS) and overseen by a minister level Project Steering

Committee (PSC). The project will be managed by civil servants and with the support from external consultants, including for technical experts, procurement and safeguard specialists. 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 detailed project management is described and depicted below.

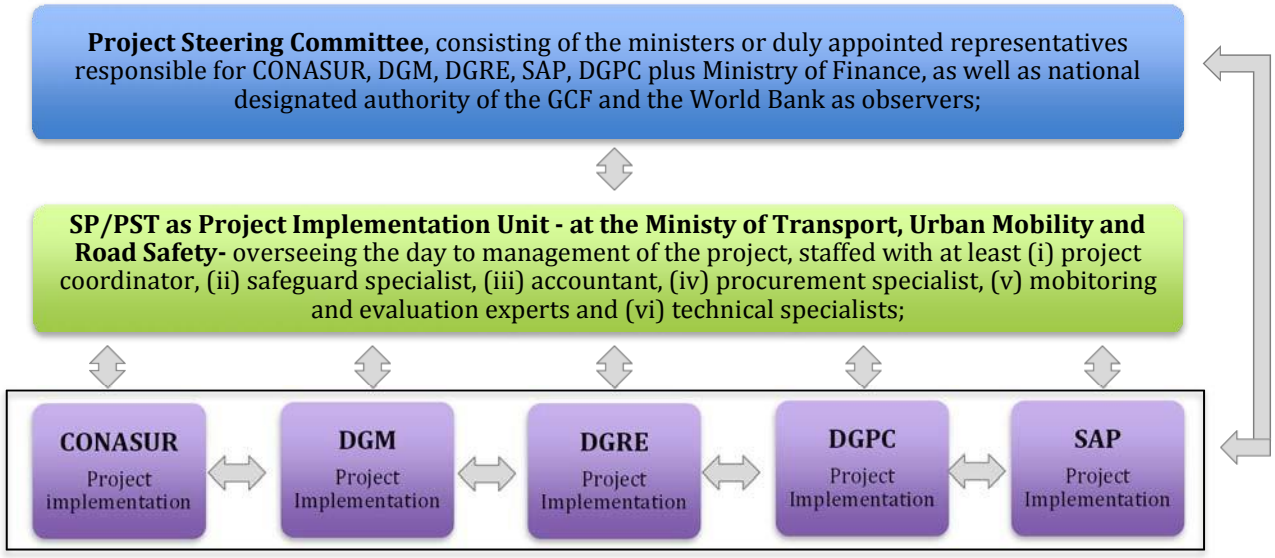

Figure 8: Project coordination and implementation structure

A Project Steering Committee (PSC) will be established, with representation from all five entities (DGPC, SAP, DGRE, DGM and CONASUR) at ministers' level or duly authorized and delegated representatives, plus representatives from the Ministry of Finance, the national designated authority for the GCF and the World Bank. The PSC will meet on a regular basis, but at least once a year 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 project will be coordinated on a day-to-day basis by the SP/PST as Project Implementation Unit under the Ministry of Transport, Urban Mobility and Road Safety (MTUMRS), since the MTUMRS has a proven track record of successfully implementing World Bank financed projects and is the responsible ministry for the largest implementing entities in terms of budget allocated (i.e. DGM). The core project team will include: (i) a project coordinator (civil servant: Director-General of one of the five implementing entities, to be confirmed) 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, CONASUR, DGRE and DGM, 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.

The technical implementation of the project will be led by the five Implementing Entities (DGM, DGPC, DGRE, CONASUR and SAP) in their respective domain. These entities will provide technical leadership with regard to formulation of activities, specification of equipment, implementation and monitoring; Based on the technical advice and leadership of the implementing entities the PIU will provide centrally coordinated support notably with regard to the procurement of goods and overall monitoring support. In addition, CONASUR will support the coordination throughout the design and implementation of the project to ensure that the needs of both the central government, the communities and civil society users are taken into account. CONASUR 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.

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 Burkina Faso use country systems coupled with a dedicated software for financial management, and follow Bank procedures for procurement, audits and safeguards, and monitoring and evaluation.

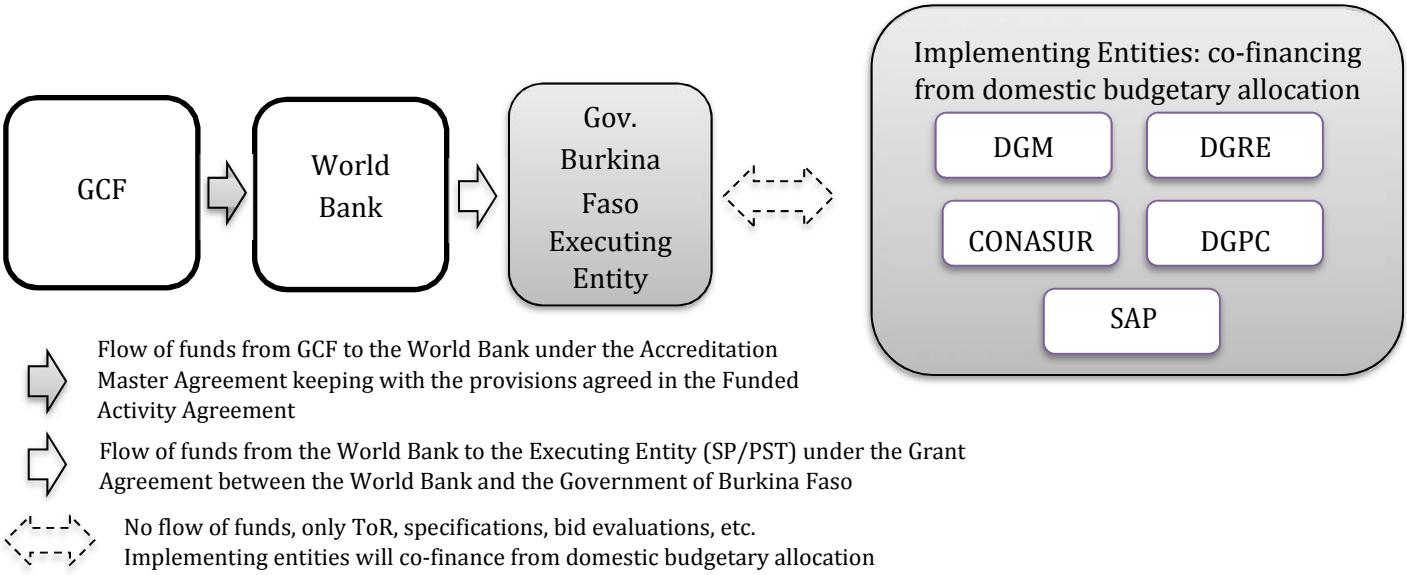

Figure 9: flow of funds from GCF to the Accredited Entity and Executing Entity, and co-financing from Implementing Entities

Project Monitoring, Reporting and Evaluation

The PIU 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

The PIU 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 annually 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

All implementing entities on behalf of the Government of Burkina Faso 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 maintain 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 Burkina Faso 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 five 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 operation and maintenance was used (15% of project costs) in order to ensure long-term sustainability and viability of the modernization. While there is a potential in sustaining financing of DGM, notably under the new structure of the ANAM, to commercialize and sell some of its services to users to recover costs, this will not be reaching a sustainable scale of financing during the period of project implementation. In the context of the preparation of the project, operation and maintenance is fully covered from public financing from the benefitting / implementing entities' ministries.

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 Burkina Faso for the implementation of the project. This Grant Agreement will include as annexes the World Bank Standard Conditions for Grants (July 2010, Annex 17), the World Bank Guidelines on Preventing and Combating Fraud and Corruption (January 2011, Annex 20), the World Bank Disbursement Guidelines (May 2006, Annex 21), the World Bank Guidelines on Selection and Employment of Consultants (January 2011, Annex 22), the World Bank Guidelines on Procurement of Goods, Works and Non-Consulting Services (January 2011, Annex 23), and the Anti Money Laundering and Combating Financing of Terrorism guidelines.

The Government of Burkina Faso will also enter into one subsidiary agreement, satisfactory to the standards of the World Bank, with DGM, which is transitioning to become a separate legal personality under the Ministry of Transport, Urban Mobility and Road Safety (MTUMRS) which will be named ANAM and supported by the national subsidiary budget. As the other departments (DGRE, CONASUR, DGPC, SAP) are governmental departments, no separate implementing agreement 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.

Tasks	2019				2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Component 1: Capacity building and institutional development																				
(i) Training and capacity building programs for agencies' staff and management																				
(ii) Enhancing institutional and regulatory frameworks																				
(iii) Providing support for system integration of project activities																				
Component 2: Improvement of hydromet and early warning infrastructure																				
(i) Modernizing and upgrading hydromet observation networks																				
(ii)Enhancing data collection & transmission, forecasting and decision support systems																				
(iii) Strengthening preparedness & emergency response operations																				
Component 3: Enhancement of service delivery and warnings to communities																				
(i) Supporting the implementation of the national framework for climate services																				
(ii) Improving flood and drought forecasting and warnings																				
(iii) Developing new products for sector specific needs																				
(iv) Strengthening "last mile" connectivity to ensure appropriate understanding and use of information																				
(v) Mobilization and sensitization of communities at risk																				
Component D: Project Management																				
(i) Project Management																				
Mid-term evaluation											x									
Final evaluation																				x

*expected start 01/01/2019

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 Burkina Faso 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.
Burkina Faso 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 Burkina Faso 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 Burkina Faso for hydromet strengthening. Investment needs for system-wide modernization of hydromet services in Burkina Faso are significant. As a least developed country, the financial needs in Burkina Faso 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 Burkina Faso'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 Burkina Faso.

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 transition to the post-project period, interventions will emphasize four 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.
- The project will also work with the Government of Burkina Faso to ensure that equipment procured under the project is insured over its lifetime.

(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 sectorial 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, on the longer term, 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 that some agencies will start exploring the opportunity 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. Operation and maintenance, 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 Burkina Faso.

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 15-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.

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

Not applicable – however the 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.

- Expected total number of direct and indirect beneficiaries, disaggregated by gender (reduced vulnerability or increased resilience)
  Total
  7 million beneficiaries out of which: 3.5 million direct (male and female), 3.5 million indirect (male and female),
- Number of beneficiaries relative to total population, disaggregated by gender (adaptation only):
  Percentage (%)
  DIRECT: 20% of total population, 50% of vulnerable population
  INDIRECT: 20% of total population, 50% of vulnerable population
  GENDER: 50% male, 50% female

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's 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 Burkina Faso project represents one of the first investments of this program, 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 and IT network infrastructure, the institutional setting, as well as product and service delivery at the same time.

The Burkina Faso 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 proposed project will support Burkina Faso in strengthening the institutional set up of the NMHSs and incorporating the services provided to DRM, agriculture and food security. Supporting Burkina Faso 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 Burkina Faso 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 Burkina Faso, which has significant climate-related risks – drought and floods respectively. After the successful implementation of the proposed project in Burkina Faso, the project's approach will be replicated in other countries and extended to other types of climate-related risks, e.g. storm surge. The scaling-up and replication will be enhanced by being part of the Africa Hydromet Framework Program. Moreover, the scaling-up of the project will be eased 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

The scaling up will also be facilitated and supported by key partnerships, e.g. WMO and GFCS. WMO and regional centers are already working alongside the World Bank in supporting the strengthening of NMHSs across the region. 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 strong 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 provide complementary efforts in archiving the Africa Regional Hydromet Program wider objectives of reducing risk and adapting to climate change.

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 infrastrcutures, 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 Burkina Faso project represents one of the first investments, 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. 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. 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 proposed project will strengthen the national regulatory and legal framework in an effort to improve climate responsive planning and development. The project is also aligned with the National Adaption Plan (NAP) and the Intended Nationally Determined Contributions (INDC) of Burkina Faso to the UN climate convention. The proposed project will facilitate the implementation of these key strategic documents, by directly implementing some of the actions brought forward and providing the enabling environment for many of the adaptation interventions e.g. related to water resources, forestry and agriculture. In this way, the project will play a key role in facilitating adaptation financing.

Furthermore, the proposed project supports the implementation and operationalization of several key national policies, including the Proposed National Program for Social and Economic Development (Programme National de Développement Economique et Social, PNDES), which has been adopted in 2016 and spells out the key development axes and priorities for the country, the Sustainable Development Strategy (Stratégie de Développement Durable), the National Civil Protection Policy (Politique Nationale de protection Civile), and the National Water Resources Strategy (Politique et Strategy en Matiere d'Eau). It notably contributes to the implementation of law no 012-2014/AN from April 22 2014, which covers the prevention and management of risks, humanitarian crisis and disasters. It is expected that the proposed project will support the monitoring, early warning and response capacity of Burkina Faso and contribute to the successful implementation of the new legal framework.

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 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 agenda, the project will also strengthen synergies across these domains for long-term sustainability of project activities.

The proposed project will enhance the institutional set-up of key agencies involved in the delivery weather, climate and early warning information. Notably DGM is currently in a transition to become a dedicated agency, the National Meteorological Agency (*Agency Nationale de la Meteorologie, ANAM*) with the mandate to generate for example own revenues from the provision of weather and climate services and sustaining highly qualified staff with more competitive salaries. This will in itself be a programmatic shift towards a more sustainable operation of the national weather and climate services. The proposed project will support DGM in the institutional shift towards ANAM. Furthermore, through the National Framework for Climate Services, which has been developed for Burkina Faso in 2016, the provision of meteorological and climatological information and services to key sectors has been defined. The proposed project will support the implementation of this framework.

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 Burkina Faso, both from reduced losses from flooding and droughts 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$3.6 million annually, after 5 years from project starting. This was based on the assumption that early warning systems provided by the DGM and DGRE 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 2.5%, which is a "conservative" estimation of the potential benefits. Considering the stochastic nature of disasters, common practice for cost-benefit analysis of disaster risk management project is to determine the reduction in average annual losses from natural hazards. This represents the averaging of potential losses over time to quantify the expected economic burden per year. Average Annual Loss (AAL) is calculated as the area under the loss frequency curve, which is a common metric indicating the Exceedance Probability of the full potential range of losses per year. The Aqueduct Global Flood Analyzer (WRI)[13] provides EP curves for urban damages and affected GDP in Burkina Faso. Improved extreme weather forecast capacity and alert through Early Warning Systems (EWS) can consistently reduce flood impacts. Global experience indicates a conservative overall range of 5-8% potential reduction of impacts. For example, a reduction of 8.5% was estimated in Russia [14] and 10% for flooding in southeastern Europe[15], while Subbiah et al (2009)[16] reported an overall potential reduction due to early warning of 3.6% of total damages. In line with the conservative approach set out for this analysis, the lower end of the range of global experience is considered (5%). It is assumed that the proposed project's contribution to the reduction of impacts is 50%, i.e. 2.5% of the total benefits. The benefits of the project are considered both in terms of avoided annual average flood urban damages and GDP losses. To avoid double counting and overlapping, the total loss considers 100% of the urban damage plus 60% of GDP loss. Under the assumptions considered in this analysis, the proposed project's cumulative benefits in terms of avoided flood economic impacts amount to 62.8 million US$ over 15 years and 6 million US$ over project time (5 years) (undiscounted values).

b) **Increased agricultural productivity**, were calculated to total US$22.7 million annually after 5 years from project starting. 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 Burkina Faso 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 Burkina Faso 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$3.36 billion in 2014, was used for this calculation. Under the assumptions considered in this analysis, the proposed project's cumulative benefits in terms of agriculture productivity improvement amount to 320 million US$ over 15 years and 39.9 million US$ over project time (5 years) (undiscounted values).

c) The **increase in efficiency of humanitarian food relief interventions**, due to enhanced preparedness and accuracy of targeting, was calculated to amount to US$0.5 million per year after 5 years from project starting.

[13] World Resource Institute, The Aqueduct Global Flood Analyze (http://floods.wri.org/).

[14] World Bank (2005). Russian Federation Hydromet Modernization Project. Project Appraisal Document, Report No. 3 1465-RU, Washington, D.C.

[15] World Bank, UNISDR, WMO & FMI (2008). Strengthening the Hydrometeorological Services in South Eastern Europe. South Eastern Europe Disaster Risk Mitigation and Adaptation Programme.

[16] Subbiah, A.R., Bildan, L., Narasimhan, R. (2009). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank-UN Project on the Economics of Disaster Risk Reduction, GFDRR, Washington.

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 2012 at US$177 million, both in terms of government reserves and international donor support. Consistent figures for such food security aid needs cannot be traced back over the years to estimate an average, but previous years have also seen consistent humanitarian and food aid being provided to Burkina Faso. According to AidData.org the humanitarian and food aid that went to Burkina Faso in 2016 was US$97 million between. In line with our 'conservative' approach we use this latest figure to estimate the potential benefits of the proposed project. Food aid is provided to Burkina Faso even in years without major droughts, which is why an increase of efficiency leading to a 0.5% benefit was chosen.

d) Benefits transfer analysis of **value for households** shows that the annual benefits of moderately improved forecasts and warning are approximately US$0.16 million at project completion. In Burkina Faso, households receive very limited weather and climate information. State preferences methods can provide an estimation of the economic value of improved services for households. Lazo (2015) carried out a state preference survey on Mozambique households' willingness-to-pay (WTP). In his survey, Lazo employed both a stated choice method with discrete choices and a contingent valuation method (Lazo, 2015). The discrete choice experiments identified the value of the actual service provided in Mozambique as US$8.33 per household, while the households' willingness to pay for significantly improved forecasts was estimated at US$0.09 per household. The contingent valuation experiment (based on single improvements compared to discrete choices) highlighted a WTP of US$1.16 per household for improved forecast. To estimate the economic value to households, Lazo's study was transferred to the Burkina Faso context, assuming a 50% contribution of the proposed project to the overall benefit. The outcomes show that the cumulative benefits of the proposed project reach approximately US$2.1 million using the stated choices method and US$27 million using the contingent valuation method after 15 years from project start. The lower figure is used in the analysis.

Other economic co-benefits were identified, but could not be quantified due to their more indirect causality and/or lack of data:

- With hydropower producing about one-quarter 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 operations, 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 5 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 investment infrastructures (Component B). O&M costs thus increase linearly over the first 5 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 exponentially starting from year 1, reaching a constant maximum at project completion.

According to World Bank guidelines, 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$202 million, with a discount rate of 5%. This represents a benefit-cost ratio of 6 to 1. 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 73%.

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$126 million, and with a discount rate of 15%, NPV equals US$81 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 (57%). And even when combining this with the highest (15 percent) discount rate, the Net Present Value exceeds the costs of the project demonstrating a benefit-cost ratio of 2 to 1. Keeping in mind that not all benefits could be accurately quantified, this still presents a compelling case to invest in this project.

Scenario	NPV (0%)	NPV (5%)	NPV (10%)	NPV (15%)	IRR
Baseline	$338.43	$202.21	$125.67	$80.72	73%
20 % decrease in benefits	$260.30	$153.68	$94.01	$59.15	58.55%
20 % increase in O&M costs	$333.78	$199.15	$123.55	$79.18	71%
20% decrease in benefits & 20% increase in O&M costs	$255.65	$150.62	$91.89	$57.61	57%

Table 3: sensitivity analysis of the economic analysis of the proposed project

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 Burkina Faso. The recent flood events in 2015 for example, killed 5 people. Flood related fatalities 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. 80 percent of the population resides in rural areas, where agriculture is the primary employment and income source. The sector is dominated by small-scale, subsistence-oriented farmers, but these producers struggle to access agricultural inputs, credits and markets. Difficult and unpredictable climatic conditions further limit agricultural production. 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. 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. According to the National progress report on the implementation of the Hyogo Framework for Action (2013-2015) there are 13 woman groups participating to the National Platform for the DRR:

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 Burkina Faso 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. Burkina Faso is one of the poorest countries of the world. Burkina Faso ranks 183rd of 188 countries in the Human Development Index. Today some 55.3 percent of its 18.1 million people live on less than US$1.90 per day (57.3 in 2011) and life expectancy is 58.6 years. Still, Burkina Faso's population is growing at a fast pace. However, the country was able to reduce its poverty level from 51.1 in 2003 to 46.7 in 2009 and 40.1 in 2014. The Gini coefficient was estimated at 0.40 in 2009. 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).

Burkina Faso 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. About one third of the country in the north is considered as sahelian. Burkina Faso has experienced 'quasi-drought' conditions since the early 1970s[17]. These conditions are most pronounced between November and December when humidity averages 10%, and in the north where rain only comes during two months out of the year. Many of the country's rivers are intermittent, except for the Mouhoun river (Black Volte). Drought events were particularly severe in 1920, 1973-1974 et 1983-1984. In 1983-1984 very dry conditions were reported countrywide and more especially the areas in the east, north and northwest of Ouagadougou were the most affected. Considered to be the worst since 1920 the drought put at risk from famine conditions about 2.5 million persons. The displaced population was estimated at 222,000. Due to drought conditions, gross cereal production in the 1984/85 season was 185,000 MT short of the national consumption requirement. Nationwide, 500,000 head of livestock were severely weakened. More recently in 2012 drought stroked and more than half of the population was affected.

Floods are also increasingly taking place in both urban and rural areas. Over the past twenty years, especially in 1988, 1992, 1994 and 1999, some zones were severely affected. For example, loss of agricultural production due to flooding of agricultural fields was estimated at 1.803 billion FCFA in 1992 and at CFAF 63,937,680,000 in 1994. Also, the cost of rehabilitating damaged dams in 1994 was estimated at CFAF 192,776,576 (Integrated Water Resource Management Project, 2000). Great weather and hydrological variability is demonstrated for example by the 1994 floods which affected over 650,000 people and were immediately followed by a drought in 1995, which in turn affected about 75,500 people and destroyed initial maize production in the Haut Plateau and northern districts. The severe floods of September 2009 affected more than 150,000 people 150,000 people[18] in Ouagadougou. Long term impacts on the regional economy are not well known yet, but damages alone exceed US$ 130 million (PDNA, 2009).

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 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. The main risk factor for children under five years of age, under-nutrition is responsible for the deaths of more than 40,000 children each year in Burkina Faso[19]: results of the national nutritional survey conducted in August 2010[20] showed a prevalence of Global Acute Malnutrition (GAM) of 10.5% and Severe Acute Malnutrition (SAM) of 1.4%, while underweight reached 31.4% and chronic malnutrition 28.9%. Waterborne diseases are very common and contribute to aggravating the nutritional situation of the population.

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.

[17] Danida (2008). Appréciation des impacts des changements climatiques sur les programmes de développement de la cooperation Danoise au Burkina Faso.

[18] EM DAT: The OFDA/CRED International Disaster Database, www.emdat.be Université catholique de Louvain Brussels Belgium

[19] WHO Countdown to 2015, 2012 Report. Burkina Faso

[20] SMART survey conducted by the Directorate for Nutrition of the Ministry of Health

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 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.*

Burkina has a total population estimated at 18.1 million people, predominantly rural, with an average annual population growth rate of about 2.91 percent in 2015. The average population density[21] is 66.18 people per km^2 (densities ranging from 65 to more than 130 inhabitants per km^2. In the south-west, north-east and south-west densities are much lower from 12 to 10 inhabitants per km^2.

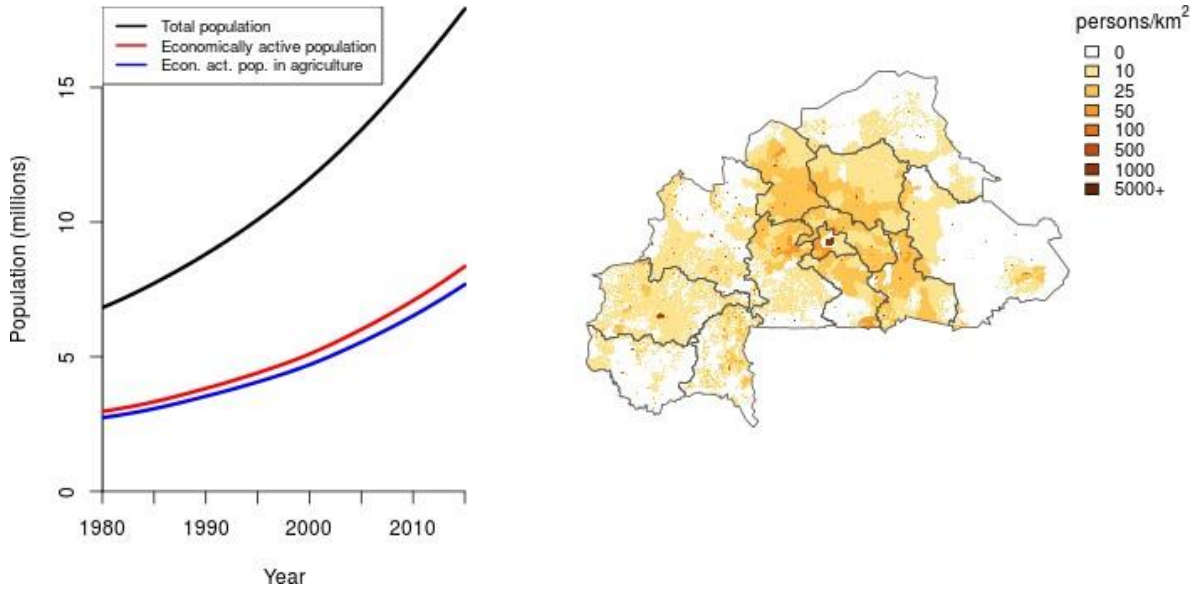

Figure 10: Burkina's Population density and growth

The country has several main primary ecosystems: tropical forests, tropical and subtropical grassland, savanna, and shrub land as well as agricultural ecosystem and pastoral ecosystem.

While Burkina Faso has experienced average annual growth of 6% over the past few years, growth slowed to a rate of 4% in 2014. This may be attributed to the significant and persistent fall in the prices of gold and cotton (27% and 8% respectively), the decline in cereal production and the political crisis of 2014[22]. There have been positive changes in the human development outlook: (i) infant mortality dropped from 65 per 1000 live births in 2010 to 43 per 1000 live

[21] http://country-facts.findthedata.com/l/185/Burkina-Faso
[22] http://www.worldbank.org/en/country/burkinafaso/overview

births in 2015; (ii) maternal mortality rates also fell from 484 deaths per 100,000 live births in 1995, to 341 deaths in 2010. Life expectancy at birth stood at 57 in 2009, higher than the regional average of 50 years.
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 Burkina. This is particularly the case for vulnerable rural households dependent on subsistence farming and livestock herding.

While the Government of Burkina 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 DGM, DGRE, SAP, DGPC and CONASUR.

There are substantial hydromet system modernization needs in order to increase the accuracy and timeliness of forecasting and modeling services. The capacities of both DGM and DGRE are 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 leave 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, CONASUR and SAP and sectorial 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-sectorial and systemic visions and approaches. There also exist 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.

The proposed project departs from the efforts made in the past on a coherent National Adaptation Programme of Action and National Adaption Plan, which are mandated by the UNFCCC for Least Developed Countries. In 2015 Burkina Faso has also reconfirmed its commitment of the convention and prepared the Intended Nationally Determined Contributions (INDC) document for the convention. In fact, the proposed project will directly contribute to the implementation of the priorities spelled out in NAPA and NAP and is in line with the INDC.

Burkina Faso has formulated in 2007 its National Adaption Programme of Action (NAPA) (*Programme d'Action National d'Adaptation a la variabilite et aux changements climatiques, PANA*) as by the requirements of the United Nations Framework Convention on Climate Change (UNFCCC) for least developed countries describing Burkina Faso's most urgent and immediate need to adapt to climate change. The NAPA provides a summary of the potential climate change impacts and proposes twelve main adaptation interventions. The proposed project is oriented along the main lines, which have been brought forward in the NAPA and will support the Government of Burkina Faso to continue implementing the program. The proposed project is in fact a direct contribution to the twelve interventions identified in

the NAPA; whereas support to early warning mechanisms have been spelled out as the most urgent and cost effective adapting method. The proposed project aims at implementing this program.

In line with the Cancun Adaption Framework and based upon the NAPAs countries have agreed to formulate and implement National Adaption Plan, notably for those least developed countries. Burkina Faso has finalized its NAP with the technical and financial support from Japan, UNDP and GEF in 2015. The Burkina Faso NAP comprises: (i) adaptation plans for each development sector and; (ii) a global adaptation plan for the entire country. The proposed project will continue to support Burkina Faso in implementing and monitoring the NAP.

Also in September 2015, Burkina Faso has reconfirmed its commitment to the UNFCCC convention and prepared the INDC spelling out both conditional and unconditional mitigation and adaptation measures and contributions from Burkina Faso. The INDC of Burkina Faso points at hybrid interventions, which address mitigation and adaptation, such as soil carbon storage or tree based adaption systems. Strengthening the national hydro-meteorological services as well as research this field are important pillars of the INDC, whereas the proposed project would contribute directly to its financing.

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 Burkina Faso, namely by the DGM, DGRE, DGPC, SAP, CONASUR and SP/PST. The Ministry of Economy and Finance, 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 Burkina Faso. The SP/PST (Permanent Secretariat of the Transport Sector Program) has considerable experience in implementing programs financed by the World Bank. The SP/PST is implementing the West Africa Regional Communications Infrastructure Project-APL-1B (P122402) and the Transport and Urban Infrastructure Development Project (P151832). It is Financial Management Agent of the Open Data Initiative Project (P151740 -Trust Fund of US$300,000) and has implemented the West Africa Regional Transport and Transit Facilitation Project (P079749 - IDA44380 - closed in June 2015). The overall performance of these projects in FM was rated Satisfactory during the last implementation support missions. Having implemented such a number of World Bank trust-funded operations, the SP/PST is familiar with World Bank procedures and standards. Some additional capacity support will be required to manage this proposed Project. The SP/PST 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 Africa Hydro-Met Program – Burkina Faso project proposal has been developed in a consultative manner with stakeholders and beneficiary in Burkina Faso as well as regional stakeholders, such as ACMAD (African Center of Meteorological Applications for Development) guiding the process from inception to proposal submission. The National

Designated Authority has been involved from its inception guiding the entire project preparation process and ensuring that it meets with the overall development and adaption priorities of Burkina Faso.

The NDA was actively involved and guided the preparation for the funding proposal from the inception 2014 to the submission of the funding proposal in 2016.

a. No objection on August 12, 2015 by the National Designated Authority (Ministry of the Economy and Finance) to the overall concept of the Africa Hydro-Met Program and the Burkina Faso country program.
b. Reaffirmed no-objection on September 30, 2016 by the new NDA. Since September 5, 2016 the National Designated Authority is with the Prime Minister's Office; Mr. Mamadou Honadia being the national focal point for the GCF; has since taking on the new position taken a leading role in the preparation of the proposal.

Please also specify the multi-stakeholder engagement plan and the consultations that were conducted when this proposal was developed.

Since 2014 several consultations and active involvement of different stakeholders, including sector ministries and government agencies as well as beneficiary organizations (like agricultural associations, SONABEL as national hydropower operator) were actively involved in the project design. In the process of the project preparation the following consultations were held:

a. A user and beneficiary forum in January 2014 brought together the different stakeholders consisting of information providers (from the agencies) as well as beneficiaries and the private sector to discuss the expectations on the climate services and how to improve them in the Burkina Faso.
b. A regional consultation facilitated by CILSS in September 2014 in Niamey, which connected stakeholders from the six countries of the Sahelian belt with regional climate centers and the providers of global weather and climate information, including ACMAD, CILSS/AGRHYMET and WMO.
c. On September 8th 2016 a national consultation workshop with the implementing entities was organized to validate the final proposal for the Africa Hydro-Met Program – Burkina Faso Country Program

In addition, the African Hydro-Met program is closely aligned with Burkina Faso National Framework for Climate Services (NFCS) and builds on the national consultations in this context.

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).

National public debt of the country is not affected by the proposed grant and the proposed project 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 Burkina Faso 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 and public (international) 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. The average benefit to cost ratio estimated or the proposed project is 6.2. 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 benefits and costs 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 5 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 5 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 Burkina Faso GDP growth rate has been on average around 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$228.3 million, with a discount rate of 5%. This represents a benefit-cost ratio of 1 to 6.24. 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 88%.

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$151.9 million, and with a discount rate of 15%, NPV equals US$104.6million. 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 hydromet'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[23] 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)[24]. Otherwise, long-term support is difficult to maintain.

E.6.5. Key efficiency and effectiveness indicators

GCF core indicators	Estimated cost per t CO_2 eq, defined as total investment cost / expected lifetime emission reductions (mitigation only)

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

	(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
	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)
	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
Other relevant indicators (e.g. estimated cost per co-benefit generated as a result of the project/programme)	

**** 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.

To estimate the value of strengthening Burkina Faso's hydro-meteorological services, an economic analysis estimating both costs and benefits of the proposed project has been undertaken. The objective of the benefit-cost analysis (BCA) is to verify the economic justification for the proposed project, position the value Burkina Faso's hydromet services in a wider sociopolitical context, and create a baseline against which progress can be compared.

The hydro-meteorological value chain, represented in Figure 10, shows that the economic and social values lay at the end of a process that starts with the 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.

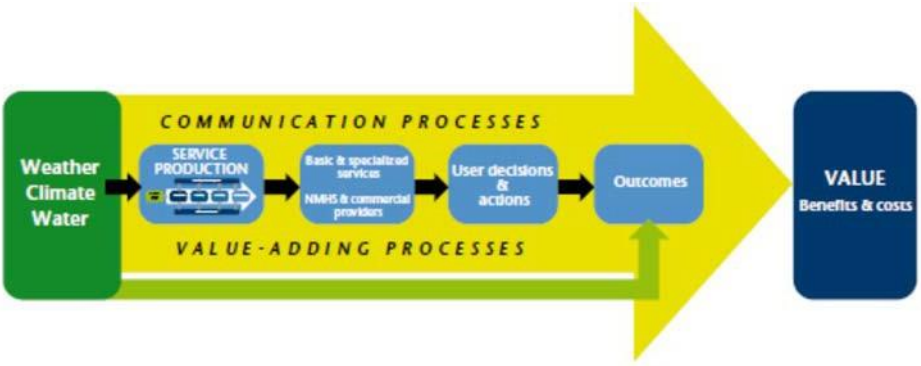

Figure 11: Simplified hydro-meteorological value chain. Source: WMO 2015.

As hydro-meteorological products and services are public goods, they are generally not bought and sold in markets and thus there is no direct information on the economic value of these services. For this reason, specific approaches need to be employed to determine the economic benefits resulting from hydro-meteorological systems' improvement projects, such as benchmarking and benefit transfer methods.

In this analysis the assumed benefits derived by different economic sectors are estimated through benefit transfers methods. The analysis follows the overall structure of the "Triple Dividend of Resilience" framework[25]. The framework suggests to consider the three dividends of resilience when estimating projects' benefits: i) First dividend: saving lives and avoiding damage and losses. That is, whereby an improved forecasting and extreme weather early warning system reduces loss of assets and livelihoods; ii) Second dividend: unlocking economic potential. Increased risk awareness and forecasting accuracy increases economic productivity, supporting long-term investments in productive assets and development opportunities; iii) Third dividend: generating development co-benefits. Investing in hydromet can serve multiple purposes that are not solely designed to reduce disaster impacts. For example, enhancing forecast accuracy and timeliness can produce co-benefits to a number of actors, including households.

The costs in the BCA calculation are those associated with the proposed project's investments. The BCA includes sensitivity analysis of a number of key parameters (including discount rates, benefits realization and cost of operation and maintenance) and explication of reasonable and identifiable omissions, biases and uncertainties. Although the

[25] Tanner, T.M., Surminski, S., Wilkinson, E., Reid, R., Rentschler, J.E., and Rajput,S. (2015) The Triple Dividend of Resilience: Realising development goals through the multiple benefits of disaster risk management. Global Facility for Disaster Reduction and Recovery (GFDRR) at the World Bank and Overseas Development Institute (ODI), London. www.odi.org/tripledividend.

implementation period for the project is estimated at five years, the benefits can in theory be derived far beyond 2022 provided adequate repair, upgrade and maintenance. Therefore, the analysis considers a timeline of 15 years from project starting (2032).

Studies have found high returns on investment in hydromet. Hallegatte (2012)[26] 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[27]
- US: benefit-ratio of 6 for forecasting[28]
- Russia: benefit-cost ratio of 4.5-10[29]
- Kyrgyz Republic: benefit-cost ratio of 2[30]
- Tajikistan: benefit-cost ratio of 2.2[31]
- Ethiopia: benefit-cost ratios range from 3 to 6[32]

Identified Benefits

Significant economic gains are anticipated through implementation of this Project in Burkina Faso, both from reduced losses from flooding and droughts 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:

The **reduction of economic losses caused by floods** was calculated to be US$3.6 million annually, after 5 years from project starting. This was based on the assumption that early warning systems provided by the DGM and DEIE 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 2.5%, which is a "conservative" estimation of the potential benefits. Considering the stochastic nature of disasters, common practice for cost-benefit analysis of disaster risk management project is to determine the reduction in average annual losses from natural hazards. This represents the averaging of potential losses over time to quantify the expected economic burden per year. Average Annual Loss (AAL) is calculated as the area under the loss frequency curve, which is a common metric indicating the Exceedance Probability of the full potential range of losses per year. The Aqueduct Global Flood Analyzer (WRI)[33] provides EP curves for urban damages and affected GDP in Burkina Faso. Improved extreme weather forecast capacity and alert through Early Warning Systems (EWS) can consistently reduce flood impacts. Global experience indicates a conservative overall range of 5-8% potential reduction of impacts. For example, a reduction of 8.5% was estimated in

[26] 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.
[27] Guocai, Z and H. Wang, 2003. *Evaluating the Value of Meteorological Services in China*. WMO Bulletin 53(4): 383-7.
[28] Rogers and Tsirkunov, 2010. *Costs and Benefits of Early Warning Systems*. Global Assessment Report on Disaster Risk Reduction. ISDR and World Bank.
[29] World Bank, 2005. *Russia National Hydromet Modernization Project*. Project Appraisal Document.
[30] World Bank, 2009. *Improving Weather, Climate and Hydrological Services Delivery in Central Asia.* Kyrgyz Republic, Republic of Tajikistan and Turkmenistan.
[31] Ibid.
[32] World Meteorological Organization, 2015; Valuing Weather and Climate: Economic Assessment of Hydromet Services.
[33] World Resource Institute, The Aqueduct Global Flood Analyze (http://floods.wri.org/).

Russia [34] and 10% for flooding in southeastern Europe[35], while Subbiah et al (2009)[36] reported an overall potential reduction due to early warning of 3.6% of total damages. In line with the conservative approach set out for this analysis, the lower end of the range of global experience is considered (5%). It is assumed that the proposed project's contribution to the reduction of impacts is 50%, i.e. 2.5% of the total benefits. The benefits of the project are considered both in terms of avoided annual average flood urban damages and GDP losses. To avoid double counting and overlapping, the total loss considers 100% of the urban damage plus 60% of GDP loss. Under the assumptions considered in this analysis, the proposed project's cumulative benefits in terms of avoided flood economic impacts amount to 62.8 million US$ over 15 years and 6 million US$ over project time (5 years) (undiscounted values).

Increased agricultural productivity, were calculated to total US$22.7 million annually after 5 years from project starting. 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 Burkina Faso 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 Burkina Faso 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$3.36 billion in 2014, was used for this calculation. Under the assumptions considered in this analysis, the proposed project's cumulative benefits in terms of agriculture productivity improvement amount to 320 million US$ over 15 years and 39.9 million US$ over project time (5 years) (undiscounted values).

The **increase in efficiency of humanitarian food relief interventions**, due to enhanced preparedness and accuracy of targeting, was calculated to amount to US$0.5 million per year after 5 years from project starting. 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 2012 at US$177 million, both in terms of government reserves and international donor support. 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 consistent humanitarian and food aid being provided to Burkina Faso. According to AidData.org the humanitarian and food aid that went to Burkina Faso in 2016 was US$97 million between. In line with our 'conservative' approach we use this latest figure to estimate the potential benefits of the proposed project. Food aid is provided to Burkina Faso even in years without major droughts, which is why an increase of efficiency leading to a 0.5% benefit was chosen.

Benefits transfer analysis of **value for households** shows that the annual benefits of moderately improved forecasts and warning are approximately US$0.16 million at project completion. In Burkina FAso, households receive very limited weather and climate information. State preferences methods can provide an estimation of the economic value of improved services for households. Lazo (2015) carried out a state preference survey on Mozambique households' willingness-to-pay (WTP). In his survey, Lazo employed both a stated choice method with discrete choices and a contingent valuation method (Lazo, 2015). The discrete choice experiments identified the value of the actual service provided in Mozambique as US$8.33 per household, while the households' willingness to pay for significantly improved forecasts was estimated at US$0.09 per household. The contingent valuation experiment (based on single

[34] World Bank (2005). Russian Federation Hydromet Modernization Project. Project Appraisal Document, Report No. 3 1465-RU, Washington, D.C.

[35] World Bank, UNISDR, WMO & FMI (2008). Strengthening the Hydrometeorological Services in South Eastern Europe. South Eastern Europe Disaster Risk Mitigation and Adaptation Programme.

[36] Subbiah, A.R., Bildan, L., Narasimhan, R. (2009). Background Paper on Assessment of the Economics of Early Warning Systems for Disaster Risk Reduction. World Bank-UN Project on the Economics of Disaster Risk Reduction, GFDRR, Washington.

improvements compared to discrete choices) highlighted a WTP of US$1.16 per household for improved forecast. To estimate the economic value to households, Lazo's study was transferred to the Burkina Faso context, assuming a 50% contribution of the proposed project to the overall benefit. The outcomes show that the cumulative benefits of the proposed project reach approximately US$2.1 million using the stated choices method and US$27 million using the contingent valuation method after 15 years from project start. The lower figure is used in the analysis.

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

- With hydropower producing about one-quarter 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 operations, 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 5 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 5 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 exponentially starting from year 1, reaching a constant maximum at project completion.

According to World Bank guidelines, 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$202 million, with a discount rate of 5%. This represents a benefit-cost ratio of 6.4 to 1. 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 73%.

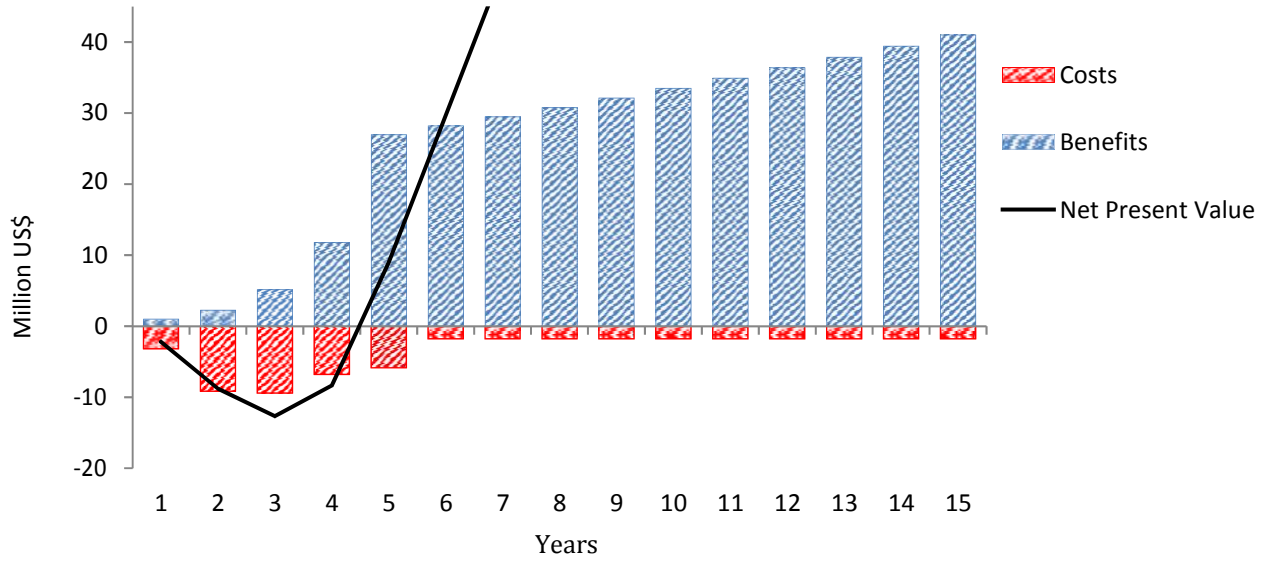

Figure 12: cost and benefits over the analysis timeframe.

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$126 million, and with a discount rate of 15%, NPV equals US$81 million. This demonstrates that the Project would be viable even with much higher discount rates.

Additional sensitivity analysis was carried out. The 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 (57%). And even when combining this with the highest (15 percent) discount rate, the Net Present Value exceeds the costs of the project demonstrating a benefit-cost ratio of 2 to 1. Keeping in mind that not all benefits could be accurately quantified, this still presents a compelling case to invest in this project.

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.

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. The proposed mix of institutional strengthening, investment and support to service delivery among the five institutions responsible for meteorology, hydrology, food security early warning and flood early (rapid) warning, as well as coordination for disaster prevention, emergency relief management and rehabilitation, 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 discussed in consultation with relevant stakeholders in Burkina Faso. The findings of the consultations are reflected in the draft Environmental and Social Management Framework (ESMF) developed by the Government of Burkina Faso. The document is attached as annex to this proposal.

The project is considered to be 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 negative environmental impacts could result mainly from certain physical interventions associated with the placement of new automatic weather stations or water level recorders or providing better access to those stations. For example, the installation of water level recorders may include some punctual and very short-term disturbances of the river slopes and sediments during construction. The water level recorders will not have any measureable impact on the aquatic ecosystem, sediment transport, etc. The limitations for accessing land due to the fencing of weather stations will be very limited and only conducted in close consultations with the local communities.

To mitigate risks and negative impacts, the Government has prepared a draft Environmental and Social Management Framework (ESMF) for activities envisaged under this project. The document provides 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 Burkina Faso 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.

The national legal framework for environmental management in Burkina Faso 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 the understanding of the GCF safeguard policies and the effective implementation of the World bank's social and environmental safeguard guidelines. The World Bank environmental and social supervision team will include environmental and social safeguard experts. Regular monitoring reports (two per year) on the implementation of the environmental and social safeguards will be provided to the World Bank for approval These reports will be verified during supervision mission. The SP/PST as Project Implementation Unit at the Ministry of Transport, Urban Mobility and Road Safety will be responsible for the monitoring of the social and environmental safeguard standards and will with this regard provide the required technical expertise to the five implementing entities (DGRE, DGPC, DGM, CONASUR, SAP)

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 Burkina Faso the gender gap is as high as the Sub-Saharan Africa's average, which is characterized by high fertility rates (5.69 birth per women) and particularly in rural areas a lower net primary enrolment of girls (65.7% versus 69.2% for boys). In addition, there are only a few women fully represented in decision making, whereas just 9,4% of all parliamentarians are women (World Bank, 2016). 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 Burkina Faso. The project's gender actions are informed by the existing World Bank gender assessments in Burkina Faso (World Bank, 2003: *Analyse Strategique des Enjeux lie au genre au Burkina Faso;* Dahan and Hanmer, 2015: The Identification for Development (iD4D) Agenda: its Potential for Empowering Women and Girls, background Paper*)* and other gender assessments (for example, SIDA, 2003: A Profile on Gender Relations Towards Gender Equality in Burkina Faso), 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 the hydromet information users and beneficiaries' needs was conducted in the Sahel countries focusing notably on three 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 that early warning messages to women and vulnerable groups including disables are targeted. A Gender Action Plan will be formulated and monitored. The Gender Action Plan will be implemented from March to July 2017 upon approval of the proposal by the board of the GCF.

The project will support DGRE, DGM, DGPC, SAP and CONASUR 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 (see Annex 16 for more details).

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 Burkina Faso 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 Permanent Secretariat of the Transport Sector Program (SP/PST) has considerable experience in implementing World Bank operation. Additional staff resources will be added to the Project Implementation Unit for the management of this project.

Financial Management

An evaluation of the Financial Management (FM) capacities of the SP/PST (Permanent Secretariat of the Transport Sector Program) of the MI was carried out in September 2016. The SP/PST is expected to be the Implementing Agency of the HYDROMET project. The objective of the assessment was to determine whether the SP/PST has adequate FM arrangements in place to ensure that the HYDROMET funds will be used only for the intended purposes with due attention to considerations of economy and efficiency. The assessment complied with the FM Manual for Bank-Financed Investment Operations, updated on February 4, 2015, as well as the Governance Global Practice FM Assessment and Risk Rating Principles.
The FM assessment indicates that the SP/PST's existing FM arrangements satisfy the minimum requirements under Bank's procedures (OP/BP 10.00). Indeed, the SP/PST has considerable experience in implementing programs financed by IDA. The SP/PST is implementing the West Africa Regional Communications Infrastructure Project-APL-1B (P122402) and the Transport and Urban Infrastructure Development Project (P151832), is Financial Management Agent of the Open Data Initiative Project (P151740 -Trust Fund of US$300,000) and has implemented the West Africa Regional Transport and Transit Facilitation Project (P079749 - IDA44380 - closed in June 2015). The overall

performance of these projects in FM was rated Satisfactory during the last implementation support missions. In addition, the SP/PST has (a) sufficient, qualified and experienced FM staff, comprised of a Finance and Administration Officer, a Principal Accountant and two Accountants; (b) a computerized accounting system; (c) a reliable internal control system with a detailed Administrative, Financial and Accounting Procedures Manual and an Internal Audit function; and (d) the external auditors issued unqualified opinions on the 2015 financial statements of IDA-funded projects managed by the SP/PST. In addition, the management letter issued by the external auditors did not raise any major internal control issue.

1. **Internal control system.** The internal control system of SP/PST comprises Project Steering Committees (PSC) which oversee project activities; a Project Implementation Manual for each project; an Administrative, Financial, and Accounting Procedures Manual; and an Internal Audit Unit to evaluate the performance of the overall internal control system. The SP/PST Internal Audit Unit is in charge of reviewing the internal control system and producing an internal control review report.

2. **Planning and budgeting.** The SP/PST prepare a detailed annual work plan and budget (AWPB), which is approved by the PSC. The SP/PST submit the approved AWPB to the Bank, for comments, before the start of the next calendar year.

3. **Accounting.** The SP/PST applied the SYSCOHADA, an assigned accounting system in West African Francophone countries, and has a multi-projects accounting software (TOMPRO) which can be customized to host any new project. The FM staff comprises of a Finance and Administration Officer, one Principal Accountant and two Accountants. SP/PST is able to reinforce the team if new projects make the existent staff overloaded.

4. **Financial reporting.** The SP/PST submit the Interim Financial Report (IFR) to the Bank within 45 days after the end of the calendar quarter period. The IFRs submitted by SP/PST provide sufficient, pertinent, and true information for a reader to establish whether: (a) funds disbursed to sub-projects are being used for the purpose intended, (b) project implementation is on track, and (c) budgeted costs will be exceeded. The SP/PST use the IFR agreed with the Bank, which include:

- an introductory narrative discussion of project developments and progress during the period, to provide context to (or other explanations of) financial information reported;
- a Sources and Uses of Funds Statement, both cumulatively and for the period covered by the report, showing separately funds provided under the project (IDA, recipient, and so on);
- a Uses of Funds by Components Statement, cumulatively and for the period covered by the report;
- the DA reconciliation, including bank statements and general ledger of the bank account;
- the disbursement forecasts of the upcoming six months; and
- an explanation of variances between the actual and planned activities and budget.

5. Annually, the SP/PST produce project financial statements, which should comply with SYSCOHADA and Bank requirements. The annual financial statements comprise:

- project presentation and project developments and progress during the year, to provide context to (or other explanations of) financial information reported;
- a Statement of Sources and Uses of Funds, which recognizes all cash receipts, cash payments, and cash balances;
- a Statement of Commitments;
- accounting policies adopted and explanatory notes; and
- a management assertion that project funds have been expended for the intended purposes as specified in the relevant Financing Agreements.

6. **Auditing.** The SP/PST is required to by projects' financial agreement to submit audited project financial statements satisfactory to the Bank every year within six months after closure of the fiscal year. A single opinion on the audited project financial statements in compliance with the International Federation of Accountants is required. In addition, the SP/PST is required to submit a Management Letter which contain auditor observations and comments and recommendations for improvements in accounting records, systems, controls, and compliance with financial covenants

in the Financial Agreement. In 2015, the external auditors issued unqualified opinions on the financial statements of IDA-funded projects managed by the SP/PST and the management letter issued did not raise any major internal control issue.

7. The SP/PST is recruiting an external auditor for the audit of all Bank-funded projects it is managing.

Disbursement

1. Disbursements under Bank-funded projects are carried out in accordance with the provisions of the IDA Disbursement Guidelines ('World Bank Disbursement Guidelines for Projects, by Loan Department' dated May 1, 2006), the Disbursement Letter, and the Financing Agreement.

2. Disbursements under the Bank-funded projects managed by SP/PST are transactions based. In addition to making advances to a Designated Account, other disbursement methods (reimbursement, direct payment, and special commitment) are available for use. Further instructions on disbursement and details on the operations of the withdrawal applications and direct payments are outlined in the Disbursement Letter of each project.

3. For each project, the SP/PST open and manage a Designated Account (DA) in the Central Bank of West African Countries (BCEAO) in CFAF BCEAO and a transaction account in CFAF BCEAO in a commercial bank acceptable to IDA.

4. The DAs are replenished through the submission of withdrawal applications. Replenishment (requests for reimbursement) and reporting on the use of advances are accompanied by a Statement of Expenditure and records required by the Bank for specific expenditures in the Disbursement Letter. The SP/PST retains all supporting documentation and make them available for periodic review by the Bank missions and external auditors.

Action plan

The SP/PST will revise the Administrative, Financial, and Accounting Procedures Manual to take into account the grant specificities.

N°	Action	Deadline
1.	Revise the Administrative, Financial, and Accounting Procedures Manual to take into account this grant specificity.	3 months after effective date.
2	Include the grant financial statements in the scope of the auditor contract (SP/PST is recruiting an auditor for all its Bank funded projects)	3 months after effective date.

Procurement

The SP/PST has adequate procurement capacity to carry out procurement under the Project. The main risks identified are the following: (a) the procurement unit within the SP/PST is staffed by the new recruited procurement specialist who may not be able to manage the additional procurement activities of this project appropriately considering that another Bank-funded project is being implemented; (b) Implementing Agencies responsible for carrying out the technical matters of the procurement may not be familiar with the procurement procedures according to the Bank's guidelines and rules; (c) control and regulation mechanism according to the provisions of the country procurement rules

and its application procedures could delay the procurement process. The overall unmitigated risk for procurement is Substantial.

Proposed corrective measures to mitigate the risk are summarized in the following table:

Action to be undertaken	Timeframe	Responsible
1. Elaboration and submission of a procurement plan to the World Bank	Final version will be discussed during negotiations	SP/PST
2. Update the Procurement Manual of the SP/PST, as part of the PIM, to include mainly the procurement methods to be used in the project along with their step-by-step explanation as well as the key role to be played by IA	By effectiveness	SP/PST
3. Train and coach the IA specialists responsible for assuring technical aspects of procurement by the SP/PST	Three months after project effectiveness	SP/PST
4. Identify the root cause of procurement delays at national level and propose appropriate solutions (global)	Six months after project effectiveness	DCMP
5. Establish performance indicator of procurement process for all stakeholders involved in the project implementation	Twelve months after project effectiveness	DCMP

The prevailing risk can be improved to Moderate provided the above corrective measures are implemented.

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; which 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.

The overall risk rating for the project is low to moderate, based on the nature of the proposed activities, the capacity of the implementing entity and the available support through the World Bank. 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.

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. The project ESMF will be prepared and published by the government, underscoring the government's commitment to an adequate environmental and social management and mitigation strategy.

Selected Risk Factor 2

Description	Risk category	Level of impact	Probability of risk occurring

Lack of Adequate Institutional Capacity for Implementation	Technical and operational	Medium (5.1-20% of project value)	Medium

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 five entities DGM, DGRE, SAP, DGPC, CONASUR 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 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 with the other entities of the project (CONASUR, SAP, DGRE and DGM) The same apply to CONASUR and SAP, which have to improve their coordination with the main suppliers of information, i.e. DGM and DGRE. 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. In addition to further mitigate the institutional capacity constraints, SP/PST has been selected as implementing entity due to its proven track record in managing complex, World Bank financed projects.

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?

The SP/PST (Permanent Secretariat of the Transport Sector Program) has considerable experience in implementing World Bank trust-funded operation. Having implemented such a number of World Bank trust-funded operation, the SP/PST is familiar with World Bank procedures and standards. Some additional capacity support will be required to manage this proposed Project. 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 SP/PST will be supported by experienced consultants where needed. 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 17) and with reference to the World Bank Guidelines on Preventing and Combating Fraud and Corruption (January 2011, Annex 20), the World Bank Disbursement Guidelines (May 2006, Annex 21), the World Bank Guidelines on Selection and Employment of Consultants (January 2011, Annex 22), the World Bank Guidelines on Procurement of Goods, Works and Non-Consulting Services (January 2011, Annex 23), 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 around US$1.2 billion.

Selected Risk Factor 4

Description	Risk category	Level of impact	Probability of risk occurring
Limited Procurement Capacity with World Bank Supported Projects	Financial	Medium (5.1-20% 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?

One of the key issues for a successful project implementation is the successful procurement of goods and services and coordinating those activities with the implementing entities. While it is expected that the project has a number different and complex items to be procured, the SP/PST has adequate procurement capacity to carry out procurement under the project. The main risks identified are the following: (a) the procurement unit within the SP/PST is staffed by the new recruited procurement specialist who may not be able to manage the additional procurement activities of this project appropriately considering that another Bank-funded project is being implemented; (b) Implementing agencies responsible for carrying out the technical matters of the procurement may not be familiar with the procurement procedures according to the Bank's guidelines and rules; (c) control and regulation mechanism according to the provisions of the country procurement rules and its application procedures could delay the procurement process. The overall unmitigated risk for procurement is Substantial.

Proposed corrective measures to mitigate the risk are summarized in the following table:

Action to be undertaken	Timeframe	Responsible
1. Elaboration and submission of a procurement plan to the World Bank	Final version will be discussed during negotiations	SP/PST
2. Update the Procurement Manual of the SP/PST, as part of the PIM, to include mainly the procurement methods to be used in the project along with their step-by-step explanation as well as the key role to be played by IA	By effectiveness	SP/PST
3. Train and coach the IA specialists responsible for assuring technical aspects of procurement by the SP/PST	Three months' after project effectiveness	SP/PST
4. Identify the root cause of procurement delays at national level and propose appropriate solutions (global)	Six months' after project effectiveness	DCMP
5. Establish performance indicator of procurement process for all stakeholders involved in the project implementation	Twelve months' after project effectiveness	DCMP

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 the implementing agencies, 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 Burkina Faso, the equipment will be covered under self-underwriting option by the government. In addition, the project will also work with the Government of Burkina Faso to ensure that equipment procured under the project is insured over its lifetime.

In relation with security concerns, risk of terrorism and attacks might influence project implementation. If access to certain areas will be constrained, 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 all implementing agencies. The main project management entity is SP/PST, 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[37]	
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 Burkina Faso 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 in chronically food insecure communities in the rural zones of the Central Plateau of Burkina Faso (ZOME 5), north and east (ZOME 7), north (ZOME 8); urban and peri-urban zones of Ouagadougou (ZOME 6) and Bobo-Dioulasso (within ZOME 2); • Enhanced agrometeorological and climate services, with a particular focus in selected climate sensitive agriculture production areas of Beragadougou, Nangollogo and the Kou valley; • New flood early warning services in selected areas amongst climate vulnerable communities of Banfora, Bama, Tougouri, Manni, Markoye, Sebba, Solenzo, Ouagadougou and Bobo-Dioulasso, and communities along the main rivers Mouhoun and Nakambe (Black Volta; White Volta) • Enhanced civil protection response capacities to extreme weather and climate related events; • Enhanced capacity to adapt infrastructure planning to weather extremes and climate change risks **Intermediate Outcome Level:** Taking advantage of these improvements, the DGM, DGRE, DGPC, SAP, CONASUR 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 Burkina Faso 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

[37] 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

	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 Burkina Faso 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.

Key impact potential indicators			
GCF core indicators	Expected tonnes of carbon dioxide equivalent (t CO_2 eq) to be reduced or avoided (Mitigation only)	Annual Lifetime	Not applicable Not applicable
	Expected total number of direct and indirect beneficiaries, disaggregated by gender (reduced vulnerability or increased resilience)	Total	7 million beneficiaries out of which: - 3.5 million direct (male and female) - 3.5 million indirect (male and female)
	Number of beneficiaries relative to total population, disaggregated by gender (adaptation only)	Percentage (%)	DIRECT: 20% of total population 50% of vulnerable population INDIRECT: 20% of total population 50% of vulnerable population GENDER: 50% male, 50% female

Other indicators

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, CONASUR and SAP	n/a	Baseline -0.5%	Baseline -2.5%	Expected losses are modeled, not observed, to allow for year-to-year comparability.
A2.0 Increased resilience of health and well-being, and	2.1 Number of food-secure households (in areas/periods at risk of climate change impacts)	Estimate from SAP	7 million (50% are female and 12%	Baseline +1%	Baseline +5%	Food security is enhanced by improved collaboration between relevant

food and water security			are female-held households FHH)			agencies 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 CONASUR and DGPC	n/a	US$0.3 million per year 70 thousand people per year	US$2.2 million per year 350 thousand people per year	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 climate resilience and their effective 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
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 DGM, DGRE, CONASUR	0	1 public sector services (food security, civil protection)	2 public sector services (food security, civil protection)	SOPs in place between meteo, 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 CONASUR, DGPC and SAP	TBD	Baseline +4%	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	Estimate from DGPC, CONASUR and SAP	TBD	0.3 million farmers	1.4 million farmers	The agro-meteorological information service continues and improve the

	Fund-supported tools, instruments, strategies and activities to respond to climate change and variability					provision of services to farmers
	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	Surveys by DGPC, CONASUR and SAP	TBD	Baseline +10% (50% male, 50% female)	Baseline +50% (50% male, 50% female)	Standard Operating Procedures 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	Surveys by DGPC, CONASUR and SAP	TBD	Baseline +10% (50% male, 50% female)	Baseline +50% (50% male, 50% female)	Partnership in place between the DRR National Platform, media and civil society
Project outputs	**Outputs that contribute to outcomes**					
1. Enhanced hydro-meteorological observing, monitoring, and impact forecasting services	End users' combined satisfaction rate and behavior change in relation with improved hydromet information services	Survey with user groups under National Framework for Climate Services	Baseline	Baseline +10%	Baseline +50%	The targeting of user groups will evolve as customized 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	10	Existing local agrometeorological assistance groups would need to be maintained and strengthened
3. Enhanced agrometeorological and climate services for agriculture	Number of additional services provided to selected areas	Survey with user groups	Baseline	Baseline +10%	Baseline +50%	Enhanced agrometeorological and climate services are developed in selected climate sensitive agriculture production areas of Beragadougou, Nangollogo and the Kou valley
4. New flood early warning services	Number of communities covered with flood early warning system	CENAOS and DGPC	0	0	5	New flood forecasting and early warning services will be delivered in selected communities

5. 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	CENAOS and DGPC	0	0	5	The final number of local and community response capacities depends upon support provided by other projects.
6. Enhanced capacity to adapt infrastructure planning to weather extremes and climate change risks	Number of infrastructure plans informed by weather extremes and climate change risks information	CENAOS and DGPC	Baseline	Baseline +10%	Baseline +50%	Infrastructure planning are responsive to climate risk information. The final number depends on the support provided by other projects.

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 DGM and DGRE, 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 Modernization and upgrading hydromet observation networks	Modernization and upgrading of the surface of meteorological network, the agro-meteorological network, hydrological stations and specialized hydrological equipment for rivers and small flood-prone watersheds	2.1.1. Modernization 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 Modernization and upgrading of the agro-meteorological network: automatic stage recorders 2.1.3. Modernization and upgrading of hydrological stations and specialized hydrological equipment for rivers and small flood-prone watersheds: Acoustic	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 buying of new field equipment and

		Doppler Current Profiler, bathymetric instruments, sediment measurement instruments, current meters, and boats	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. Equipment for a national Operational Center for Crisis Monitoring, Activation and Management to withstand all disaster scenarios; 2.3.2. Equipment and tools for SAP, DGCP and CONASUR, such as specialized emergency vehicles and search and rescue equipment	Equipment for 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. Institutionalization 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 understanding and use of information, and (ii) mobilization and sensitization of community and establishing effective feedback mechanisms for communities at risk	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 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, hydrometeorologists 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	Mobilization and sensitization the community, and establishment of an effective feedback mechanisms for 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 Burkina Faso.

Project progress will be monitored by the Project monitoring and evaluation team of SP/PST based on official data sources monitored directly by the DGM, DGRE, DGPC, SAP, CONASUR 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.

Milestones	**Expected Dates**
Start of Project Implementation	01/03/2018
Interim Evaluation	01/10/2020
Project Completion	28/02/2023
Final Evaluation	30/05/2023

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

- ☐ NDA No-objection Letter
- ☐ Feasibility Study
- ☐ 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)
- ☐ Project/Programme Confirmation/Term Sheet (including cost/budget breakdown, disbursement schedule, etc.) – *see the Accreditation Master Agreement, Annex I*
- ☐ Environmental and Social Impact Assessment (ESIA) or Environmental and Social Management Plan (If applicable)
- ☐ Appraisal Report or Due Diligence Report with recommendations (If applicable)
- ☐ Evaluation Report of the baseline project (If applicable)
- ☐ Map indicating the location of the project/programme
- ☐ Timetable of project/programme implementation

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

PREMIER MINISTERE
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CABINET
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AUTORITE NATIONALE
DU FONDS VERT POUR LE CLIMAT

BURKINA FASO
Unité - Progrès - Justice

Ouagadougou, le 30 SEP 2016

N° 16-01-/PM/CAB/AND-FVC

Le Point Focal

A

Monsieur le Directeur Général
du Fonds Vert pour le Climat

G-Tower, 175 Art Center
Daero, Yeonsu-gu, Incheon
406-840

REPUBLIC OF KOREA

Objet : Endorsement of the Funding proposal for the GCF by The World Bank regarding Africa Resilience in Sub-Saharan Africa: Burkina Faso Country Project ».

ENGLISH TRANSLATION BY THE WORLD BANK – THE ORIGINAL IS ATTACHED FOR REFERENCE

Mr Director-General,

We refer to the *Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Phase I - Burkina-Faso Project* submitted by the World Bank to us on September 26, 2016.

The undersigned is the duly authorized representative of the National Designated Authority of Burkina-Faso to the Green Climate Fund.

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 Burkina-Faso 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 Burkina-Faso'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 also confirm this no-objection applies to all projects and activities underneath this proposal.

We acknowledge that this letter will be made publicly available on the GCF website.

Kind regards,

Mamadou HONADIA
Médailler d'honneur des Eaux et Forêts
Chevalier de l'Ordre du Mérite

ENGLISH TRANSLATION BY THE WORLD BANK – THE ORIGINAL IS ATTACHED FOR REFERENCE

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Unité - Progrès - Justice

Ouagadougou, le 30 SEP 2016

N° 16-01-/PM/CAB/AND-FVC

Le Point Focal

A

Monsieur le Directeur Général
du Fonds Vert pour le Climat

G-Tower, 175 Art Center
Daero, Yeonsu-gu, Incheon
406-840

REPUBLIC OF KOREA

Objet : Endossement de la requête de financement au Fonds Vert Climat (FVC) du projet «Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project ».

Monsieur le Directeur Général,

Je me réfère au projet « Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project, comme inclus dans la proposition de financement présentée par la Banque Mondiale à nous le 26 septembre 2016.

Je soussigné, **Monsieur Mamadou HONADIA,** représentant dûment autorisé comme Autorité Nationale Désignée (AND) ou point focal du Burkina Faso au titre du programme "Fonds Vert pour le Climat (FVC) ", conformément à la décision **B.08/10 du FVC**, dont je reconnais avoir examiné le contenu, donne par la présente, mon avis de non-objection au projet " Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project pour qu'il soit inclus dans la proposition de financement FVC.

.../...

En communiquant mon avis de non-objection, il est implicite que :

- le gouvernement du Burkina Faso n'a pas d'objection au projet « Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project », comme inclus dans la proposition de financement FVC ;

- le projet «Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project», inclus dans la proposition de financement FVC, est conforme aux priorités nationales entrant dans les stratégies et plans de développement du pays ;

- conformément aux garanties environnementales et sociales du FVC, le projet « Africa Hydromet Program – Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project » peut être inclus dans la proposition de financement FVC parce-que, conforme aux lois et réglementations nationales pertinentes.

Je confirme que notre processus national pour déterminer l'avis de non-objection au projet « Africa Hydromet Program –Strengthening Climate Resilience in Sub-Saharan Africa: Burkina Faso Country Project » comme inclus dans la proposition de financement FVC a été dûment suivi.

Je confirme également que mon non-objection s'applique à tous les projets ou activités à mettre en œuvre dans le cadre de ce programme.

Je suis informé que cette lettre sera rendue publique sur le site Web de FVC.

Veuillez recevoir, **Monsieur le Directeur Général**, mes salutations cordiales.

AND - FONDS VERT CLIMAT
Le Point Focal
PREMIER MINISTÈRE

Mamadou HONADIA
Médailler d'honneur des Eaux et Forêts
Chevalier de l'Ordre du Mérite

Environmental and social report(s) disclosure

Basic project/programme information	
Project/programme title	Africa Hydromet Program: Phase 1 – Burkina Faso Country Project
Accredited entity	The World Bank
Environmental and social safeguards (ESS) category	Category B

Environmental and Social Impact Assessment (ESIA) (if applicable)	
Date of disclosure on accredited entity's website	2017-05-31
Language(s) of disclosure	English and French
Link to disclosure	English: http://documents.worldbank.org/curated/en/952951496249112723/Environmental-and-social-management-framework French (original): http://documents.worldbank.org/curated/en/372201496177096124/Cadre-de-gestion-environnementale-et-sociale The Environmental and Social Management Framework contains an impact assessment (ESIA) consistent with the requirements of PS1 for a category B project.
Other link(s)	
Environmental and Social Impact Assessment (ESMP) (if applicable)	
Date of disclosure on accredited entity's website	2017-05-31
Language(s) of disclosure	English and French
Link to disclosure	English: http://documents.worldbank.org/curated/en/952951496249112723/Environmental-and-social-management-framework French (original): http://documents.worldbank.org/curated/en/372201496177096124/Cadre-de-gestion-environnementale-et-sociale The Environmental and Social Management Framework contains a management plan (ESMP) consistent with the requirements of PS1 for a category B project.
Other link(s)	
Resettlement Action Plan (RAP) (if applicable)	
Date of disclosure on accredited entity's website	Not applicable