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Report No: PAD1063

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED GRANT

IN THE AMOUNT OF US$ 5 MILLION

FROM THE STRATEGIC CLIMATE FUND

TO THE

REPUBLIC OF HAITI

FOR A

STRENGTHENING HYDRO-METEOROLOGICAL SERVICES PROJECT

May 19, 2015

Social, Urban, Rural and Resilience Global Practice
Latin America and Caribbean Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective May 15, 2015)

Currency Unit	=	HTG
46.3 HTG	=	US$1
US$0.02	=	HTG 1

FISCAL YEAR
October 1 – September 30

ABBREVIATIONS AND ACRONYMS

CIAT	Comité Interministériel d'Aménagement du Territoire (Inter-ministerial Committee for Territorial Planning)
CIF	Climate Investment Funds
CNIGS	Centre National de l'Information Géo-Spatiale (National Center for Geographical and Spatial Information)
CNM	Centre National de Météorologie (National Center for Meteorology)
CNSA	Coordination Nationale de la Sécurité Alimentaire (National Coordination for Food Security)
DDA	Direction Départementale de l'Agriculture (Departmental Directorate for Agriculture)
DG	Director General
DIA	Direction des Infrastructures Agricoles (Agriculture Infrastructure Directorate)
DPC	Direction de la Protection Civile (Civil Protection Directorate)
DRE	Direction des Ressources en Eau (Water Resource Directorate)
EMP	Environment Management Plan
ESMF	Environmental and Social Management Framework
EU	European Union
EWS	Early Warning System
GFDRR	Global Facility for Disaster Reduction and Recovery
GoH	Government of the Republic of Haiti
IDB	Inter-American Development Bank
MARNDR	Ministère de l'Agriculture, Ressources Naturelles et Développement Rural (Ministry of Agriculture, Natural Resources and Rural Development)
MDE	Ministère de l'Environnement (Ministry of the Environment)
MICT	Ministère de l'Intérieur et des Collectivités Territoriales (Ministry of Interior and Territorial Communities)
MPCE	Ministère du Plan et de la Coopération Externe (Ministry of Planning and External Cooperation)
MTPTC	Ministère des Travaux Publics, Transports et Communications (Ministry of Public Works, Transport and Communications)

OFNAC	Office National de l'Aviation Civile (National Civil Aviation Agency)
OM	Operations Manual
ONEV	Observatoire National de l'Environnement et de la Vulnérabilité (National Observatory on Environment and Vulnerability)
OP	Operational Policy
PAD	Project Appraisal Document
PNAP	Programme National d'Alerte Précoce (National Early Warning Project)
PPCR	Pilot Program for Climate Resilience
RESEPAG	Re-launching Agriculture: Strengthening Agriculture Public Services Project
SCF	Strategic Climate Fund
SEMANAH	Service Maritime et de Navigation d'Haïti (Haiti National Maritime and Navigation Service)
SNRE	Service National des Ressources en Eau (National Service for Water Resources)
SPCR	Strategic Program for Climate Resilience
UEP	Unité d'Études et de Programmation (Study and Planning Unit, MARNDR)
UIS	Unité Informatique et Statistique (Statistics and IT Unit, MARNDR)
UPMP	Unité de Passation de Marchés Publics (Centralized procurement unit, MARNDR)
USAID	United States Agency for International Development
WMO	World Meteorological Organization

Regional Vice President:	Jorge Familiar
Special Envoy:	Mary A. Barton-Dock
Senior Global Practice Director:	Ede Jorge Ijjasz-Vásquez
Practice Manager:	Anna Wellenstein
Task Team Leader:	Gaetano Vivo

HAITI
Strengthening Hydro-meteorological Services Project

TABLE OF CONTENTS

PAD DATA SHEET

Haiti

HT Strengthening Hydro-Met Services (P148259)

PROJECT APPRAISAL DOCUMENT

LATIN AMERICA AND CARIBBEAN

Social, Urban, Rural and Resilience Global Practice

Report No.: PAD1063

Basic Information		
Project ID P148259	EA Category B - Partial Assessment	Team Leader(s) Gaetano Vivo
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]	
Project Implementation Start Date 30-Jul-2015	Project Implementation End Date 30-Jun-2020	
Expected Effectiveness Date 30-Jul-2015	Expected Closing Date 30-Jun-2020	
Joint IFC No		

Practice Manager/Manager	Senior Global Practice Director	Country Director	Regional Vice President
Anna Wellenstein	Ede Jorge Ijjasz-Vasquez	Mary A. Barton-Dock	Jorge Familiar

Borrower: Republic of Haiti			
Responsible Agency: Ministry of Agriculture, Natural Resources and Rural Development (MARNDR)			
Contact:	Edie Charles	Title:	Director General
Telephone No.:	50934436227	Email:	edcharles58@gmail.com

Project Financing Data(in USD Million)					
[ ]	Loan	[ ]	IDA Grant	[ ]	Guarantee
[ ]	Credit	[X]	Grant	[ ]	Other

Total Project Cost:	5.00	Total Bank Financing:	0.00
Financing Gap:	0.00		

Financing Source	Amount
Borrower	0.00
Strategic Climate Fund Grant	5.00
Total	5.00

Expected Disbursements (in USD Million)

Fiscal Year	2016	2017	2018	2019	2020
Annual	0.20	0.95	2.20	1.50	0.15
Cumulative	0.20	1.15	3.35	4.85	5.00

Institutional Data

Practice Area (Lead)

Social, Urban, Rural and Resilience Global Practice

Cross Cutting Topics

[X] Climate Change
[ ] Fragile, Conflict & Violence
[ ] Gender
[ ] Jobs
[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Water, sanitation and flood protection	Flood protection	60	100	
Agriculture, fishing, and forestry	Irrigation and drainage	40	100	
Total		100		

☐ I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Social protection and risk management	Natural disaster management	60
Rural development	Other rural development	20
Urban development	Urban planning and housing policy	20
Total		100

Proposed Development Objective(s)

The Project Development Objective (PDO) is to strengthen the Republic of Haiti's institutional capacity to provide hydro-meteorological and climate information services customized to the needs of the civil protection and agriculture sectors, which contributes to increasing disaster and climate resilience.

Components

Component Name	Cost (USD Millions)
Institutional strengthening of hydro-meteorological services and development of data management tools	3.00
Identification of hydro-meteorological and climate services' requirements for select end users and development of information services to support decision making	1.40
Support to project implementation, monitoring and evaluation, and PPCR knowledge management	0.60

Systematic Operations Risk- Rating Tool (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	High
4. Technical Design of Project or Program	Moderate
5. Institutional Capacity for Implementation and Sustainability	High
6. Fiduciary	Substantial
7. Environment and Social	Moderate
8. Stakeholders	Low
9. Other	N/A
OVERALL	Substantial

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ]	No [X]
Does the project require any waivers of Bank policies?	Yes [ ]	No [X]
Have these been approved by Bank management?	Yes [ ]	No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ]	No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X]	No [ ]

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment OP/BP 4.01	**X**	
Natural Habitats OP/BP 4.04		**X**
Forests OP/BP 4.36		**X**

Pest Management OP 4.09		**X**
Physical Cultural Resources OP/BP 4.11		**X**
Indigenous Peoples OP/BP 4.10		**X**
Involuntary Resettlement OP/BP 4.12		**X**
Safety of Dams OP/BP 4.37		**X**
Projects on International Waterways OP/BP 7.50		**X**
Projects in Disputed Areas OP/BP 7.60		**X**

Legal Covenants

Name	**Recurrent**	**Due Date**	**Frequency**
Other Undertakings (Schedule 2, Section V)	N/A	four months of Project effectiveness	N/A

Description of Covenant

Schedule 2, Section V of the Grant Agreement: "The Recipient undertakes to amend within four (4) months of Project effectiveness the existing contract for carrying out the audit of RESEPAG II's financial statements so that it includes carrying out the audit for the Project, based on terms of reference acceptable to the World Bank. It being understood, however, that failure to amend the aforementioned contract does not constitute a waiver of the audit obligations of the Recipient under this Grant Agreement".

Conditions

Source Of Fund	**Name**	**Type**
CSCF	Signing of Grant Agreement	Effectiveness

Description of Condition

Article V, section 5.01 (a) of the Grant Agreement: "This Agreement shall not become effective until evidence satisfactory to the World Bank has been furnished to the World Bank that the conditions specified below have been satisfied.

(a) The execution and delivery of this Agreement on behalf of the Recipient have been duly authorized or ratified by all necessary governmental action."

Source Of Fund	**Name**	**Type**
CSCF	Approval of the Project Operation Manual	Effectiveness

Description of Condition

Article V, section 5.01 (b) of the Grant Agreement: "This Agreement shall not become effective until evidence satisfactory to the World Bank has been furnished to the World Bank that the conditions specified below have been satisfied.

(b) The Project Operations Manual has been adopted by the Recipient in a manner acceptable to the World Bank."

Team Composition				
Bank Staff				
Name	**Role**	**Title**	**Specialization**	**Unit**
Gaetano Vivo	Team Leader (ADM Responsible)	Disaster Risk Management Specialist	Disaster Risk Management	GSURR
Prosper Nindorera	Procurement Specialist	Sr Procurement Specialist	Procurement	GGODR
Fabienne Mroczka	Financial Management Specialist	Sr Financial Management Specialist	Financial Management	GGODR
Aboubacar Magassouba	Team Member	Consultant	Procurement	GGODR
Carolina J. Cuba Hammond	Team Member	Sr Program Assistant	Assistant	GSURR
Claudia Ruth Soto Orozco	Team Member	Junior Professional Associate	Disaster Risk Management	GSURR
Jean Baptiste Migraine	Team Member	Disaster Risk Management Specialist	Disaster Risk Management, Early Warning Systems	GSURR
Josue Akre	Team Member	Financial Management Specialist	Financial Management	GGODR
Michel Matera	Team Member	Sr Disaster Risk Management Specialist	Disaster Risk Management	GSURR
Nancy Chaarani Meza	Team Member	Operations Officer	Operations	GSURR
Nyaneba E. Nkrumah	Safeguards Specialist	Sr Natural Resources Mgmt. Spec.	Safeguards	GENDR
Peter F. B. A. Lafere	Safeguards Specialist	Social Development Specialist	Safeguards	GSURR
Ramiro Ignacio Jauregui-Zabalaga	Counsel	Senior Counsel	Counsel	LEGLE
Rose Caline Desruisseaux-Cadet	Team Member	E T Consultant	Procurement	GGODR
Victor Manuel Ordonez Conde	Team Member	Sr Finance Officer	Finance Officer	WFALN
Extended Team				
Name	**Title**	**Office Phone**	**Location**	
Emmanuel Pousse	Sr. Public Sector Specialist		Paris	
Consultants (Will be disclosed in the Monthly Operational Summary)				
Consultants Required ?	Consulting services to be determined			

I. STRATEGIC CONTEXT

A. Country Context

1. **Development Context.** Haiti possesses several key strategic advantages but also faces considerable challenges. Its position in the Caribbean, proximity to the United States, young labor force, and rich cultural heritage offer a range of economic opportunities. Agriculture, light manufacturing, tourism and potential mineral resources represent opportunities for the country's economic development. While extreme poverty declined from 31 percent to 23.8 percent between 2000 and 2012[1], driven by rising non-agricultural labor income and external financial flows (e.g. remittances and international aid), poverty remains very high at 58.5 percent. Recent data show that almost 6.3 million Haitians are unable to meet their basic needs and 2.5 million are unable to cover food needs[2]. One million Haitians live slightly above the poverty level but could fall back into poverty as a result of external shocks, including climatic induced shocks. Evidence shows that climatic shocks are the most frequent shocks affecting communities in Haiti[3].

2. **Haiti's history has been marked by natural and man-made crises.** In 2008, rising food and fuel prices led to riots and the fall of the government. The same year, tropical storms and hurricanes caused losses estimated at 15 percent of GDP. The earthquake on January 12, 2010 killed 220,000 people, including one in three civil servants, displaced 1.5 million people, and destroyed the equivalent of 120 percent of GDP. Based on the analysis of historical data for the period 1976-2012, average losses and damages associated with hydro-meteorological events are estimated at an amount equivalent to 1.95 percent of GDP[4]. During the last decades, widespread deforestation triggered by energy needs, among other uses[5], contributed to erosion and watershed degradation[6] throughout the country, increasingly exposing the agricultural sector, the environment and population in general to the impacts of weather and climate hazards. The poorest populations tend to be hit harder by these disasters, especially hurricanes where almost

[1] Though not completely comparable, the monetary poverty indicator from 2000 was calculated using methodology similar to the new official methodology, including the use of a national food poverty line against per capita household consumption. The reduction in consumption poverty is confirmed by trends in non-monetary well-being indicators based poverty measures and are considered the most accurate in capturing welfare levels, especially in countries with high levels of rural poverty and significant income volatility. World Bank Poverty Assessment, 2014

[2] These rates are based on per capita consumption and were calculated using the 2012 official Haitian moderate and extreme poverty lines of 82.2 HTG (US$1.98) and 41.7 HTG (US$1) per day, respectively.

[3] World Bank Poverty Assessment, 2014

[4] Rapport préliminaire sur l'impact économique et budgétaire des désastres en Haiti, Haitian Ministry of Economy and Finance and The World Bank *(forthcoming)*

[5] In 2003 as much as 66% of energy consumption was provided by firewood and charcoal. Haiti: Strategy to Alleviate the Pressure of Fuel Demand on National Woodfuel Resources. ESMAP Technical Paper, 2007

[6] 25 out of 30 watersheds are severely degraded. Comité Interministériel d'Aménagement du Territoire (Inter-Ministerial Committee Territorial Planning), Haiti Strategic Program for Climate Resilience (SPCR), 2013

50 percent of damages and losses to the productive sectors are recorded in the agricultural sector[7].

3. **Haiti's economic recovery and growth potential will not be sustained without improving the country's resilience to natural hazards.** A World Bank global study[8] ranked Haiti fifth in exposure to risk of two or more hazards, with over 93 percent of its territory and 96 percent of its population at risk of two or more hazards and 56 percent of its GDP linked to an area exposed to risk stemming from two or more hazards. Haiti is located in a seismically active zone being intersected by several major tectonic faults and is exposed to weather and climate hazards, especially cyclones (wind damage, flooding, land/mudslides and coastal surges) and droughts. The presence of mountain ranges behind the coastline favors flooding due to rapid runoff during heavy rainfall impacting the urban areas located on the coast. High population density (up to 40,000 per km^2 in Port-au-Prince), combined with the large number of informal settlements and weak infrastructure, renders Haiti's population particularly vulnerable.

B. Sectoral and Institutional Context

4. **Climate Vulnerability Context.** Climate change may further accentuate the risk of hydro-meteorological hazards by increasing the frequency and/or intensity of extreme events. Due to a scattered collection of historical data, climate scenarios for Haiti rely solely on regional climate information. According to the IPCC models[9], temperatures in the Caribbean region could rise from 1.2ºC to 2.3ºC by 2100, with a median increase of 2.0°C during the 21st century; this is slightly less than the world average. In addition, an increase of ocean surface temperature (1.2°C to 2.3°C projected by 2100 compared to a 1986–2005 baseline) may threaten marine ecosystems and particularly coral reefs, which provide natural protection to the Haitian coastline. Sea level rise, which could reach 60 cm by 2100 according to some studies[10], may pose a serious threat to coastal areas where the majority of Haiti's population and assets are concentrated.

5. **Understanding hydro-meteorological and climate risks is imperative to assess social and economic impacts and to develop adequate policy responses to support Haiti's sustained development.** Over the past decade, hydro-meteorological hazards alone killed more than 6,600 people and affected 1.3 million others[11]. In addition to claiming human lives, hydro-meteorological hazards take a heavy toll on all sectors of the Haitian economy. Largely rain-fed, Haiti's agriculture sector is the main livelihood in rural areas and vulnerable to hydro-meteorological and climate hazards, which poses a threat to Haiti's ability to meet its food security targets. Possible manifestations of climate change (variations in rain patterns, intensification of cyclones, reduction in rainfall, longer periods of drought, and the salinization of coastal plains) may reduce agricultural productivity and, in conjunction with the volatility of global food prices, pose a significant threat to Haiti's foods security. Lack of historical datasets

[7] Calculations based on existing Post-Disaster Needs Assessments (PDNAs)
[8] World Bank, Natural disaster hotspots: A global risk analysis, 2005
[9] Inter-governmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014) http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap29_FINAL.pdf.)
[10] A sea level rise of 61 cm is estimated for the bay of Port au Prince, in Turn Down the Heat III: Confronting the New Climate Normal, The World Bank, 2014
[11] Data refer to the decade 2004-2014 and include hydrological (floods; landslides) and meteorological (storms) events. Source: EM-DAT (http://www.emdat.be).

for floods, landslides and wind makes it hard to run probabilistic risk models and inform planning of new infrastructure, including hydro-electric plants and other renewable forms of energy production.

6. **An effective capacity to monitor hydro-meteorological and climate parameters and estimate the potential impact of events is critical for increasing Haiti's resilience, enhancing its productivity and benefiting society at large.** For instance, systematic meteorological and hydrological data collection is needed to establish early warning systems for tropical cyclones, wind storms, floods, drought and other hazards, hence preventing losses of human lives, delivering reliable information to farmers, and increase reliability of agriculture insurance products. Globally, recorded economic losses linked to extreme hydro-meteorological events have increased nearly 50 times over the past five decades, while the global loss of life has decreased significantly, by a factor of about 10. This can mainly be attributed to advancements in monitoring and forecasting, early warning, and emergency preparedness and response planning at the national and local levels. In addition, comprehensive historical hydro-met datasets are indispensable to improve the resolution of climate models and better understand climate change impacts.

7. **Current institutional scenario.** Haiti's hydro-meteorological services are dispersed across several institutions in charge of collecting, storing, processing, and disseminating data (see Figure 1 in Annex 1 for the current institutional landscape). The National Center for Meteorology (CNM) and the National Service for Water Resources (SNRE), both under the Ministry of Agriculture, Natural Resources, and Rural Development (MARNDR), have a primary role in providing hydro-meteorological and climate services. However they both lack a dedicated budget, adequate human resources, and operational procedures to fulfil their mandate. CNM *de facto* relies on the National Civil Aviation Agency (OFNAC), which provides them with office space and personnel. CNM data collection is limited to 3 synoptic stations located at the airports of Port-au-Prince, Cap Haïtien, and Jérémie. Forecasting is largely supported by Météo France due to CNM's insufficient operational capacity and it is not verified due to a lack of observation data and inadequate human resources (only two trained forecasters). SNRE has no operating budget and a small number of staff. The only service delivered regularly has been financed through the National Early Warning Project (PNAP), funded by the Inter-American Development Bank (IDB). Following the closure of the PNAP (December 2014), institutional and financial constraints have begun to put at risk the network of 48 automatic limnigraphs, 18 automatic rain gauges and data management tools provided by the project. The national network of gauges and observers no longer exists, except for volunteers of religious institutions, who regularly monitor 10 manual rain gauges in the country.

8. In 2006 a ministerial decree transferred the responsibility for hydro-meteorological services to the Ministry of Environment (MDE), introducing further complexity in the institutional framework. In principle, within MDE, the National Observatory on Environment and Vulnerability (ONEV) would have the mandate for managing all environmental information, while the Water Resource Directorate (DRE) would be responsible for monitoring watersheds and water resources (including groundwater). In practice, both departments lack an operational budget to fulfil their mission and depend almost exclusively on project resources. As a result, the respective responsibilities of these agencies tend to vary according to available resources, and are

not based upon sound operational procedures. In 2012, MDE and MARNDR signed a MoU to jointly undertake, under the Haiti Strategic Program for Climate Resilience (SPCR), a reorganization of the hydro-met services. A UNDP-financed project under preparation is expected to provide institutional strengthening to help MDE better define its responsibilities vis-à-vis MARNDR in the management of water resources.

9. Finally, the National Center for Geographical and Spatial Information (CNIGS), whose mission is managing and disseminating geospatial information, plays a role in hydro-met data collection. A semi-autonomous entity attached to the Ministry of Planning and External Cooperation (MPCE), CNIGS is considered as a reliable and effective technical partner in data management by many national and international agencies. Although not formally mandated to collect hydro-met data, today CNIGS manages 24 automatic meteorological stations provided by a European Union (EU)-financed project.

10. In a context of institutional fragmentation and lack of sustainable financing, projects supported by international donors have contributed to the creation of parallel and uncoordinated systems for hydro-met data acquisition, validation, storage and analysis. The lack of clear roles and responsibilities and the absence of a coordination structure has led some government agencies (e.g. the National Coordination for Food Security, CNSA) and several NGOs with recurrent needs for hydro-met data to develop their own data collection and management system. This has resulted into a constellation of stations of different types managed by several public and private entities, installed on a project basis and not connected to a national network. Aside from donor financing, maintenance of hydro-met stations (particularly automatic ones) as well as data collection and transmission are not sustained and have been discontinued also due to other challenges such as the lack of access to remote areas, vandalism, and weather damage. Data currently collected by existing stations is not being stored in a central database and is therefore not being used, with the exception of sporadic donor-funded initiatives. Historical data from stations is scattered and in many cases recorded on paper hence not appropriately accessible, nor scientifically validated, and vulnerable to rats, mice or time. Finally, there is a shortage of middle managers and experts with specialized training on hydro-meteorology, climatology and related disciplines, as well as of a specific policy and operational framework for climate resilience[12].

11. **First steps of an institutional reform.** In order to overcome these challenges, there is an urgent need for re-organizing the hydromet services with a view to increasing their sustainability. The first steps for the reorganization have been taken under the umbrella of the Haiti Strategic Program for Climate Resilience (SPCR), with support from the Inter-Ministerial Committee for Territorial Planning (CIAT), focal point within the Government of the Republic of Haiti (GoH). In November 2013, the Minister of Agriculture appointed an inter-ministerial "Ad-hoc Commission"[13] tasked with putting forward options for an institutional reform of Haiti's hydro-meteorological services. This was part of a broader institutional reform process of the MARNDR. Throughout 2014, national technical-level consultations pointed to a general consensus on the need for a new institutional framework for the hydromet services. The following key priorities emerged from the consultations: (i) rationalizing and streamlining the

[12] These elements, among others, were noted from several assessments carried out during the past few years, which contain detailed information about the situation of Haiti's hydro-meteorological services: WMO (2010), PPCR (2012), IDB (2014), WB (2014).
[13] The ad-hoc Commission is composed of MARDNR, MDE, CNIGS, and Inter-ministerial Committee for Territorial Planning (CIAT).

national data collection and management system; (ii) establishing a mechanism to bring together data producers and main end users (aviation, civil protection, water utility, etc.) and provide feedback, and increase the socio-economic value of data; and (iii) ensuring a sustainable financing model based on a cost-recovery principle.

12. **World Bank Value Added.** The World Bank has significant global expertise in supporting the preparation and implementation of hydro-meteorological services projects. Currently, the Bank manages dedicated support initiatives such as the Global Facility for Disaster Reduction and Recovery (GFDRR) Hydromet Program, as well as several Pilot Program for Climate Resilience (PPCR) hydromet operations. The Bank and GFDRR have also developed a strong collaboration with the WMO and leading national hydro-met agencies in other countries. The Bank also provides technical and financial assistance for increasing Haiti's resilience in the agriculture and infrastructure sectors and for strengthening its disaster management system. Additionally, coordination with other technical and financial partners (IDB, WMO, EU, USAID, UNDP) has been a priority since the outset of project identification with a view to converging on a common approach for supporting the modernization of hydromet services in Haiti.

C. Higher Level Objectives to which the Project Contributes

13. **Promoting Shared Prosperity and Ending Extreme Poverty.** The proposed Project would contribute to the Bank's twin goals of ending extreme poverty and promoting shared prosperity. Contributing more than 25 percent to Haiti's GDP and accounting for 75 percent of employment in low-income households[14], the agriculture sector is critical for Haiti's growth and poverty eradication. Annual productivity losses due to extreme meteorological events and soil erosions have been estimated to range from 0.5 to 1.2 percent[15]. With only 1percent of farmers using irrigation[16], agriculture production is heavily dependent on rainfall and the impact of climate change on the sector could be even more severe. By focusing on agriculture and emergency preparedness the proposed Project directly contributes to protecting lives and assets of the most vulnerable, and ensuring a more resilient growth. In particular, improved access to observed hydro-meteorological data is expected to increase accuracy of forecasting and effectiveness of early warning systems. Similarly, systematic and reliable hydromet data can inform decisions of farmers, which results in reduced costs of routine farming activities (especially planting and harvest) and enhanced income.

14. **Relationship to the Haiti Interim Strategy Note (ISN).** The proposed Project is fully consistent with the World Bank Group's Haiti Interim Strategy Note FY13-FY14 (Report#71885-HT) discussed by the Executive Directors on September 27, 2012. The proposed Project would specifically support two of four objectives of the Haiti ISN: (i) reducing vulnerability and increase resilience and (ii) promoting inclusive growth. It will also contribute to the ISN crosscutting theme of strengthening governance.

15. **Reducing Vulnerability to Climate Change.** Furthermore, the proposed Project stems directly from the Government of Haiti's National Strategic Program for Climate Resilience

[14] World Bank, SCD, 2014

[15] World Bank, Haiti: Diagnostic and Proposals for Agriculture and Rural Development Policies and Strategies. Washington, DC, 2005

[16] E. Jadotte, Characterization of Inequality and Poverty in the Republic of Haiti", Vol. 15, No. 29, pp. 8-56, 2007

(SPCR), endorsed in May 2013, which includes "Strengthening Knowledge Management of Hydro-meteorological, Water Resources, and Climate Data to Inform Decision Making and Policy Dialogue" as one of the four complementary pillars to be financed using PPCR financing[17]. Developing the institutional capacity to collect, generate and analyze hydro-meteorological and climate-related data is an essential starting point for transforming decision making, starting with the most vulnerable sectors, and build long term resilience. By enhancing access to critical climate information, the proposed Project provides the backbone for achieving the four key results expected by Haiti's SPCR[18]. Finally, the proposed Project contributes to the implementation of the Haiti National Action Plan for Adaptation (NAPA[19]), which was endorsed in 2006.

II. PROJECT DEVELOPMENT OBJECTIVES

A. PDO

16. The Project Development Objective (PDO) is to strengthen the Republic of Haiti's institutional capacity to provide hydro-meteorological and climate information services customized to the needs of the civil protection and agriculture sectors, which contributes to increasing disaster and climate resilience.

Project Beneficiaries

17. Project beneficiaries include all end users that may benefit from reliable hydro-meteorological and climate data to inform their decision-making. The Results Framework (Annex 1) includes gender-disaggregated data on expected project beneficiaries. Direct beneficiaries would include public and private actors who work in sectors specifically targeted by the proposed Project, i.e. farmers and emergency responders/planners. Indirectly, the Haitian population in general and particularly the poor and most vulnerable to hydro-meteorological shocks (women, children and elderly, slum dwellers, rural population, and people living in high risk areas) will benefit from information services provided by the proposed Project or by applications stemming from them.

PDO Level Results Indicators

18. The achievement of the PDO would be monitored through the following indicators:

[17]This project is part of the Haiti PPCR program, which consists of 4 projects: Centre-Artibonite Regional Development Project (WB); DRM & Reconstruction-PPCR AF (WB), Hydromet (WB) and Climate Proofing of Agriculture in the Centre-Artibonite Loop (IDB), with specific program-level coordination mechanism led by CIAT. Further details are included in Annex 8.

[18] The four outcomes listed in the SPCR are: (i) level of vulnerability to climate change reduced; (ii) behavioral evolution in relation to climate risks triggered among target population; (c) Target groups and beneficiaries of the PPCR, including women and other vulnerable groups, have improved their income and living conditions, thereby enhancing their climate resilience and adaptation capacity; (d) Increased awareness and understanding of the development challenges associated to climate change issues by decision makers and national specialists on natural resources management, within the public and private sector as well as within civil society.

[19] NAPA's objectives are to (i) Identify urgent needs for the country, in terms of adaptation, and communicate these needs to international organizations investing in environmental matters, (ii) Mobilize national efforts to protect the environment, (iii) Contribute to poverty reduction of vulnerable people with a view to improving local communities' capacity to adapt to climate change, (iv) Contribute to national development and, consequently, to regional and global ecological balance.

(i) Data collected from hydro-met networks are accessible on a centralized online data management platform, with standard operating procedures for validation and storage;
(ii) Number of sub-networks feeding into the centralized platform;
(iii) End users' satisfaction rate towards improved hydromet information services (percentage, gender-disaggregated).

III. PROJECT DESCRIPTION

A. Project Components

19. The proposed Project will strengthen the Republic of Haiti's capacity to collect hydro-meteorological and climate data and contribute to building its future adaptive capacity by providing access to hydro-meteorological and climate information to end users. In the context of chronic fragility, the proposed Project has been designed flexibly so that activities can the sequenced to adapt to implementation challenges posed by political instability. In the first phase, the proposed Project will focus on developing a baseline of the existing data collection networks, comparing it with an optimal network, and highlighting critical gaps. At the same time, technical assistance will strengthen the linkages with end users while building capacity of MARNDR and line ministries. In the second phase, the proposed Project will focus on improving the network coverage and enhancing accessibility and customization of hydro-met information that is critical for decision making in key sectors (civil protection and agriculture).

20. The proposed Project will consist of the following three components:

(i) Institutional strengthening of hydro-meteorological services and development of data management tools *(US$3 million)*;
(ii) Identification of hydro-meteorological and climate services' requirements for select end users and development of information services to support decision making *(US$1.4 million);*
(iii) Support to project implementation, monitoring and evaluation, and PPCR knowledge management *(US$0.6 million).*

21. **Component 1. Institutional strengthening of the hydro-meteorological services and development of data management tools (US$3 million).** The focus of this component will be on the integration of the existing hydromet data collection networks into one national data platform based on an *open data* approach and accessible across end users in the Government of Haiti (GoH) and beyond. In addition to establishing the technical platform, the component will provide technical assistance to the GoH to gradually move from the current structure of six hydro-meteorological networks managed by five different government entities to a structure with one national platform and shared standard operating procedures for operating and maintaining all hydro-meteorological data collection devices. Specifically, the component will: support a country-wide, geo-referenced baseline assessment of stations; define requirements for an optimal national network; repair and replace, where needed, existing data-collecting stations; and establish a data platform that gathers data from all existing stations. Furthermore, this component will provide technical assistance to advance the institutional reform of hydromet and climate services. This includes: supporting dialogue between MARNDR and MDE to better define their

respective roles and responsibilities with regards to hydromet and climate services; deepening the dialogue with main end users and implementing the institutional reform emerging from this process; and formulating and promoting data sharing procedures across government actors based on an *open data* approach. Finally, the component will support technical capacity building in the hydromet institutions (MARNDR and end users) through training and study tours. Specific activities will strengthen the linkage between research and practice in climate-resilience, by involving Haitian university graduates and young professionals in data collection and analysis.

22. **Component 2. Identify hydro-meteorological and climate services' requirements for select end users and developing information services to support decision making (US$1.4 million).** The focus of this component will be the definition of hydromet information requirements for end users. In line with recommendations from the Global Framework for Climate Services this is expected to be a long-term process, with a continuous user feedback mechanism, including in the aftermath of major events. End users targeted by the proposed Project include: civil protection (e.g. parametric thresholds for select high-risk zones, in order to enable use of the hydro-meteorological data platform as a decision support mechanism for the activation of warnings by the Civil Protection Directorate - DPC) and agriculture (e.g. leveraging the new data platform to improve existing information services for farmers and the national food security agency). These sectors were chosen with a view to tapping synergies with ongoing Bank-financed projects, in particular the Disaster Risk Management and Reconstruction Project (P126346) and Re-launching Agriculture: Strengthening Agriculture Public Services II Project (P126744). Several other priority sectors supported by the World Bank in Haiti will also benefit from improved access to reliable hydromet and climate information, including infrastructure (e.g. update probability of occurrence for select hazards in order to better integrate climate resilience measures into infrastructure design), and health (e.g. information service for warnings of water-borne diseases and contingency planning).

23. **Component 3. Support to project implementation, monitoring and evaluation, and PPCR knowledge management (US$0.6 million).** Component 3 will include two subcomponents. (i) Strengthening MARNDR capacity to comply with Bank fiduciary, safeguard, and M&E procedures and ensure effective and timely implementation of project activities. This will include the recruitment of a Project Coordinator in charge of day-to-day project management, additional human resources, and financing of operating cost. (ii) Supporting MARNDR M&E capacity and PPCR knowledge management. An M&E specialist financed through the proposed Project will strengthen MARNDR's capacity to monitor and report progress on the project-level results of the SPCR (in coordination with CIAT). Special attention will be paid to distilling learning and knowledge from the proposed Project and disseminating them across the PPCR national and regional partners, including leveraging the hydromet data platform as well as the end user interface across other PPCR projects in Haiti as well as the Caribbean Regional PPCR program.

B. Project Financing

Lending instrument

24. The proposed lending instrument is an Investment Project Financing (IPF) consisting of a US$5 million Recipient Executed Grant awarded to Haiti by the Climate Investment Fund (CIF) as part of the Pilot Program for Climate Resilience (PPCR), a multi-donor program designed to respond to the urgent need to increase investments in climate risk and resilience measures for highly vulnerable countries. The PPCR for the Caribbean is being administered and implemented jointly by the Inter-American Development Bank (IDB) and the World Bank (WB) in a multi-sectorial and integrated manner involving public, private and civil society entities.

Project Cost and Financing

Project Components	**Project Cost in US$M**	**SCF Financing in US$M**	**% Financing**
1. Support the hydro-meteorological services' institutional reform process and develop data management tools	3.0	3.0	100%
2. Identify hydro-meteorological and climate services' requirements for select end users and developing information services to support decision making	1.4	1.4	100%
3. Support to project implementation, monitoring and evaluation, and PPCR knowledge management	0.6	0.6	100%
Total Financing Required	5.0	5.0	100%

C. Lessons Learned and Reflected in the Project Design

25. **Effective institutional development requires intense policy dialogue and capacity building to ensure the government is truly onboard.** This lesson is highlighted in the Relaunching Agriculture Project I (RESEPAG I) (P113623) Implementation Completion and Results Report[20]. In light of this, throughout preparation the Bank carried out regular dialogue with the MARDNR as well as with the main end users of hydromet and climate information. In particular, responding to a request of the MARNDR, the World Bank carried out an institutional and technical baseline assessment and its results were presented in a workshop (January 2014) which informed the Project preparation process. In September 2014, a MARNDR workshop on "Hydro-meteorological services at the service of development", brought together representatives of hydromet data producers and end users as well as the main donors provided the opportunity for a broad consultation on the activities of the proposed Project.

26. **When a project is implemented directly by the Ministry without a Project Implementation Unit (PIU), project design and implementation arrangements must be simple and well defined.** The proposed Project does not foresee the creation of a PIU and relies as much as possible on the MARNDR structure to achieve the institutional development objective of the proposed Project. Against this background, project design has been kept

[20] The World Bank, Relaunching Agriculture Project I (RESEPAG I) Implementation Completion and Results Report (report No: ICR00003287), 2015.

relatively simple (e.g. Procurement Plan; Results Framework). Furthermore, Component 3 of the proposed Project provides human and financial resources to strengthen key services of the MARNDR (i.e. M&E, financial management, procurement).

27. **Supporting the institutional reform of hydro-met services is critical and requires coordinated support from donors.** Over the past decade, overlapping responsibilities of line ministries and uncoordinated interventions of donors contributed to the institutional fragmentation and lack of sustainability of hydromet services. Setting up the "Ad-hoc Commission" contributed to fostering consensus at the technical level on the long term vision for hydromet and climate services and started putting it on the agenda of decision makers. Project preparation has been carried out in close collaboration with the main partners engaged in the sector, in particular WMO and IDB who joined meetings with the Commission and contributed to drafting project documents. During implementation, a common Steering Committee led by MARNDR overseeing both the World Bank and WMO projects will help ensure synergies and complementarity.

28. **To be effective, hydromet modernization projects should not to have a piece-meal approach and require sufficient investments and capacity building to enable the elevation of the hydro-meteorological institutions from a group of data collection entities to a full-fledged service[21]**. In order to achieve this transformational impact, the Bank joined forces with WMO and developed strong synergies between the PPCR project and a Canada-funded project implemented by WMO.

29. Evaluations of other Bank-financed projects in Haiti have highlighted the need for strengthening implementing agencies' capacity for monitoring project performance. Since the outset of project preparation, the Bank supported MARNDR's *Unité d'Etudes et de Programmation* (UEP) in the design of the project's results framework. Indicators were chosen with a view to simplify M&E data collection, while still allowing verification of progress towards the PDO.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

30. The proposed Project will be implemented by MARNDR, who will have responsibility for reporting fiduciary and overall project progress to the Ministry of Finance and the World Bank. MARNDR services for meteorology and hydrology, currently split between CNM and SNRE respectively, will be the main technical counterparts of the proposed Project. A project coordinator hired through the proposed Project will be responsible of the successful implementation of all the project activities. The Project Coordinator will report to the Director General (DG) of the MARNDR. Should CNM and SNRE be merged into the new hydro-

[21] David Rogers and Vladimir Tsirkunov, Weather and Climate Resilience: Effective Preparedness through National Hydrological and Meteorological Services, The World Bank, 2013

meteorological Unit[22] during the proposed Project timeframe, the Project Coordinator will be reporting to its Director. The proposed Project will rely on the fiduciary and M&E services of the MARNDR and will strengthen their capacities as needed. This is in line with the Bank and main development partners' strategy to use and strengthen MARNDR institutional capacity, increase ownership and move away from a ring-fenced PIU and project-based approach.

31. CIAT remains the PPCR focal point for Haiti, with the responsibility of ensuring coordination among the agencies executing the different investment projects and reporting on behalf of the GoH to the Climate Investment Funds (CIFs). As described in the SPCR, CIAT will facilitate the coordination among different state and non-state institutions involved in this project, as well as the policy dialogue needed to integrated climate resilience in the GoH's plans and investments.

32. Hydro-meteorological services are critical for resilience of a vast array of sectors to climatic shocks. In order to allow sector-specific input in the preparation and implementation of project activities, the Project Coordinator will ensure regular liaison between CNM, SNRE and other key stakeholders of the proposed Project (MDE, CNIGS, CIAT, among others). This technical-level collaboration, which was enhanced by the creation of the "Hydromet Commission", will be expanded to the key end users targeted by the proposed Project or relevant for the sector (CNSA, DPC, and OFNAC). Meetings between these stakeholders, facilitated by the Project Coordinator, will take place on regular basis and will focus on the following tasks, among others: preparation of technical specifications and terms of reference for activities to be implemented under the proposed Project, monitoring of project activities, and coordination with other initiatives.

33. MARNDR would continue to provide strategic oversight to the sector and ensure coordination among the main development partners working with the GoH on hydromet through a multi-stakeholder Steering Committee (Director-level). The Steering Committee was created in early 2014 in the context of the WMO hydromet project and its mandate and membership will be amended to include the strategic oversight of the proposed World Bank-financed hydromet Project. The Steering Committee includes the following government institutions: MARNDR, MDE, CIAT, CNIGS, OFNAC, DPC, and SEMANAH. The Committee is expected to meet twice a year. Greater detail on the proposed Project implementation arrangements is provided in Annex 3.

B. Results Monitoring and Evaluation

34. . The UEP, through its M&E and statistics units will be in charge of monitoring all indicators and providing all relevant data to the Project Coordinator. Component 3 of the proposed Project will strengthen the capacity of the UEP with the recruitment of an M&E specialist who will liaise with CNM and SNRE and will attend regular project coordination meetings. The Project Coordinator will have the overall responsibility for monitoring project performance indicators and report to the Bank semi-annually. The Coordinator will also be

[22] Throughout project preparation, MARNDR has expressed its willingness to merge CNM and SNRE as a first, needed step to rationalize and elevate its hydromet services.

responsible for providing timely input on the SPCR implementation to the national PPCR focal point.

C. Sustainability

35. The creation of the "ad-hoc Inter-Ministerial Commission" tasked with the reorganization of Haiti's hydro-meteorological services as well as the signing of a Memorandum of Understanding between MARNDR and MDE have shown the commitment of the Government to initiate a reform of this sector. Implementation arrangements (using MARNDR services as opposed to creating a new PIU, strategic oversight by a Steering Committee including the main end users, etc.) are expected to consolidate MARNDR's institutional structure, encourage ownership of the proposed Project by all stakeholders involved and, ultimately, increase the sustainability of project's results.

36. During project preparation MARNDR explored the possibility of allocating annual resources to cover operations and maintenance cost of the network. The Bank worked closely with MARNDR and other stakeholders to estimate both investment and operating costs of hydromet services (see Economic Analysis section). This evaluation provided MARDNR for the first time with an estimated cost analysis for hydromet services (roughly US$200,000/year) which is a critical step towards improving its financial planning and making adequate budget allocations.

V. KEY RISKS AND MITIGATION MEASURES

A. Overall Risk Rating Explanation and Explanation of Key Risks

37. Overall project implementation risk is assessed as substantial. Key risks to achieving results and their respective mitigation measures are:

- *Political and Governance*. A transition government was appointed in January 2015 and an electoral schedule has been agreed. However, in the past delays in the holding of elections have exacerbated instability. The Bank will systematically assess risks during implementation and will accordingly adjust the implementation support plan in order to minimize potential disruptions to the Project.
- *Sector Strategies and Policies*. A strategy for sector development and roadmap has yet to be adopted and implemented. In order to mitigate this risk during project implementation, the Bank will continue to work in close coordination with main donors (IDB, EU, WMO) and to help the MARNDR develop its own strategic vision for the reform of hydromet and climate services.
- *Institutional Capacity for Implementation and Sustainability*: In spite of recent positive signs,the future institutional framework of hydromet services and its execution timeline are still being worked out. Therefore, there is a high risk that the institutional fragmentation and overlap between the GoH's institutions in charge of delivering hydromet services as well as the insufficient public financing will persist. The proposed Project will include assistance for institutional reform and sustainable financing

strategies based on international best practices. However, there remains residual risk that cannot be mitigated.

- *Fiduciary*. Fiduciary and M&E responsibilities will rely on MARNDR's services and the creation of a project implementation unit is not envisaged. This is in line with the Bank and main development partners' strategy to use and strengthen MARNDR institutional capacity as needed, increase ownership and move away from a ring-fenced project-based approach. However, based on previous experience with Bank-financed project implemented by MARNDR, fiduciary capacity was identified as a substantial risk. In order to mitigate this risk, project design strategically focused on a few areas of technical assistance and minimized the number of contracts to be processed by the procurement unit. Additionally, the proposed Project will provide technical and human resources assistance to strengthen MARNDR fiduciary units, according to the needs of the proposed Project.

VI. APPRAISAL SUMMARY

A. Economic Analysis

38. Since 2010 Haiti's weather forecast and severe weather warnings are based on models and analysis run abroad (mainly by US NOAA and Meteo France)23. This leaves enormous potential for producing forecasts and warnings better adapted to local conditions, diminishing the loss of lives and assets in this highly climate-vulnerable country. Similarly, there are no seasonal forecasts or timely planting and harvesting advisories adapted to the local conditions/data that could enhance the productivity of farmers, particularly as climate change undermines the predictive value of historical climate knowledge and associated traditional practices. These key services, among others, would be delivered by the hydromet services with support from the World Bank-financed project and the WMO-implemented "Climate Services to Reduce Vulnerability in Haiti". The two projects have been designed in a complementary fashion and generate benefits jointly and over the same timeframe. The World Bank project proposes US$750,000 for investments, US$3.65 million for capacity development and US$600,000 for project management. The parallel project implemented by WMO includes US$1.7 million for investments (including office buildings), US$3 million for capacity development and US$430,000 for project management24.

39. A comprehensive economic analysis confirmed a positive return on investment, with a benefit/cost ratio comprised between 1.6 and 33 over a 15-year timeframe. The proposed Project will enable a rationalization of the various existing hydromet networks which is expected to reduce cost (optimization of logistical costs related to data collection, station distribution and data management) and increase benefits (increase in added value of information for end users). Furthermore, well-functioning, modern early warning systems are expected to reduce losses associated with hydro-meteorological and climate hazards[25].

[23] WMO, Strengthening of Hydrological and Meteorological Services in Haiti, 2010
[24] Project amount in Canadian Dollars (CAD). The indicated amount assumes exchange rate 1 CAD = 0.78 US$.
[25] 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, 2012)

40. **Rationale for Public Sector Provision/Financing.** The proposed Project objective is to strengthen hydromet services through institutional support in several areas, while making sure that services are adapted to end users. In this context, the use of public sector financing is well justified given the value of hydromet data in matters of national importance, such as the protection of the population and their livelihoods from weather related events, including natural disasters. In the past, scattered donor funding, even within various public institutions, has increased fragmentation in hydromet data management (inconsistent and incomplete datasets, lack of a comprehensive spatial approach for data collection, etc) and created a need for organizing and further developing the existing public sector resources.

41. **World Bank Value Added.** The World Bank has experience in supporting institutional reforms and is providing support to broader institutional reform to MARNDR via the Relaunching Agriculture Project II (RESEPAG II) (P126744). The World Bank also has ample global experience in strengthening hydromet services, particularly with institutional and infrastructure improvements, as well as providing the know-how in supporting local government to build ownership. Finally, the World Bank has developed a long-term partnership with the Government of Haiti in areas closely linked with hydromet, including two International Development Association (IDA) financed disaster risk management projects (with commitments totaling US$80 million): the Disaster Risk Management and Reconstruction Project (P126346) and the Emergency Recovery and Disaster Management Project (P090159). The country as has also received technical assistance for risk identification and data management financed by the Global Facility for Disaster Reduction and Recovery (GFDRR).

B. Technical Considerations

42. Several assessments carried out over the past few years contain detailed analysis about the institutional and technical context of Haiti's hydro-meteorological services. The most recent institutional and technical assessments of Haiti's hydromet services which informed the design of the proposed Project were carried out by WMO[26], IDB[27], and the World Bank[28]. Additionally, close monitoring of the institutional reform currently undertaken by the MARNDR with support from IDB contributed to the incorporation of mitigation against potential institutional weaknesses.

C. Financial Management

43. The proposed Project will initially rely on the Financial Management (FM) capacities of the RESEPAG II (P126744) while the Ministry's centralized FM unit is created and operational. Once the FM unit is functioning and the Bank has verified its capacity, the financial management responsibilities of the proposed Project will be transferred there. More details are presented in Annex 3.

D. Procurement

[26] WMO, Strengthening of Meteorological and Hydrological Services in Haiti, 2010
[27] IDB, Rapport d'expertise du Système d'Alerte des Crues en Haïti, 2014
[28] World Bank, Expertise Institutionnelle des Services Hydro-Meteo d'Haiti, 2014

44. MARDNR's centralized procurement unit (UPMP) will be responsible for managing procurement for the proposed Project. Stakeholders which are part Project Steering Committee will provide input for the preparation of technical documentation required for procurement and contract management. The main procurement challenges relate to delays in procurement due to capacity constraints in the UPMP. Even though the procurement unit centralizes all procurement activities of the MARNDR, it is still dependent on project funding, which can be volatile. Component 3 of the proposed Project will support operational capacity of UPMP. Furthermore, the Bank and other donors (e.g. IDB, FAO) will provide training on procurement to UPMP staff via other projects implemented by MARNDR.

45. UPMP prepared a procurement plan for the first 18 months of project implementation. The Operations Manual (OM) will clearly spell out the procurement implementation arrangements, including detailed steps and the respective stakeholders' responsibilities in the procurement process.

E. Social (including Safeguards)

46. The proposed Project's positive social impacts include an increased resilience to weather shocks such as tropical cyclones, wind storms, floods, drought and other hazards as a result of better capacity to monitor and predict weather conditions. The proposed Project is not expected to have any negative social impacts or risks related to social safeguards.

47. The proposed Project will not require involuntary resettlement (OP/BP 4.12) and is not expected to require land acquisition. Infrastructure subcomponents focus on replacements and upgrades of existing structures. Construction of new hydro-meteorological equipment installations will be limited to public lands or buildings where they do not affect users' livelihoods. The Environmental and Social Management Framework (ESMF) includes screening procedures for site selection to prevent the selection of sites that would require involuntary resettlement as defined by OP/BP 4.12.

F. Environment (including Safeguards)

48. The proposed Project has an Environmental Risk Category B investment under the World Bank's Operational Policy on Environmental Assessment (OP/BP 4.01) and has a very low environmental risk. OP/BP 4.01 is the only policy triggered under the proposed Project. The proposed Project will mostly maintain and replace approximately 50 meteorological, agro-meteorological, hydrological, hydro-geological, climatic and marine data collection equipment, focusing on mainly replacements and upgrades. The main potentially negative environmental impact is related to the safe disposal of mercury, often contained in the thermometers of old hydro-meteorological and other such equipment. Possible adverse effects may include exposure to mercury during installation and removal of the equipment, unsafe disposal of mercury containing components, and short terms exposure to minor electromagnetic fields as meteorological information is relayed over a network from the equipment to a central location. These environmental impacts are expected to be localized and minimized through responsive mitigation measures. An Environmental and Social Management Framework (ESMF) has been prepared by the MARNDR and disclosed in Haiti and on the World Bank's external website. The

process to prepare the ESMF included consultations with stakeholders including some land owners and users in and around the sites of already existing equipment. The ESMF addresses: (i) safe disposal/storage of old equipment, in particular, of mercury containing parts such as thermometers, temperature gauges, etc. (ii) the safety of workers involved in the repair or removal of equipment, and (iii) possible exposure to minor electromagnetic fields. The ESMF also addresses potential negative impacts and appropriate procedures to avoid, minimize, and mitigate these impacts. It also contains an Environmental Management Plan section as part of the ESMF which focuses specifically on procedures for safe removal and disposal of mercury. The framework will also be incorporated into the Project's Operations Manual.

G. World Bank Grievance Redress

49. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's corporate Grievance Redress Service (GRS), please visit www.worldbank.org/grs. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

Annex 1: Results Framework and Monitoring

Country: Haiti

Project Name: HT Strengthening Hydro-Met Services (P148259)

Results Framework

Project Development Objectives

PDO Statement							
The Project Development Objective (PDO) is to strengthen the Republic of Haiti's institutional capacity to provide hydro-meteorological and climate information services customized to the needs of the civil protection and agriculture sectors, which contributes to increasing disaster and climate resilience.							
These results are at	Project Level						
Project Development Objective Indicators							
		Cumulative Target Values					
Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Data collected from hydro-met networks are accessible on a centralized online hydro-meteorological data management platform, with its own operating procedures for validation and storage (Yes/No)	No	No	No	Yes	Yes	Yes	Yes
Number of sub-networks feeding into the centralized platform (Number)	0	2	3	4	4	5	5
End users' satisfaction rate towards improved hydromet information services (Percentage)	TBD	TBD	baseline* 1.2	baseline* 1.3	baseline* 1.4	baseline* 1.5	baseline*1.5

End users' satisfaction rate towards improved hydromet information services (gender disaggregated) (Percentage - Sub-Type: Breakdown)	TBD	TBD	baseline* 1.5	baseline* 1.6	baseline* 1.8	baseline* 2	baseline*2
		Cumulative Target Values					
Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	End Target
Number of users and instructors trained on the use of the centralized data platform (Number)	0	0	20	50	70	80	80
Number of users and instructors trained on the use of the centralized data platform (% of women) (Number - Sub-Type: Breakdown)	0	0	0	0	10	20	20
Hydrological and meteorological stations reporting data to the platform in line with agreed SOPs (Number)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Number of Civil Protection Committees using the customized application from the centralized data platform (Number)	0	10	20	30	35	40	40
Operational stations (physical structure) (Number)	TBD	baseline+ 10	baseline+ 25	baseline+ 35	baseline+ 45	baseline+ 50	baseline+50
Number of Departmental Agricultural Directions (DDA) using the customized application from the centralized data platform (Number)	0	2	4	6	8	10	10
Timely submission of project procurement reports (Yes/No)	No	Yes	Yes	Yes	Yes	Yes	Yes
Direct project beneficiaries (Number) - (Core)	0	0	0	0.2 million	0.5 million	1 million	1 million
Female beneficiaries (Percentage - Sub-Type: Supplemental) - (Core)	0	0	0	TBD	TBD	TBD	TBD
Timely submission of financial management reports (Yes/No)	No	Yes	Yes	Yes	Yes	Yes	Yes

Indicator Description

Project Development Objective Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Data collected from hydro-met networks are accessible on a centralized online hydro-meteorological data management platform, with its own operating procedures for validation and storage	Development of data sharing tools. Platform operational and accessible. Contributes to PPCR Core Indicators #2 ("Evidence of strengthened government capacity and coordination mechanism to mainstream climate resilience") and #3 ("Quality and extent to which climate responsive instruments/investment models are developed and tested")	Annual	Project reports	UEP
Number of sub-networks feeding into the centralized platform	Hydromet inter-institutional collaboration. Contributes to PPCR Core Indicator #3 ("Quality and extent to which climate responsive instruments/investment models are developed and tested).	Annual	Project reports	UEP
End users' satisfaction rate towards improved hydromet information services	Satisfaction rate towards improved services for population and farmers (gender-disaggregated) calculated as a percentage of users surveyed. Contributes to PPCR Core Indicator #3 ("Quality and extent to which climate responsive instruments/investment models are developed and tested). This will be assessed through a beneficiary survey which will also assess gender-specific aspects (e.g. access to hydromet information; behavioral impact; etc.). The baseline and end-target will be determined during the first year of implementation.	Mid-term and end of project	Project reports	UEP

End users' satisfaction rate towards improved hydromet information services (gender disaggregated)	Satisfaction rate towards improved services for population and farmers (gender-disaggregated). The baseline and end target will be determined during the first year of implementation.	Mid-term and end of project	Project reports	UEP

Intermediate Results Indicators

Indicator Name	Description (indicator definition etc.)	Frequency	Data Source / Methodology	Responsibility for Data Collection
Number of users and instructors trained on the use of the centralized data platform	Capacity to use the data system. Contributes to PPCR Core Indicator #2. ("Evidence of strengthened government capacity and coordination mechanism to mainstream climate resilience")	Annual	Project reports	UEP
Number of users and instructors trained on the use of the centralized data platform (% of women)	Capacity to use the data system, percentage of women. The baseline will be determined during the first year of implementation. Contributes to PPCR Core Indicator #2.	Annual	Project reports	UEP
Hydrological and meteorological stations reporting data to the platform in line with agreed SOPs	Number of stations feeding standardized raw data into the platform. Contributes to PPCR Core Indicator #3 ("Quality and extent to which climate responsive instruments/investment models are developed and tested). The baseline and end target will be determined during the first year of implementation.	Annual	Project reports.	UEP
Number of Civil Protection Committees using the customized application from the centralized data platform	Contribution to the security of goods and people. Even though the full fledge data platform will only be operational in 2018, it is expected that already available data sharing platforms (e.g. Geonode) will be used for consolidating datasets available	Annual	Project reports.	UEP

	and start improving the services to both civil protection and agriculture users in the short term. Contributes to PPCR Core Indicator #4 ("Extent to which vulnerable households, communities, businesses and public sector services use improved PPCR supported tools, instruments, strategies and activities to respond to climate variability or climate change")			
Operational stations (physical structure)	Number of stations. Improvement of observation and communication infrastructure. Contributes to PPCR Core Indicator #2 ("Evidence of strengthened government capacity and coordination mechanism to mainstream climate resilience"). The baseline will be determined during the first year of implementation. The end target is the baseline +50.	Annual	Project reports.	UEP
Number of Departmental Agricultural Directions (DDA) using the customized application from the centralized data platform	Contribution to food security. Contributes to PPCR Core Indicator #4 ("Extent to which vulnerable households, communities, businesses and public sector services use improved PPCR supported tools, instruments, strategies and activities to respond to climate variability or climate change")	Annual	Project reports.	UEP
Timely submission of project procurement reports	Monitoring of fiduciary and coordination capacities.	Quarterly	Project reports.	UEP
Direct project beneficiaries	Direct beneficiaries are people or groups who directly derive benefits from an intervention (i.e., children who benefit from an immunization program; families	Annual	Project reports. The Operation Manual will detail how this indicator will be	UEP

	that have a new piped water connection). Please note that this indicator requires supplemental information. Supplemental Value: Female beneficiaries (percentage). Based on the assessment and definition of direct project beneficiaries, specify what proportion of the direct project beneficiaries are female. This indicator is calculated as a percentage.		computed.	
Female beneficiaries	Based on the assessment and definition of direct project beneficiaries, specify what percentage of the beneficiaries are female.	Annual	Project reports.	UEP
Timely submission of financial management reports	Monitoring of fiduciary and coordination capacities.	Quarterly	Project reports	UEP

Annex 2: Detailed Project Description

HAITI: Strengthening of Hydro-Meteorological Services Project

Component 1. – Institutional strengthening of the hydro-meteorological services and development of data management tools *(US$3 million)*

1. **Institutional strengthening, capacity building, and partnership development**: This sub-component aims to strengthen institutional capacity of the hydro-meteorological services, its technical capacity, and its financial sustainability. It complements an ongoing operation supported by the World Meteorological Organization (WMO). It also builds on an IDB-financed project which supports the broader institutional reform of the MARNDR[29], including resource management; human resources; monitoring and evaluation; and the rationalization of the ministry's directorates and decentralized structures. The MARDNR reform plan and roadmap were adopted in February 2014. The WMO implemented project (financed by Canada) supports the modernization of the National Center for Meteorology (CNM) and National Service for Water Resources (SNRE), and provides basic infrastructure (co-located office venue for meteo and water services of MARNDR) and technical training for the delivery of core hydro-meteorological services. The list of activities included under the WMO project and the synergy with the Bank hydromet project is presented at the end of this Annex.

- *Long-term strategy based on sustainable financing and staffing model*: Building on and expanding the institutional support provided via the WMO project, this activity will provide the technical assistance needed to gradually evolve from the current scenario (six hydro-meteorological networks managed by five government entities without adequate capacity) towards one national entity coordinating the development, operation and maintenance of all hydrometeorological services. This will require mobilization of technical assistance (public sector and hydro-met experts) and sharing of experience from countries having addressed similar challenges. This includes *inter alia*: supporting dialogue between MARNDR and MDE to better define their respective roles and responsibilities with regards to hydromet and climate services; deepening the dialogue with main end users and implementing the institutional reform emerging from this process; formulating and promoting data sharing procedures across Government actors based on an *open data* approach.

- *Training and knowledge exchange programs for capacity development in hydromet data management*: This activity will provide the necessary training (both in Haiti and abroad) on hydro-met data management to both producers and users to allow for an optimal use of hydro-meteorological networks. Training will follow curricula and guidelines provided by the WMO and will include, among others: harmonized data management practices for different sensors, validation protocols, backup arrangements and data sharing policies, as well as equipment maintenance and calibration. It is expected that the WMO will focus on sector specific training (forecast, flood monitoring, etc.), while the Bank financed project will focus on strengthening data management, maintenance and repair of stations as well as IT/communication equipment for the new SNRE-CNM joint office facility.

[29] Finance, Health, and Agriculture are the three Ministries in the GoH piloting an institutional reform.

- *Development of applications and applied research programs*: This activity aims to strengthen Haiti's research community and strengthen its linkages with climate resilience practitioners. In particular, the proposed Project will support about 40 Master/PhD students and/or young professionals to carry out field work thus improving data hydro-meteorological and climate data collection/management. This will contribute to the generation and dissemination of new scientific knowledge in the field of climate resilience in Haiti.

2. **Strengthening inter-institutional data sharing and coordination:** This sub-component aims to integrate existing data collection networks into one single data platform, shared across several ministries, government agencies and other end users. Minimal requirements for data collection networks will be determined in relation to the needs of different end users.

- *Development of a central data platform for integration of data from all existing hydro-met stations*: The first step of the integration process is an exhaustive geo-referenced mapping of water level, piezometric, agro-meteorological, weather, climate and marine stations. This assessment will specify location, technical specifications and working conditions for each of the data-collecting stations. The second step will be to develop a proposal for an optimal network (based on the country-wide assessment completed) which would meet priority national needs while taking into account the maintenance and operational budget. The third step will be to define the overall architecture and the technical specifications of a centralized platform capable to gather data from all existing sensors. The hardware will be designed to ensure reliability in extreme weather conditions, and observers (staff) will allow semi-automatic collection of manual observations (e.g. entering data via SMS, GPRS and any other technologies that may become available). The fourth step will be the development of standard operating procedures for equipment calibration, quality control and data validation processes, to ensure harmonized acquisition of data from networks initially designed for specific purposes. These procedures will be based on an *open data* approach, which allows free access to "raw" hydro-met and climate data in order to catalyze development of end-user applications. The proposed Project will support the development of and training on standard operating procedures (collection, verification, interpretation) for managing hydro-meteorological equipment and data.

- *Development of specialized interfaces based on a geographical information system responding to users' requirements*: A number of software interfaces will be developed for select end users, in order to allow them access to hydrometeorological information. Targeted uses include, inter alia: (i) civil protection (under the leadership of DPC), (ii) agriculture (under the leadership of CNSA and the DIA). It is expected that once these first two interfaces will be operational, additional interfaces could be developed at marginal cost for other sectors, such as infrastructure design, aviation, maritime services, and public health.

- *Training on use and maintenance of online data management platform (including specialized interfaces)*: Data producers contributing to the national platform as well as users of the data interfaces will receive customized support to integrate the tool into their decision making processes. This support will involve specific guidance with user manuals, face-to-face trainings and a stand-by "help desk" available to assist as needed.

- *Optimization of the hydro-meteorological networks (repairs, replacement and maintenance of equipment)*: The baseline assessment of weather and hydrological stations will provide a clear picture of the state of the network and will indicate where repair /replacement of equipment is needed the most, in order to provide optimal services for different users (civil protection, agriculture/food security, and public works). The proposed Project will repair, replace or upgrade about 50 stations (meteorological, agro-meteorological, hydrological, hydro-geological, climatic and marine) country wide. In addition, specific algorithms will be developed to enable a geospatial interpolation of critical parameters using field data in conjunction with data from remote sensing (e.g. satellite). The proposed Project budget will only support repair, upgrade, calibration, and replacement of equipment, while operation and maintenance cost will be supported by the Government.

- *Inter-ministerial coordination of the hydromet platform (MARNDR, CIAT, MDE, CNIGS and end users)* (provided in–kind by the Government): the MARNDR, via the Project Coordinator, will facilitate a multi-stakeholder management of the platform and allow interactions between the data producers and users. These stakeholders will provide critical input on issues including: management of the platform, IT solutions and architecture for data management, systematic review of hydro-met and climate applications based on end-user feedback, etc. These consultations will not receive direct support from the proposed Project; however they will be assisted by consultants involved in the project implementation as needed.

Component 2. – Identify hydro-meteorological and climate services' requirements for select end users and developing information services to support decision making (US$1.4 million)

- *Scoping hydro-meteorological requirements of user groups (parameters, spatial resolution, frequency of updates, format of service delivery and bulletins, dissemination channels)*: The clear understanding of user groups' requirements is critical to design the optimal hydro-meteorological networks and develop customized services. In line with recommendations from the Global Framework for Climate Services, the scoping of requirements will involve a long-term process, with a continuous user feedback mechanism, including following major events. Two priority sectors are targeted, namely disaster risk management (civil protection) and agriculture. Other sectors will be able to engage in similar exercises through the WMO project, and will benefit from a joint methodological framework and from possible economies of scale. It is anticipated that some feedback from users will require adjustments in data managements processes and this sub-component will include support for rapid updates and improvements to the system.

- *Update and implement operating procedures for optimal use of hydro-meteorological services for agriculture (agro-meteorological information services)*: In Haiti, the agriculture sectors employs a little more than 1,000,000 individuals having on average 1.5 ha of land. Through this activity the proposed Project will target enhanced availability and accessibility of hydro-meteorological information in order to contribute to: (i) improvements to production and (ii) averted losses to production. More specifically, building on the data

platform and the dedicated interface (Component 1), the proposed Project will pilot an information service for farmers, designed following the specific requirements expressed by users from the agricultural community, including food security stakeholders. The pilot will support existing institutions (primarily MARNDR and CNSA) in the delivery of information services to vulnerable populations, along with their existing mandate, possibly through synergies with ongoing agriculture projects such as the Bank-financed RESEPAG II (P126744), USAID-financed Feed the Future, etc. Recommendations and best practices from the WMO "Guide to Agricultural Meteorological Practices" will be used. An international agro-meteorological expert will support the development of the standard operating procedures and the piloting of their application in target zones, and the sub-component will also support logistical cost related to the participation of users and civil servants in pilots.

- *Update and implement operating procedures for optimal use of hydro-meteorological services for civil protection:* This activity will develop or update procedures for optimal use of hydro-meteorological services for the triggering of early warnings, and for civil protection activities during and in the aftermath of emergencies. A pilot service will identify specific parametric thresholds for select high-risk zones, in order to enable use of the hydro-meteorological data platform as a decision support mechanism for the activation of warnings by competent authorities. Services and procedures will be designed in order to respond to specific requirements expressed by user groups from the civil protection and humanitarian communities. Data will be drawn from the platform and via the customized interface (Component 1). An international early warning system expert will support the development of the standard operating procedures and the piloting of their application in specific zones, and the sub-component will also support the participation of users and civil servants in the pilots.

- *Update the probability of occurrence for selected hazards in order to enable mainstreaming climate variability and change into development processes and infrastructure design*: The probability of occurrence (return period) for extreme events in Haiti have been estimated decades ago, and the intensity and frequency of some hazards such as flooding, wind storm and storm surge have evolved over time in relation with urbanization, degradation of ecosystems and climate change. The proposed Project will update the official return periods for priority hazards, in order to facilitate the design of infrastructure and planning of development processes. Stakeholders contributing to hazard monitoring, development planning and infrastructure design will be invited to take part in the process, with support provided for their participation on field sites. The process will be guided by an international expert in risk evaluation and mapping, and will lead to updated hazard maps for flooding, storm surge, extreme precipitation and extreme winds.

Component 3. - Support to project implementation, monitoring and evaluation, and PPCR knowledge management *(US$0.6 million)*

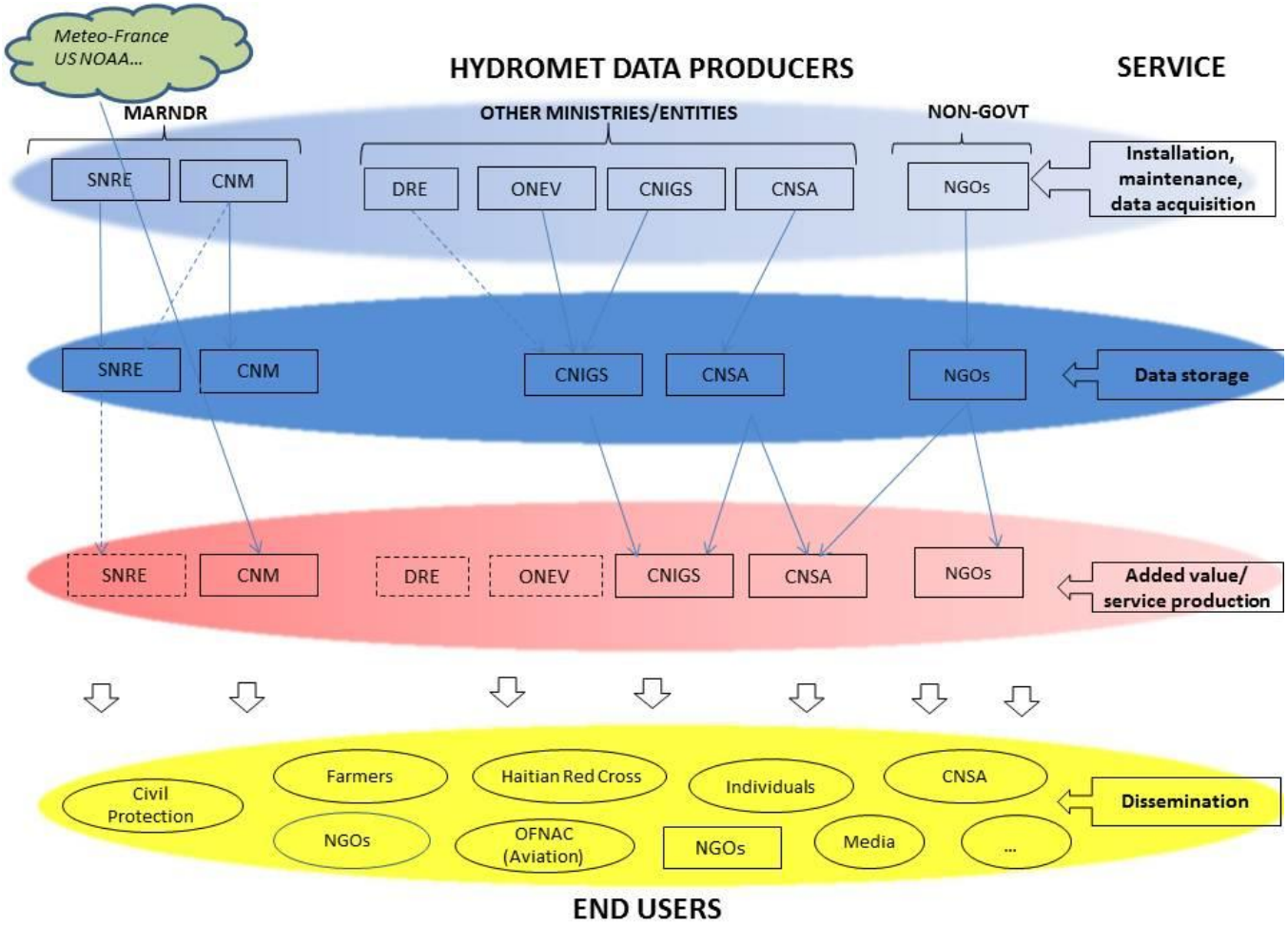
3. **Strengthening MARNDR capacity to comply with Bank fiduciary, safeguard, and M&E procedure and ensure effective and timely implementation of project activities.** This will include the recruitment of a project Coordinator in charge of day-to-day project

management, additional human resources, and financing of operating costs. As the proposed Project will rely on MARNDR fiduciary, safeguard, and M&E services, this sub-component will provide additional capacity where needed and the financing of operating costs. A project coordinator will be recruited to ensure a smooth implementation of activities and regular liaising with the proposed Project partners. For monitoring and evaluation, a full time M&E specialist will be hired in support of the MARNDR's *Unité d'Études et de Programmation* (UEP). The incumbent will liaise regularly between CNM and SNRE on the one hand and UEP and *Unité Informatique et Statistique* (UIS) on the other hand.

4. **Supporting MARNDR M&E capacity and PPCR knowledge management.** The M&E specialist financed through the proposed Project will strengthen MARNDR's capacity to monitor and report progress on the project-level results of the SPCR (in coordination with CIAT). Special attention will be paid to distilling learning and knowledge from the proposed Project and sharing them across the PPCR national and regional partners, including the Caribbean Community Climate Change Centre (5C). This will include, among others, leveraging the hydromet data platform (Component 1) as well as the end user interface (Component 2) across other PPCR projects in Haiti as well as the Caribbean Regional PPCR program.

***Synergies between World Bank-financed and WMO hydromet projects*:** Close coordination with the main development partners (in particular: IDB, EU, WMO, USAID, UNDP) already involved in Haiti's hydromet sector took place throughout project preparation. In particular, MARNDR ensured a synergy between the Bank and the WMO Hydromet Projects, as they will be implemented in parallel. Both projects take an integrated sector-wide approach and engage the Government on focusing on sustainability, maintaining the data collection and management systems and retaining qualified staff. In particular, the WMO project focuses on: (i) building a joint office facility to host SNRE and CNM; and (ii) expanding CNM capacity for specialized forecasting operations. The Bank project provides assistance to: (i) strengthen CNM and SNRE and support the evolution towards a new institutional and financing model; (ii) improve service delivery, primarily for food security/agriculture and civil protection.

Figure 1: Current institutional landscape for hydromet services in Haiti[30]



[30] The dashed line refers to roles and processes that exist in principle but are not carried out *de facto*.

Figure 2: Overview of project activities and costs

Component	Sub-Component	Activity	Component cost	Total project cost
1. Institutional strengthening of the hydro-meteorological services and development of data management tools	1.1. - Institutional strengthening; capacity and partnership development	1.1.1.- Long-term strategy based on sustainable financing and staffing model	USD 3,000,000	USD 5,000,000
		1.1.2.- Training and knowledge exchange programs for capacity development in hydromet data management		
		1.1.3. - Development of applications and applied research programs		
	1.2. - Strengthening inter-institutional data sharing and coordination	1.2.1. – Development of a central data platform for integration of data collected from all stations		
		1.2.2. - Development of customized user interfaces		
		1.2.3. - Training and support on the use of the information platform		
		1.2.4. - Optimization of the hydrological and meteorological network (repairs, replacement and maintenance of equipment) + *government co-financing for maintenance*		
		1.2.5. – Inter-ministerial coordination of the hydromet platform (MARNDR, CIAT, MDE, CNIGS and users) - *government co-financing*		
2. Identify hydro-meteorological and climate services' requirements for select end users and developing information services to support decision making		2.1. – Systematically scope needs for end-user groups (parameters, spatial resolution, frequency of data updates, required format for access, dissemination channels)	USD 1,400,000	
		2.2. - Update and implement operating procedures for the use of hydromet services for agricultural and food security purposes (agri-met information services)		
		2.3. - Update and implement operating procedures to ensure that hydromet services contribute to Early Warning Systems (EWS) at the level of the Civil Protection		
		2.4. - Update return period of selected hazards in order to enable mainstreaming climate variability and change into development processes and infrastructure design		
3. Support to project implementation & PPCR knowledge management	3.1. – Support to project implementation (coordination, monitoring and evaluation, procurement, financial management, safeguards, communication)		USD 600,000	
	3.2 - Supporting MARNDR M&E capacity and PPCR knowledge management			

Annex 3: Implementation Arrangements

HAITI: Strengthening of Hydro-Meteorological Services Project

Project Institutional and Implementation Arrangements

Project administration mechanisms

1. The proposed Project will be implemented by MARNDR, who will have responsibility for reporting fiduciary and overall project progress to the Ministry of Finance and the World Bank. MARNDR services for meteorology and hydrology, currently split between CNM and SNRE respectively, will be the main technical counterparts of the proposed Project. A project coordinator, to be hired through the proposed Project, will be responsible for the successful implementation of all the proposed Project's activities and will facilitate the institutional strengthening process. S/He will report to the Director General (DG) of the MARNDR. Should SNRE and CNM merge into a single hydro-meteorological Unit during the proposed Project timeframe[31], the Project Coordinator will be reporting to the Unit's Director.

2. Fiduciary and M&E responsibilities will rely on MARNDR's services and the creation of a project implementation unit is not envisaged. This is in line with the Bank and main development partners' strategy to use and strengthen MARNDR institutional capacity as needed, increase ownership and move away from a ring-fenced project-based approach. MARNDR's centralized procurement unit (*Unité de Passation des Marchés Publics*, UPMP) will carry out all procurement for the Project-financed activities. The proposed Project will initially rely on the Financial Management (FM) capacities of the Bank-financed RESEPAG II project, while the capacity of the MARNDR FM unit is strengthened. Once the MARNDR FM unit is fully operational, the fiduciary responsibility of the proposed Project will be transferred to MARNDR. M&E responsibilities for the proposed Project will lie with the Planning and Studies Unit (UEP) of the MARNDR, who will have a dedicated staff (financed by the proposed Project) liaise regularly between the hydro-meteorological units and the other stakeholders of the proposed Project. More details on fiduciary arrangements can be found in Section 2 of this Annex.

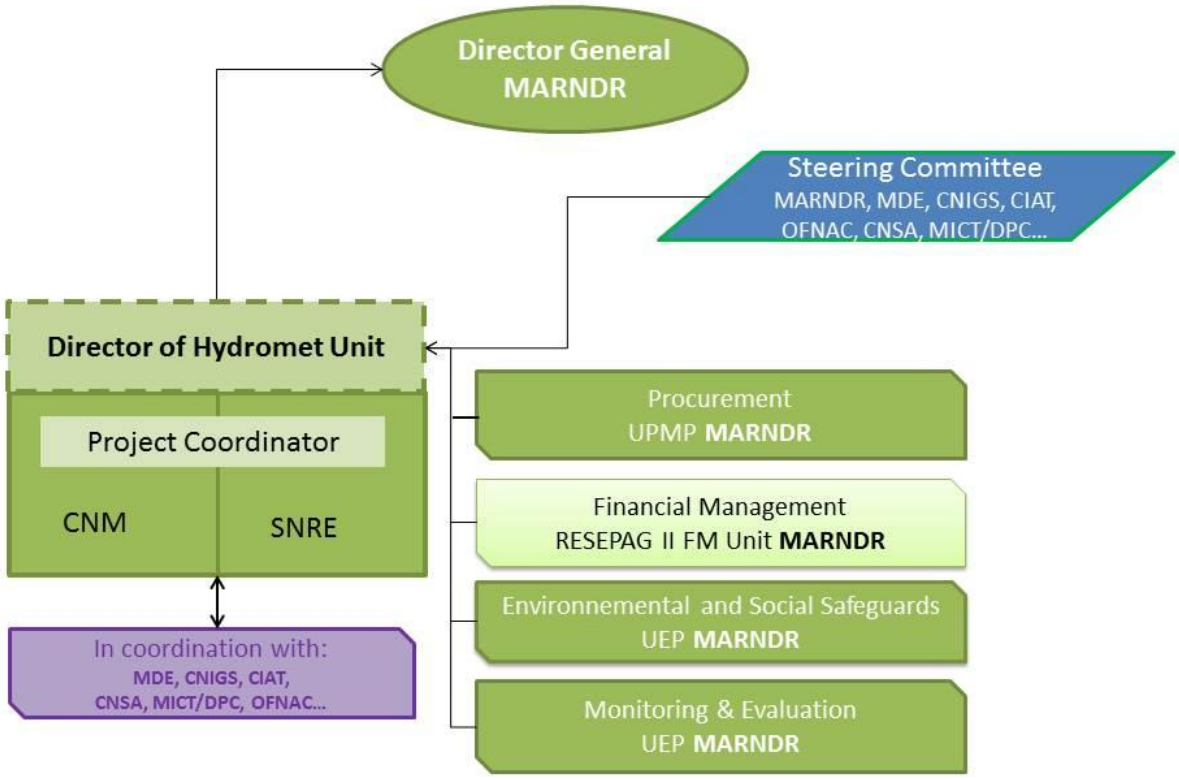
3. Hydro-meteorological services are critical for resilience of a vast array of sectors to climatic shocks. In order to allow sector-specific input in the preparation and implementation of project activities, the Project Coordinator will ensure regular liaison between CNM, SNRE and other key stakeholders for the proposed Project (MDE, CNIGS, CIAT, among others). This technical-level collaboration, which was enhanced by the creation of the "Hydromet Commission", will be expanded to the key end users targeted by the proposed Project or relevant for the sector (CNSA, DPC, OFNAC). Meetings between these stakeholders, facilitated by the Project Coordinator, will take place on regular basis (once a month or as needed) will focus on the following tasks, among others: preparation of technical specifications and terms of reference

[31] During several meetings taken place throughout project preparation, MARNDR has expressed its willingness to merge CNM and SNRE as a first, needed step to rationalize and elevate its hydromet services.

for activities to be implemented under the proposed Project, monitoring of project activities, coordination with other initiatives, etc.

4. MARNDR would continue to provide strategic oversight to the sector and ensure coordination among the main development partners working with the GoH on hydromet through a multi-stakeholder Steering Committee (Director-level). The Steering Committee was created in early 2014 in the context of the WMO hydromet project and its mandate will be amended to include the supervision of the World Bank hydromet project. The Steering Committee includes the following government institutions: MARNDR, MDE, CIAT, CNIGS, DPC, OFNAC, SEMANAH. The Committee is expected to meet twice a year.

Figure 3: Project reporting structure



5. The proposed Project will be implemented in accordance with the Project Appraisal Document (PAD), the Operations Manual (OM), which will be prepared prior to grant effectiveness, and reflected in all associated legal agreements. The OM includes: (i) a detailed description of project components; (ii) a funds operating manual; (iii) implementation arrangements and agreed guidelines for different project components; (iv) detailed project cost estimates; (v) the procurement plans; (vi) the Environmental and Social Management Framework (ESMF) and (vii) guidelines for PPCR M&E and reporting. The OM will be amended

periodically, to incorporate adjustments during project implementation in agreement with the Bank.

6. **PPCR Coordination and Reporting.** CIAT will remain the Bank's main counterpart for the Haiti SPCR as a whole, ensuring coordination between the Hydromet Project and the Haiti SPCR as well as coordination among the different investment projects (see Annex 8). The Project Coordinator, assisted by MARNDR UEP services, will have the responsibility of providing regular updates to CIAT, who is responsible for reporting on behalf of the GoH to the Climate Investment Funds (CIFs) on implementation of the SPCR. As described in the SPCR, CIAT will facilitate the coordination among different state and non-state institutions involved in the SPCR, as well as the policy dialogue needed to integrated climate resilience in the GoH's plans and investments.

Financial Management, Disbursements and Procurement

Financial Management Responsibilities

7. As indicated, the overall financial responsibilities will rely on MARNDR's existing capacity. This is in line with the strategy of the Bank and other main development partners to use and strengthen MARNDR institutional capacity, increase ownership and move away from a project-based approach. The proposed Project will initially rely on the Financial Management (FM) capacities of the RESEPAG II (P126744) while the Ministry's centralized FM unit is created and operational. Once the FM unit is functioning and the Bank has verified its capacity, the financial management responsibilities of the proposed Project will be transferred there. In order to maintain adequate FM arrangements to handle the activities generated by the proposed Project, MARNDR agreed to undertake the actions detailed below:

(i) Appoint a short term FM consultant on a part time basis, given the additional workload created by the grant;
(ii) Review the roles and responsibilities of FM staff to accommodate the additional workload;
(iii) Train the FM staff in Bank's FM policies and norms, mainly for the Chief Accountant;
(iv) Calibrate the SYSCOP accounting software to enable its use for the proposed Project and provide continued training to accounting staff;
(v) Within four months of grant effectiveness, include the audit of the proposed Project's financial statements in the existing audit contract under the RESEPAG II (P126744) project, based on TORs acceptable to the Bank.

8. The proposed FM arrangements at the MARNDR for the proposed Project meet the minimum fiduciary requirements under OP/BP10.00. More details on implementation arrangements are detailed below:

9. **Staffing.** The FM functions of the MARNDR are under the responsibility of the Project's Coordinator to whom the Accounting Unit reports. The Accounting Unit is composed of a Chief Accountant and an accountant with appropriate qualifications and experience. As the Chief Accountant has relatively limited experience with Bank-financed projects, some initial training

of the FM staff will be necessary. A review of the existing workload of the finance and accounting team was performed and it was agreed that a short-term financial management consultant would be recruited to strengthen the team on a part-time basis for a short period.

10. **Budgeting Process.** The budget process will be clearly stipulated in the administrative, financial and accounting procedures manuals. Annual budgets and work plans will be coordinated and prepared by the accounting unit and submitted to the Bank for its no-objection at the beginning of the fiscal year and any changes in the budget and work plans will also be submitted to the Bank on a no-objection basis.

11. **Accounting Policies and Procedures.** The proposed Project will use Cash Basis Accounting for preparation of the Project's semi-annual interim financial statements and audited annual financial statements, in accordance with the International Public Accounting Standards (IPSAS) and the national Accounting Standards.

12. The Project's Operations Manual (OM) will contain a financial management section, which will include appropriate accounting policies and financial reporting procedures. The FM capacities at the RESEPAG II PIU will continue to review the current policies and procedures and the detailed systems of internal control and determine if any additional control measures need to be implemented for the proposed Project. The draft OM will be subject to review and acceptance by the World Bank and will be finalized prior to effectiveness.

13. **Accounting System.** The MARNDR has computerized accounting software (SYSCOP) which is multi-users and using cloud computing solutions provided by Google. SYSCOP is multi-currency and allows managing a practically unlimited number of donors and projects separately. The World Bank is already recorded as a donor and an additional project code and chart of accounts can easily be set up for the Strengthening Hydro-meteorological Services Project in order to keep track and report on the proposed Project expenditures in accordance with the Bank's financial management requirements. These requirements have already been met for RESEPAG I and RESEPAG II (P126744) projects. However, some technical adjustments are needed to allow generating complete interim unaudited financial reports (IFRs) in a format acceptable to the Bank.

14. **Internal Controls and Internal audit.** The MARNDR will maintain its strong system of internal controls and procedures that will be documented in the OM.

15. **Reporting arrangements.** IFRs are regularly prepared and transmitted to the World Bank, though with delays. Under the proposed Strengthening Hydro-meteorological Services Project, the MARNDR will prepare and transmit semi-annual IFRs to the World Bank. The IFRs will be submitted to the Bank no later than forty-five (45) days after the end of the semester.

16. **Auditing Arrangements.** RESEPAG I (P113623) and II (P126744) projects' financial statements have been regularly audited. The audit opinions for the RESEPAG II project for the fiscal year ending September 30, 2013 did not raise any material issues. The RESEPAG II audit report for the fiscal year ending September 2014 was received and deemed acceptable by the

World Bank at the end of April 2015. The Strengthening Hydro-meteorological Services Project will follow the same auditing requirements that the RESEPAG II project has:

(i) Annual audited financial statements of the proposed Project will be transmitted to the World Bank not later than six (6) months after the end of each recipient's fiscal year. The auditors will issue a single opinion on the financial reports prepared by MARNDR.
(ii) The external audit will be undertaken by a private firm selected in accordance with independence and competency criteria acceptable to IDA.

17. It will be agreed that the current audit contract under the RESEPAG II project will be amended to include the audit of Strengthening Hydro-meteorological Services Project's financial statements, to avoid multiple external auditors for the Bank-financed projects managed by a same entity.

18. **Disbursement Arrangements and Flow of Funds.** The primary disbursement methods will be Advances and Direct Payments. Reimbursements and Special Commitments will also be made available. To facilitate timely disbursements for the proposed Project's eligible expenditures, the Recipient, through the MARNDR will open and operate a segregated Designated Account (DA) in US$ at the central bank (*Banque de la Republique d'Haïti /BRH*). Subsequently, another account denominated in Haitian Gourdes (HTG) will be opened at BRH and will also be managed by the MARNDR to process payments. The MARNDR will be responsible for the appropriate accounting of the funds deposited into the designated accounts, for reporting on the use of these funds and for ensuring that they are included in the audits of the financial statements. Ceiling of the DAs and the Minimum Application size for Direct Payment or Special Commitment will be communicated in the Disbursement Letter.

19. Summary Sheets with Records and Statements of Expenditures (SOE) will be required for documenting eligible expenditures and reimbursements to be paid by the DAs. Direct Payments will be documented by Records. Applications documenting the advances to the DAs will be made on a quarterly basis.

20. SOE limits for expenditures against contracts for works; goods**;** consultant services for consulting firms; and individual consultant services will be determined in the Disbursement Letter. Documentation supporting expenditures claimed against SOEs will be retained by the implementing agency and will be available for review when requested by the World Bank supervision missions and the proposed Project's auditors.

21. The proposed Project will have a Disbursement Deadline Date (final date on which the World Bank will accept applications for withdrawal from the Recipient or documentation on the use of Grant proceeds already advanced by the World Bank) of four months after the Closing Date of the proposed Project. This "Grace Period" is granted in order to permit orderly project completion and closure of the Grant account via the submission of applications and supporting documentation for expenditures incurred on or before the Closing Date. Expenditures incurred between the Closing Date and the Disbursement Deadline Date are not eligible for disbursement, except as otherwise agreed with the World Bank. All documentation for expenditures submitted for disbursements will be retained at the MARNDR during the lifetime of the proposed Project

and be made available to the external auditors for their annual audit, and to the World Bank and its representatives if requested. After project closing, the relevant documentation will be retained for two years, following the Government's regulations on record keeping and archiving. In the event that auditors or the World Bank implementation support missions find that disbursements made were not justified by the supporting documentation, or are ineligible, the World Bank may, at its discretion, require the Recipient to: (i) refund an equivalent amount to the World Bank, or (ii) exceptionally, provide substitute documentation evidencing other eligible expenditures.

22. Before the World Bank closes the Grant account (two months after the Disbursement Deadline Date), the Recipient must provide supporting documentation satisfactory to the World Bank that shows the expenditures paid out of the DA, or refund any undocumented balance. If the Recipient fails to provide the documentation or refund required by the World Bank by this date (two months after the Disbursement Deadline Date), the World Bank does not permit the use of the DAs under new Grants/Credits made to or guaranteed by the Recipient.

23. **Supervision Arrangements.** As part of the proposed Project supervision missions, risk-based FM supervisions will be conducted every six months. These will pay particular attention to: (i) project accounting and internal control systems; (ii) budgeting and financial planning arrangements; (iii) review of IFRs; (iv) review of audit reports, including financial statements, and remedial actions recommended in the auditor's Management Letter; and (v) disbursement management and financial flows. FM supervision will pay particular attention to any incidences of corrupt practices involving project resources for project implementation.

24. **Procurement Arrangements.** Procurement for the proposed project will be carried out in accordance with the World Bank Guidelines*: Procurement of Goods, Works, and Non-Consulting Services under IBRD Loans and IDA Credits & Grants* dated January 2011, revised July 2014 and *Guidelines: Selection and Employment of Consultants under IBRD Loans & IDA Credits & Grants by World Bank Borrowers* dated January 2011, revised July 2014 and the provisions stipulated in the Financing Agreement. For each contract to be financed by the proposed Project, the different procurement methods or consultant selection methods, the need for prequalification, estimated costs, prior review requirements, and time frame are agreed between the Recipient and the Bank in the Procurement Plan. The Procurement Plan would be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity.

25. **Assessment of the agency's capacity to implement procurement.** Procurement activities for the proposed Project will be executed by the newly created Procurement Unit in the MARNDR called "Unite de Passation des Marches Publics" (UPMP). Since May 2014, all the procurement specialists of the MARNDR are gathered within the UPMP. This unit is headed by a seasoned professional and comprises 11 staff. While the procurement performance of the Ministry under the RESEPAG has been modest, based on a preliminary assessment the UPMP appears to be able to manage procurement under the proposed Project. The creation of this unit is a positive move forward and the country development partners are working together with the aim of strengthening and developing the capacity of this unit. Thus the Bank, in the context of the RESEPAG restructuring, has agreed to support the MARNDR to:

(i) Finance an additional procurement specialist and an archivist;
(ii) Harmonize standard bidding documents (SBD) for national competitive bidding, the Bank is willing to accept the use of existing document that are acceptable;
(iii) Revisit the Ministry internal procedures with the aim of streamlining procedures and clarifying responsibility;
(iv) Organize and finance short procurement training based on findings of prior review and post procurement reviews;

As the Public Procurement System in Haiti remains relatively weak, despite procurement reforms undertaken during the last decade, the overall project risk for procurement is substantial.

26. **Procurement Plan, Thresholds for Procurement Methods and Bank Review**. The summary procurement plan for implementation of the proposed Project was agreed between the Recipient and the Bank on December 10, 2014 and is presented below in Table 1. The plan will be updated at least annually or as required to reflect the actual project implementation needs and improvements in institutional capacity. The recommended thresholds for the use of the procurement methods and prior review specified in the Financing Agreement are identified in Table 2 below. These thresholds, as well as the requirement for IDA prior review of the contracts, are common to World Bank projects in Haiti, and have served as the basis for the agreed procurement plan. Supervision of procurement will be carried out primarily through prior review supplemented by supervision missions at least twice a year.

Table 1: Summary Procurement Plan

Ref. No.	Description	Estimated Budget US$	Procurement Method	Bank Review method	Domestic Preference (Yes/No)	Expected Bid-Opening Date	Comments
1	**WORKS**	**0**					
1.1		**0**					
2	**GOODS & NON-CONSULTANT SERVICES**	**2,631,000**					
2.1	Consultant firm for the supply (Hardware and software) and installation of the Hydromet data platform	2,631,000	ICB	Prior	No	31-Jan-18	Management services contract within two-stage bidding based upon capabilities and resources of prospective eligible hydromet firms to perform the particular contract satisfactorily
3	**SERVICES**	**1,745,000**					
3.1	Consultant Firm for the design and Supervision of the hydromet data platform	850,000	QCBS	Prior	No	1-Mar-16	
3.2	Consultant firm for development of applications for enhanced monitoring and forecasting of hazards and impacts	320,000	QBS	Ex-Post	No	31-Jan-18	
3.3	Financial Audit of the project	50,000	QCBS	Prior	No	31-Jan-16	
3.4	Individual Consultant Project Coordinator	260,000	IC	Prior	No	31-Aug-15	Local consultant
3.5	Short term individual consultants to provide technical assistance to the project coordination	67,000	IC	Prior	No	31-Jan-16	Local consultant
3.6	Individual consultant to provide UEP staff with technical assistance for M&E (including during mid term and final evaluation of the project)	87,000	IC	Prior	No	31-Jan-18	Local consultant
3.7	Individual consultants to strengthen the RESEPAG fiduciary unit in charge of the Hydromet Project	90,000	IC	Ex-Post	No	31-Aug-15	Local consultant
3.8	Consultants to provide UEP staff with technical assistance to comply with safeguard instruments	21,000	IC	Ex-Post	No	31-Aug-15	Local consultant
4	**OPERATING COSTS**	**624,000**					
4.1	Operating costs, field trips, transportation, workshops, seminars	624,000	N/A	Ex-Post	No	N/A	Operating Costs, Transportation, workshops, seminars
	TOTAL	**5,000,000**					

Table 2: Thresholds for Procurement Methods and Prior Review

Expenditure Category	Contract Value (US$ Thousands)	Procurement Method	Contracts subject to Prior Review (US$ Thousands)
1. Goods, non-consulting services	>500	ICB	≥150
	≤500	NCB	≥150
	≤50	Shopping	None
2. Consultants	> 200	QCBS, QBS, FBS, LCS	≥50
- 2.A Firmes nationales	≤300	CQS	≥50
	Regardless of Value	Single Source	All
- 2.B Individuals	Regardless of value	Comparison of 3 CVs in accordance with Chapter V of the Guidelines	>50,000 and some key missions

Abbreviations:

ICB = International Competitive Bidding
QCBS = Quality- and Cost-Based Selection
NCB = National Competitive Bidding
QBS = Quality-Based Selection
DC = Direct Contracting
FBS = Fixed Budget Selection
LCS = Least-Cost Selection
CQS = Selection Based on Consultants' qualifications
IC = Individual Consultant

Environmental and Social (including safeguards)

27. **Social.** There are no social safeguards triggered under this project. The Environmental and Social Management Framework (ESMF) contains screening procedures to ensure that infrastructure works will not result in involuntary resettlement as defined by OP/BP 4.12.

28. **Environmental and Social Management Framework.** This project triggers OP/BP 4.01, Environmental Assessment Policy, based on the hydro-metrological and other equipment to be replaced or repaired under this project. The equipment contains mercury thermometers and the safe handling and disposal of all mercury components is important to ensure that mercury does not enter the biological chain, particularly in an island setting, where land based waste can end up in the sea. The ESMF details (i) the precise location of these mercury components in the equipment; (ii) procedures for their safe removal that would need to be conveyed to workers in a training session; (iii) a step by step procedure for their safe disposal in a location approved and discussed with the Government and (iv) the process for getting the mercury components to their ultimate destination, whether it is in safe storage, or shipped off-island to mercury-capable incinerators. Unfortunately, none of these incinerators are located in the Caribbean and therefore ultimate removal off the island may be too costly to be executed under the proposed Project.

29. Training of the workers handling the mercury should be carried out by the contractor, with assistance from the environmental specialist on the team. The requirements related to the safe disposal of mercury are detailed in the bidding documents under the environmental section. As part of the ESMF, an Environmental Management Plan (EMP) section gives procedural guidance to the contractor regarding how to remove and dispose of mercury. The contracts should also refer to relevant sections of the ESMF for contractors to follow these procedures.

30. **Anticipated Impacts.** The proposed Project is expected to generate significant positive environmental benefits through the establishment of a system that can i) assist in weather prediction ---highly necessary for agriculture, ii) track environmental and climatic changes, iii) assess potential flooding situations which would trigger the issuance of flood warnings; iv) prevent the loss of life and infrastructure. Negative impacts are described as above but these impacts are highly localized and readily mitigated.

Applicable Safeguards Policies

Safeguard Policies Triggered by the Project	Yes	No
Environmental Assessment (OP/BP 4.01)	[X]	[ ]
Natural Habitats (OP/BP 4.04)	[]	[X]
Pest Management (OP 4.09)	[ ]	[X]
Indigenous Peoples (OP/BP 4.10)	[ ]	[X]
Physical Cultural Resources (OP/BP 4.11)	[ ]	[X]
Involuntary Resettlement (OP/BP 4.12)	[ ]	[X]
Forests (OP/BP 4.36)	[ ]	[X]
Safety of Dams (OP/BP 4.37)	[ ]	[X]
Projects on International Waterways (OP/BP 7.50)	[ ]	[X]
Projects in Disputed Areas (OP/BP 7.60)	[ ]	[X]

31. **Safeguards Compliance Procedure during Implementation.** An environmental management specialist will be assigned to the proposed Project by the Ministry of Agriculture. This specialist will be responsible for ensuring that the installation and removal of equipment is done according to the EMP. The specialist will ensure that the contractor has trained all workers and will follow an intense supervision schedule during the period of removal and installation of equipment. The environmental specialist will be trained in OP/BP 4.12 Involuntary Resettlement in order to enable him/her to correctly identify and avoid involuntary resettlement as defined by the policy.

32. **Borrower's Capacity to Implement Safeguards.** The Borrower's capacity to implement safeguards is generally weak. While there is a unit within MARNDR that has an environmental specialist, clear cut guidance on monitoring, application of mitigation measures, and supervision scheduling will be needed. In the case of Haiti, it is also necessary to ensure that the contractor has clear cut guidance on worker safety and waste disposal. If the contractor bears the responsibility for ensuring the safe removal and disposal of the mercury, the role of Government can be minimized to enforcement. In this case, regular and timely supervision of the contractor is extremely important.

33. **Consultations and Disclosure of Safeguards Documents.** The process to prepare the ESMF included consultations with stakeholders including some land owners and users in and around the sites of already existing equipment. During these initial consultations with stakeholders, the environmental safeguard focal point in MARNDR provided appropriate information related to the positive and potential negative impacts of these meters. The views and opinions of stakeholders were incorporated into the ESMF. The finalized ESMF has been disclosed on the World Bank's external website as well as the website of the MARNDR.

Monitoring and Evaluation

34. The Results Framework (RF), presented in Annex 1, has been developed in coordination with the MARNDR, and the monitoring of the indicators will be carried out by MARNDR's monitoring and evaluation unit (UEP) in close collaboration with SNRE and CNM. Indicators have been identified with a view to building on data already collected by the MARNDR in order to avoid overburdening staff and duplicating efforts. All indicators were reviewed vis-à-vis PPCR Core Indicators to ensure coordination of efforts. MARNDR's monitoring and evaluation unit will also liaise with CIAT (PPCR focal point in the GoH) and report progress on the SPCR implementation and share lessons learnt.

35. The Project Coordinator will be responsible for providing timely information about the Project's implementation progress, including qualitative information on the execution of selected activities, procurement and contractual decisions, accounting and financial recording, and other operational and administrative matters. The Component 3 of the proposed Project will support the recruitment of a monitoring and evaluation specialist within the UEP. The incumbent will liaise closely with CNM and SNRE, as well as other partners involved in the proposed Project (e.g. Civil Protection Directorate; CNSA; and other key stakeholders of the proposed Project) and will provide regular updates to the Project Coordinator. The Project's Operations Manual will provide specific details regarding monitoring and evaluation responsibilities, data collection requirements, timing and use of information.

Annex 4: Implementation Support Plan

HAITI: Strengthening of Hydro-Meteorological Services Project

Strategy and Approach for Implementation Support

1. The strategy for Implementation Support Plan (ISP) stems from the nature of the proposed Project and the main risks highlighted in the SORT. Regular follow-up and support for the proposed Project would be provided by the TTL assisted by operational support staff. Technical experts in hydrology, meteorology, data management, etc. will also provide assistance in the implementation of specific activities.

2. The proposed Project would be supervised on a routine basis by procurement, financial management, and safeguard specialists. Support on fiduciary aspects will also be provided by the Bank to MARNDR via the RESEPAG II Project, hence synergies and economies of scale will be possible. Throughout implementation, as during project preparation, coordination with the main partners (IDB, WMO, EU) will be critical to: (i) ensure synergies with other projects implemented in parallel (e.g. WMO and EU – see Annex 7 for further details); (ii) carry out policy dialogue with the GoH as well as facilitating inter-ministerial coordination within the GoH.

3. Along with regular implementation support provided from headquarters, day-to-day interaction with the implementation agency will be facilitated by Bank specialists based in the Haiti Country Office managing operations related to the concerned sectors (disaster risk management, urban development, agriculture, water). The ISP will be reviewed at least once a year to ensure that it continues to meet the implementation support needs of the proposed Project.

Implementation Support Plan

Time	***Focus***	***Skills Needed***	***Resource Estimate***	***Partner Role***
First twelve months	Technical assistance to MARNDR for preparing and carrying out the baseline assessment of the network; Technical assistance to continue the institutional strengthening work started during preparation and supporting regular	Task Team Leader Hydrologist/Meteorologist Public sector reform specialist/economist	8 Staff weeks 8 Staff weeks 6 Staff weeks	Ensure cordinated approach

	liaison with the end users			
	Cooperation between M&E unit in MARNDR (UEP) and CNM-SNRE; Cooperation between MARNDR and CIAT (PPCR focal point)	M&E	4 staff weeks	
	Strengthening fiduciary capacity of MARNDR	FM Procurement	4 staff weeks 4 staff weeks	
12-60 months	Support for development of ToR, implementation of activities, capacity building; Fiduciary capacity of MARNDR Safeguards	Hydrologist/Meteorologist DRM Procurement and FM Specialist Environmental and Social Specialist	10 staff weeks/year 8 staff weeks/year (combined) 1 staff week/year	Ensure technical soundness and compliance with Bank procedures

Skills Mix Required

Skills Needed	***Number of Staff Weeks per FY***	***Number of Trips***	***Comments***
Team Leader	8	4-5	
Technical (Hydromet) Specialist	8	4-5	
Public Sector Reform Specialist	6	3-4	
Procurement Support	4	2-3	May be combined with other projects
Financial Management	4	2-3	May be combined with other projects
Environmental Specialist	1	2	May be combined with other projects
Social Specialist	1	2	May be combined with support to other projects

Annex 5: Economic Analysis

HAITI: Strengthening of Hydro-Meteorological Services Project

Summary

1. Since 2010 Haiti's weather forecast and severe weather warnings are based on models and analysis run abroad (mainly by US NOAA and Meteo France). This leaves enormous potential for producing more adapted forecasts and warnings diminishing the loss of lives and assets in this highly climate-vulnerable country. Similarly, there are no seasonal forecasts or timely planting and harvesting advisories adapted to the local conditions/data that could enhance the productivity of farmers, particularly as climate change undermines the predictive value of historical climate knowledge and associated traditional practices. These key services, among others, would be delivered by the hydromet services with support from the World Bank-financed project and the WMO-implemented "Climate Services to Reduce Vulnerability in Haiti". The two projects have been designed in a complementary fashion and generate benefits jointly and over the same timeframe. The World Bank Project proposes US$750,000 for investments, US$3.65 million for capacity development and US$600,000 for project management. The parallel project implemented by WMO has a similar budget allocation (US$5.1 million) as the World Bank project and includes: US$1.7 million for investments (including office buildings); US$3 million for capacity development; and US$430,000 for project management[32].

2. A comprehensive economic analysis confirmed a positive return on investment, with a benefit/cost ratio comprised between 1.6 and 33 over a 15-year timeframe. The analysis finds that, as a result of the rationalization of the various existing hydromet networks, operational costs will be reduced (optimization of travel costs related to data collection, station distribution and data management), benefits will be increased (increase in added value of information for end users) and losses associated with hydro-meteorological and climate hazards will be reduced.

3. **Rationale for Public Sector Provision/Financing. Rationale for Public Sector Provision/Financing.** The proposed Project objective is to strengthen hydromet services through institutional support in several areas, while making sure that services are adapted to end users. In this context, supporting public sector financing is well justified given the value of hydromet data in strategic and security matters, such as the protection of vulnerable population and its livelihoods. These are at the core of hydromet services, and they naturally lie under the public sector umbrella. In the past years, scattered funding, even within various public institutions, has increased fragmentation in hydromet data management (inconsistent and incomplete datasets, lack of a comprehensive spatial approach for data collection, etc). Therefore, there is a need to create value by organizing the existing public sector resources and developing them further.

4. The proposed Project will create the basis for future private sector activities. One of the main objectives of the proposed 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 applications that respond to user's needs. It has been shown empirically that the private sector rarely gets involved in this field without well-identified business applications. Over the long

[32] Assumes exchange rate 1 CAD = 0.78 US$

term, private sector development is also seen as a key to ensure financial sustainability of hydromet services (including infrastructure). In other countries, the private sector has developed well on solid foundations created by the public sector.

5. **Specific World Bank Value Added.** The World Bank is providing support to broader institutional reform to MARNDR via the RESEPAG II project. Furthermore, the World Bank has ample global experience in strengthening hydromet services, particularly with institutional and infrastructure improvements, as well as providing the know-how in supporting local government to build ownership. Finally, the World Bank has developed a long-term partnership with the Government of Haiti in areas closely linked with hydromet, including two IDA-financed disaster risk management projects (with commitments totaling US$80 million) and technical assistance for risk identification and data management financed by the Global Facility for Disaster Reduction and Recovery (GFDRR).

Benefits of the proposed Project

6. The benefits of the proposed Project will materialize in three ways: (i) optimization of operational costs; (ii) reduction in damage and losses related to hydrometeorological hazards and (iii) increase in benefits in productive sectors. Overall, the minimum expected benefits over a 15-year period are about US$42 million, as a result of investments supported by this Project and by the WMO. Considering that the total operating costs (including staff salary) will be about US$1.5 million per year, or US$22.5 over the same 15-year period, the minimum cost-benefit ratio of both projects is about 1.6, and could be as high as 33.

Optimization of operational costs

7. There are three main areas under which the proposed Project expect to optimize operational costs:

- *Optimization of travel for collecting information, maintaining stations' equipment, etc*. This will allow rationalization of cars and drivers, and allow for potentially significant savings. Indeed, together, staff and vehicles now tally up to 85% of the total operational costs. While it is difficult to forecast the full extent to which this category of costs[33] will be reduced, there will definitely be a significant reduction once measurements to do not have to be taken visually in person by staff of different agencies who have to drive around the country frequently.

- *Optimization of station distribution*. While some areas are well equipped with stations, some lack the necessary coverage. It is expected that the rationalization will result in a combination of cost reduction (by reducing redundancy), efficiency gains (by redistributing stations in a way that saves operating costs), and greater value (by providing more—and more reliable—data.

[33] A ball park figure for the saving in operating cost could be US$ 50,000/year.

- *Data management is a field where scale economies operate well.* In this sense pooling various networks makes economic sense. The marginal cost of storage (servers, AC, etc.) is decreasing.

Reduction in damages and losses

8. Overall, based on available historic data, natural disasters[34] are estimated to have caused damages and losses amounting to about 5 percent of GDP on average per year during 1975-2012, about US$400 million per year in relation to the 2013 GDP. Well-functioning, modern early warning systems reduce disaster-related asset losses by between 0.003% and 0.017% of GDP[35]. The potential benefit of an investment in hydromet and warning systems can be estimated as the difference between the current protection provided by hydromet and forecasting systems in a country, and the potential reduction in asset losses if the system were modernized. Under this benchmarking methodology Haiti would be considered a low-income country with a weak system, and would therefore be assumed to capture only 10% of the asset saving benefits achievable today in a country with a high functioning hydromet and warning system. Potential benefits resulting from reduction in loss of property would thus be calculated in the range of US$0.25-1.4 million per year, or about US$3.75-US$21 million over 15 years.

Increasing benefits

9. Modernized hydromet and climate services provide benefits to weather-sensitive sectors in several ways, including: early warning systems, seasonal advisories, infrastructure design, and planning. A conservative global benchmark is that modern forecast services add value of 0.1% to 1% in weather-sensitive sectors[36]. Considering that climate sensitive sectors represent 30% of the GDP in Haiti, this would translate into gains of approximately 0.03% and 0.3% of GDP[37]. Potential benefits can therefore be estimated to be about US$2.5 - US$25 million per year, or a range of US$37.5 – US$375 million in benefits over a 15-year period.

10. The areas with expected increasing benefits are the following:

- Increasing data control and quality (leading to better information availability through enhanced data management).
- Increasing density of observation network and hence quantity and/or quality of data.
- Increasing direct hydromet applications: weather forecast, water management, agriculture and watershed management.
- Deepening and widening the basis of service production in existing and new fields: health, energy, consumption of good and services sensitive to meteorology (leisure industry, agro industry, catering etc.).

[34] Including hurricanes, floods and earthquakes
[35] 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, 2012)
[36] Ibid.
[37] A similar approach was used to estimate benefits from improved hydromet services in Yemen (PPCR, 2013) and Nepal (PPCR, 2012)

Annex 6: List of main donor-funded hydro-met initiatives[38]

HAITI: Strengthening of Hydro-Meteorological Services Project

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- Contributing to more forward-looking applications, such as big data ones (almost any field can be contemplated here from traffic management to crime prevention).

Donor	Project	Status	Amount (mln US$)	Main activities	Potential linkages with PPCR Hydro-met Project
WMO	Climate Services to Reduce Haiti's Vulnerability	Active	5.1	- Construction of a joint building for CNM and SNRE and equipment - Business plan for hydro-met services- Training in weather forecast - Pilot weather radio networks.	- Development of a long term strategy for the hydromet sector - Training and education - Establishment of a national network - Technical guidance from WMO
EU	Global Climate Change Action (GCCA)	Active	8.2	- TA to MDE for environmental impact evaluation - Local adaptation pilot projects	- Strengthening of data management and climate services within MDE - Integration of climate resilience in public policies
USAID	WINNER "Feed the Future" Initiative	Active	N/A	- More than 5 weather stations and 2 EWS in Tabarre and Gonaive (currently not functioning) -financial support to CNSA (10 departmental observatories and 120 rain gauges)	- Integration of stations and data into national network and central database - Leverage of CNSA departmental network
WB	RESEPAG (P113523)	Closed	0.2	- Network of agro-climatic stations in the North of Haiti	Integration of stations and data into national network and central database
WB-IFC	Haiti Agriculture Index Insurance Policy and Regulatory Capacity Building (NLTA P131111)	Closed	0.174	- Acquisition of historic weather datasets (30 years)	Hand-over of datasets to new hydromet Unit
IDB	National Early Warning System Project (PNAP)	Closed	5	- Network of 40+ hydrological stations - Municipal Early Warning System (EWS) for floods - Capacity development at the	- Integration into national network of stations and central database - Re-vamping of EWS

[38] The list includes the main active and recently closed projects involving hydro-met data collection and management. This list was compiled based exclusively on information exchanged during meetings with donors and may not be exhaustive.

				national and decentralized level - Public awareness and education.	
IDB	PNAP TA – follow up	Closed	0.44	- Technical assistance to define institutional arrangements for the EWS and hand-over to MARNDR - Improve data collection and analysis	Support to MARNDR during PPCR project preparation
EU	Territorial Information Program for Sustainable Development (PITDD):	Closed	9.6	- Network of 24 weather stations (manual and automatic) across the country - Data platform	Integration of stations and data into national network and central database

Annex 7: Haiti's Strategic Program for Climate Resilience (SPCR)

HAITI: Strengthening of Hydro-Meteorological Services Project

Climate Change Adaptation and Disaster Risk Management in Haiti

1. In the last ten years, Haiti has taken steps to assist authorities better manage disaster risk and identify the country's vulnerabilities and adaptation needs. Erosion and watershed degradation was accentuated by deforestation, increasingly exposing the agricultural sector and the environment in general to the impacts of weather and climate hazards. Climate change may further increase the risk of hydro-meteorological hazards by intensifying the frequency or intensity of extreme events.

2. Since 2004, the Bank has supported the GoH to increase its capacity to coordinate the preparation and response to natural disasters through the establishment and strengthening of municipal Civil Protection Committees and the development of long-term DRM plans. Following the January 2010 earthquake, the Bank supported program to finance hazard and vulnerability assessments at the national and municipal level with the objective of supporting the GoH's neighborhood recovery and housing repair program. In the transport sector, the Bank has focused on the rehabilitation of critical spot interventions aimed at increasing the resilience of the system in key damaged and vulnerable areas.

Strengthening Hydromet Services as one of the four PPRC Investment projects

3. In light of the DRM challenges faced by the country, the GoH, through the CIAT, developed a US$25.0 million Strategic Program for Climate Resilience (SPCR), as part of the Pilot Program for Climate Resilience (PPCR) developed and operational under the Strategic Climate Fund (SCF), which is one of two funds within the design of the Climate Investment Funds (CIF). The SPCR was endorsed in May 2013 and the proposed Project will receive an allocation of US$5 million corresponding to one of the four priority SPCR investment projects as described below.

Investment	**Partner**	**PPCR amount (US$ million)**
Investment Project 1: Climate Proofing of Infrastructures in Centre-Artibonite Loop	WB	8.0
Investment Project 2: Climate Proofing of Agriculture in the Centre-Artibonite Loop	IDB	4.5
Investment Project 3: Climate Change Adaptation in the Coastal Cities of the Gulf of La Gonâve	WB	7.0
Investment Project 4: Strengthening Knowledge Management of Hydro-meteorological, Water Resources, and Climate Data to Inform Decision Making and Policy Dialogue	WB	5.0
	TOTAL	25.0

4. A summary of PPCR Core Indicators and their link to the proposed Project indicators is provided in the table below:

PPCR core indicators	**Suggested in SPCR**	**Proposed project indicator**
1. Degree of integration of climate change in national, including sector planning	Yes	
2. Evidence of strengthened government capacity and coordination mechanism to mainstream climate resilience	Yes	- Data collected from hydro-met networks are accessible on a centralized online hydro-meteorological data management platform, with its own operating procedures for validation and storage - Number of sub-networks feeding into the centralized platform - Number of users and instructors trained on the use of the centralized data platform
3. Quality and extent to which climate responsive instruments/investment models are developed and tested.	Yes	- Data collected from hydro-met networks are accessible on a centralized online hydro-meteorological data management platform, with its own operating procedures for validation and storage - Number of sub-networks feeding into the centralized platform - Number of users and instructors trained on the use of the centralized data platform - Percentage of end users' satisfaction rate towards improved hydromet information services
4. Extent to which vulnerable households, communities, businesses, and public sector services use improved PPCR-supported tools, instruments, strategies, and activities to respond to CC and CV.	Yes	- Number of Civil Protection Committees using the customized application from the centralized data platform - Number of Departmental Agricultural Directions (DDA) using the customized application from the centralized data platform
5. Number of people supported by the PPCR to cope with the effects of climate change.	Yes	- Direct project beneficiaries (number), of which female (percentage)