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The World Bank

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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 (P148259)

February 10, 2015

Social, Urban, Rural and Resilience Global Practice
Latin American and the Caribbean Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective November 3, 2014)

Currency Unit = HTG
45.8 HTG = US\$1
US\$0.022 = HTG 1

FISCAL YEAR

October 1 – September 30

ABBREVIATIONS AND ACRONYMS

BP	Bank Procedure
BRH	Central Bank of Haiti
CAS	Country Assistance Strategy
CIAT	Inter-ministerial Committee for Territorial Planning
CIF	Climate Investment Funds
CNIGS	National Center for Geographical and Spatial Information
CNM	National Center for Meteorology
CNSA	National Food Security Coordination
CQS	Selection Based on Consultant Qualifications
DC	Direct Contracting
DDA	Departmental Agricultural Directions
DG	General Director
DINEPA	National Water and Sanitation Directorate
DPC	Civil Protection Directorate
DRE	Water Resource Directorate
EMP	Environment Management Plan
EU	European Union
FBS	Fixed Budget Selection
FM	Financial Management
GDP	Gross Domestic Product
GFDRR	The Global Facility for Disaster Reduction and Recovery
GoH	Government of the Republic of Haiti
IBRD	International Bank for Reconstruction and Development
IC	Individual Consultant
ICB	International Competitive Bidding
IDA	International Development Association
IDB	Inter-American Development Bank
IFC	International Finance Corporation
IFR	Interim Financial Report

IPSAS	International Public Accounting Standards
ISN	Interim Strategy Note
ISP	Implementation Support Plan
LCS	Least-Cost Selection
MARNDR	Ministry of Agriculture, Natural Resources and Sustainable Development
MDE	Ministry of the Environment
MINUSTAH	United Nations Stabilization Mission in Haiti
MPCE	Ministry of Planning and External Cooperation
MSP	Ministry of Health and Population
MTPTC	Ministry of Public Works, Transport and Communication
NCB	National Competitive Bidding
NCS	Non-consulting services
OFNAC	National Civil Aviation Agency
OM	Operations Manual
ONEV	National Observatory on Environment and Vulnerability
OP	Operational Policy
PAD	Project Appraisal Document
PDO	Project Development Objective
PNAP	National Early Warning Project
PPCR	Pilot Program for Climate Resilience
QBS	Quality-Based Selection
QCBS	Quality and Cost-Based Selection
RESEPAG	Re-launching Agriculture: Strengthening Agriculture Public Services Project
RFP	Request for Proposal
SBD	Standard Bidding Document
SCF	Strategic Climate Fund
SNRE	National Service for Water Resources
SOE	Statement of Expenditures
SPCR	Strategic Program for Climate Resilience
SYSCOP	Accounting software
TOR	Terms of Reference
UEP	Study and Planning Unit, MARNDR
UIS	MARNDR's Statistical and IT Unit
UPMP	MARNDR' centralized procurement unit
USAID	United States Agency for International Development
WMO	World Meteorological Organization

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HAITI
Strengthening Hydro-meteorological Services Project

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PAD DATA SHEET

Haiti

HT Strengthening Hydro-meteorological Services Project (P148259)

PROJECT APPRAISAL DOCUMENT

LATIN AMERICA AND CARIBBEAN

SOCIAL, URBAN, RURAL, AND RESILIENCE GLOBAL PRACTICE

0000009081

Report No.: PAD1063

Basic Information				
Project ID P148259	EA Category B - Partial Assessment	Team Leader Gaetano Vivo		
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [X]			
	Financial Intermediaries []			
	Series of Projects []			
Project Implementation Start Date 30-June-2015	Project Implementation End Date 30-June-2020			
Expected Effectiveness Date 30-June-2015	Expected Closing Date 30-June-2020			
Joint IFC No				
Practice Manager Anna Wellenstein	Senior Global Practice Director Ede Jorge Vasquez	Special Envoy Ijjasz-Mary A. Barton-Dock	Regional President Jorge Familiar	Vice
Recipient: Republic of Haiti				
Responsible Agency: Ministry of Agriculture, Natural Resources and Sustainable Development (MARNDR)				
Contact: Telephone No.:	Mr. Pierre Guy Lafontant +509 3994 3372	Title: Director General Email:	Director General pglafontant@yahoo.com pglafontant@agriculture.gouv.ht	

Project Financing Data (in USD Million)							
<input type="checkbox"/>	Loan	<input checked="" type="checkbox"/>	Grant	<input type="checkbox"/>	Guarantee		
<input type="checkbox"/>	Credit	<input type="checkbox"/>	IDA Grant	<input type="checkbox"/>	Other		
Total Project Cost:		USD 5.0			Total Strategic Climate Fund Financing:		USD 5.0
Financing Gap:		0.0					
Financing Source				Amount			
BORROWER/RECIPIENT				0.0			
Strategic Climate Fund				USD 5.0			
Total				USD 5.0			
Expected Disbursements (in USD Million)							
Fiscal Year	2015	2016	2017	2018	2019	2020	
Annual	0.1	0.5	1	1	1.5	.9	
Cumulative	0.1	0.6	1.6	2.6	4.1	5	
Proposed Development Objective(s)							
<p>The proposed 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.</p> <p>The PDO will be achieved through: (i) integrating existing hydro-met data collecting networks into a national data platform and strengthening capacity for data archiving, validation, and analysis; and (ii) identifying hydro-meteorological and climate services’ requirements for select end users (including agriculture and civil protection) and developing information services to support decision making.</p>							
Components							
Component Name					Cost (USD Millions)		
Institutional strengthening of hydro-meteorological services and development of data management tools					US\$3.0 million		
Identification of hydro-meteorological and climate					US\$1.4 million		

services' requirements for select end users and development of information services to support decision making				
Support to project implementation, monitoring and evaluation, and PPCR knowledge management		US\$0.6 million		
Institutional Data				
Sector Board				
Urban Development				
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	0
Agriculture, fishing, and forestry	Irrigation and drainage	40		
Total		100		
<input type="checkbox"/> 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		
Urban development	Urban planning and housing policy	20		
Rural development	Other rural development	20		
Total		100		
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 [] 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

Description of Covenant

Name	Recurrent	Due Date	Frequency

Description of Covenant

Conditions

Name	Type

Description of Condition

Team Composition

Bank Staff

Name	Title	Specialization	Unit
Gaetano Vivo	Disaster Risk Management Specialist	Team Leader	GURDR
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Michel Matera	Sr. Disaster Risk Management Specialist	Disaster Risk Management	GURDR
Claudia Soto Orozco	Junior Professional Associate	Disaster Risk Management	GURDR

Non Bank Staff

Name	Title	Office Phone	City
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Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Haiti			X		

I. STRATEGIC CONTEXT

A. Country Context¹

1. **Development Context.** Haiti is the third largest Caribbean nation, with an estimated population of 10.4 million. The country's comparative advantages include access to major markets, abundant human capital (35 percent of the population is under 15) and a dynamic diaspora. Agriculture, light manufacturing, tourism and potential mineral resources represent opportunities for the country's economic development.² Five years after the devastating earthquake that hit the country in January 2010, the overall economy is improving and the government is beginning to implement its vision for turning Haiti into an emerging country by 2030. Growth is estimated to have reached 4.3 percent in HFY13, up from 2.9 percent observed in HFY12, mainly due to a pick-up in agricultural production, construction and the industrial sector, in particular the textile and garment industry. Extreme poverty has declined in the past decade from 31 percent in 2000 to 24 percent in 2012³, driven by rising non-agricultural labor income and external financial flows, such as remittances and international aid. Poverty, however, remains endemic with almost 6.3 million Haitians unable to meet their basic needs and 2.5 million unable to cover food needs⁴. One million Haitians live slightly above the poverty level and could fall back into poverty due to an external shock, including climatic shocks. Evidence shows that climatic shocks are the most frequent shocks affecting communities in Haiti⁵.

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, losses and damages associated with hydro-meteorological events are estimated at an amount equivalent to 1.95 percent of GDP.⁶ During the last decades, widespread deforestation triggered by energy needs, among other uses⁷, contributed to erosion and watershed degradation⁸ throughout the country, increasingly exposing the agricultural sector and the environment and population in general to the impacts of weather and climate hazards. These

¹ The country context follows the content of the SCD document currently under preparation.

² World Bank Systematic Country Diagnostic 2015, currently under preparation.

³ 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

⁴ 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.

⁵ World Bank and Observatoire National de la Pauvrete et de l'Exclusion Sociale (ONPES), Investing in People to Fight Poverty in Haiti, Reflections for Evidence-based Policy Making, 2014

⁶ Rapport préliminaire sur l'impact économique et budgétaire des désastres en Haiti, Haitian Ministry of Economy and Finance and The World Bank (*forthcoming*)

⁷ In 2003 as much as 66% of energy consumption was provided by firewood and charcoal (ESMAP (2007). Haiti: Strategy to Alleviate the Pressure of Fuel Demand on National Woodfuel Resources. ESMAP Technical Paper

⁸ 25 out of 30 watersheds are severely degraded (SPCR)

disasters tend to hit harder the poorest populations, especially hurricanes where almost 50 percent of damages and losses to the productive sectors are recorded in the agricultural sector⁹.

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 study¹⁰ 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 and impacting the urban areas located on the coast. High population density (up to 40,000 per km² in Port-au-Prince), combined with the large number of informal settlements and weak infrastructure, renders Haiti's population particularly vulnerable.

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 models¹¹, temperatures in the Caribbean region could rise from 1.2°C to 2.3°C, with a median of 2.0 °C during the 21st century; this is slightly less than the world average. Climate change may result in an increase of the average temperature up to 1.9°C and a significant decrease (-5/6 percent) in median annual rainfall by 2100. In addition, an increase of ocean surface temperature (1.2°C to 2.3°C increase in surface temperature 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 studies¹², 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 for Haiti's development. Over the past decade, hydro-meteorological hazards alone killed more than 6,600 people and affected 1.3 million others¹³. 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 food security. Lack of historical datasets for floods, landslides and wind makes it hard

⁹ Calculations based on existing Post-Disaster Needs Assessments (PDNAs).

¹⁰ Natural disaster hotspots: A global risk analysis, The World Bank, 2005

¹¹ Inter-governmental Panel on Climate Change (IPCC) Fifth Assessment Report (2014) http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap29_FINAL.pdf)

¹² 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

¹³ Data refer to the decade 2004-2014 and include hydrological (floods; landslides) and meteorological (storms) events. Source: EM-DAT (<http://www.emdat.be>).

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.

B. Sectoral and Institutional Context

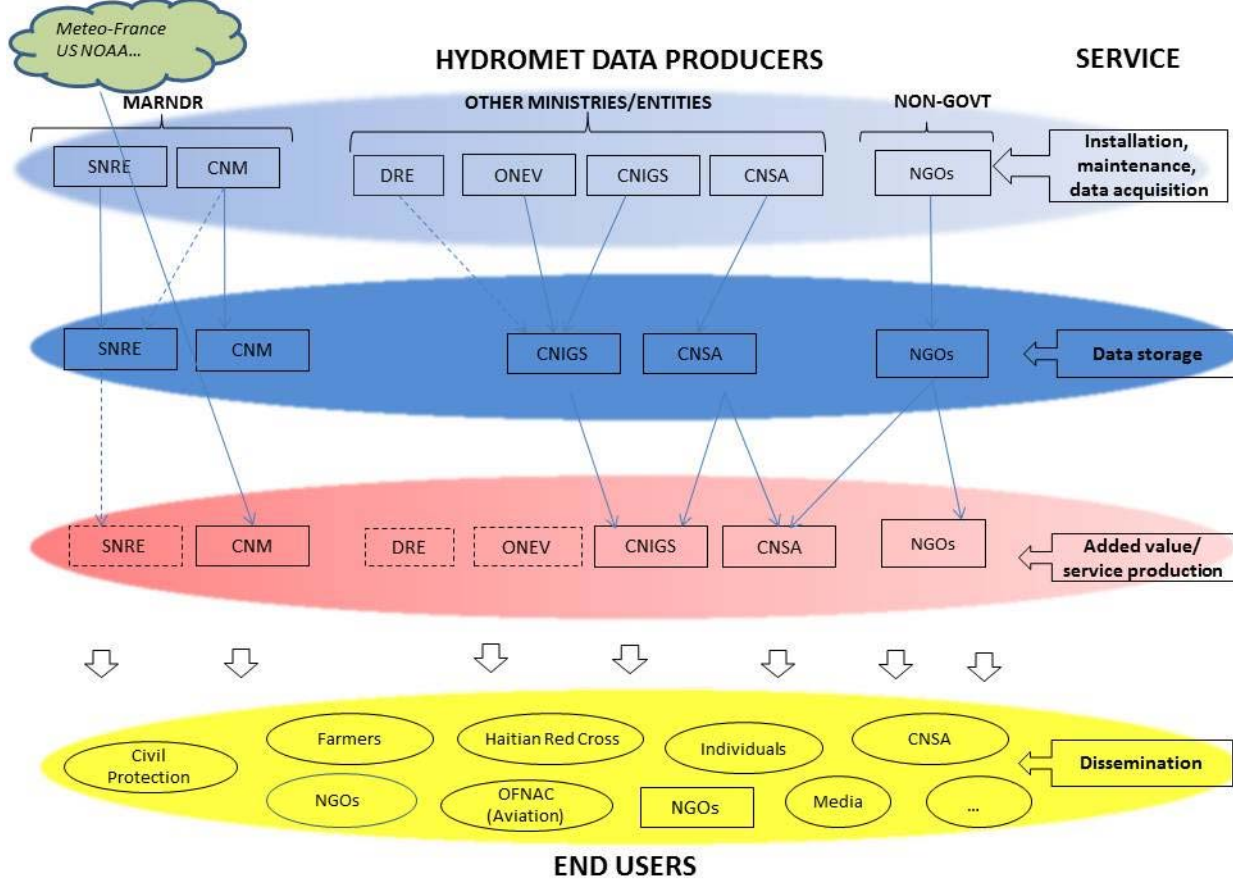
7. *Current institutional scenario.* Haiti's hydro-meteorological services are dispersed across several institutions in charge of collecting, storing, processing, and disseminating data (see Figure 1 for the current institutional landscape). The National Center for Meteorology (CNM) and the National 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, 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, which until 2001 also integrated CNM (in addition to the agro-meteorological and climate service; groundwater and surface water services) has seen its human and financial resources gradually reduced and has mostly relied on international assistance. Today SNRE has no operating budget and a scarce 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, with the exception of volunteers of religious institutions which 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 an 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.

Figure 1: Current institutional landscape for hydromet services in Haiti¹⁴



¹⁴ The dashed line refers to roles and processes that exist in principle but are not carried out *de facto*.

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 resilience¹⁵.

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 SPCR, with support from the Inter-Ministerial Committee for Territorial Planning (CIAT), focal point within the GoH. In November 2013, the Minister of Agriculture appointed an inter-ministerial “Ad-hoc Commission”¹⁶ 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 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. A national workshop hosted by MARNDR in September 2014 brought together more than 30 representatives of hydromet data producers and users to agree on a common vision for the hydromet services. A new organogram for the hydromet structure was proposed, merging the hydro- and meteo- services into one “Hydro-Met Unit¹⁷”. The workshop also agreed to set out a roadmap and a calendar for implementing the

¹⁵ 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), WMO (2012), PPCR (2012), PNAP (2012), WB (2014).

¹⁶ The ad-hoc Commission is composed of MARNDR, MDE, CNIGS, and Inter-ministerial Committee for Territorial Planning (CIAT).

¹⁷ At present the options being contemplated for the creation of a new hydro-met structure are “Unit” (Unité) or “Directorate” (Direction). According to a decree of 2005 which regulates all reorganization of public administration, within a ministry a unit” can be created to provide technical support to Directorate for implementing sector policies. De facto, in the Haitian administration units have been created to implement policies and they have often been preferred to directorates as their creation can take place with a simple circular note (circulaire), thus not requiring new or amended law.

recommended institutional reform. Although the acute political crisis that re-emerged few months later, in January 2015, (newly appointed government and minister and elections expected in late 2015) has taken some traction away from the process, a consensus on the reform today exists at the technical level. Similarly, the main donors (IDB, EU, WMO, USAID) fully agree on the importance of coordinated policy dialogue to reform and modernize Haiti's hydro-met services (see Annex 7 for a list of the main donor financed projects).

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 also provides technical and financial assistance for increasing Haiti's resilience in the agriculture and infrastructure sectors and strengthening its disaster management system. Additionally, coordination with other donors (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. Finally, the Bank and the GFDRR have developed a strong collaboration with World Meteorological Organization (WMO) and leading national hydro-met agencies in other countries.

C. Higher Level Objectives to which the Project Contributes

13. **Promoting Shared Prosperity and Ending Extreme Poverty.** The Project would contribute to the Bank's twin goals of ending extreme poverty and promoting shared prosperity. By focusing on agriculture and civil protection the 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.

14. **Relationship to the Haiti 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, which programs a second tranche of the US\$500 million allocated to Haiti from the IDA 16 Crisis Response Window. The project would specifically support two of four objectives of the Haiti ISN: (i) reducing vulnerability and increase resilience and (ii) building human capital. It will also contribute to the ISN crosscutting theme of strengthening governance.

15. **Reducing Vulnerability to Climate Change.** Furthermore, the project stems directly from the Government of Haiti's National Strategic Program for Climate Resilience (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 financing¹⁸. Developing the

¹⁸This 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.

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 the Haiti's SPCR¹⁹. Finally, the Project contributes to implementation of the National Action Plan for Adaptation (NAPA²⁰), 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.

B. Project Beneficiaries

17. Project beneficiaries include all end-users that may benefit from reliable hydro-meteorological and climate data to inform their decision-making. Direct beneficiaries include public and private actors who work in sectors specifically targeted by the 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 project or by applications stemming from them. Recent evidence²¹ shows that Haitian women and girls are particularly vulnerable because they face important obstacles to the accumulation and use of their assets, particularly their human capital. Adult women are still less well educated than adult men and are more likely to be illiterate, while maternal mortality is still dramatically high. Furthermore, women in Haiti are significantly less likely to be employed than man and earn more than 30% less. In rural areas, woman-headed households have less access to agricultural inputs (such as seeds) which could lead to lower productivity, thereby creating a gender gap. The project will adopt a gender-sensitive approach by fostering equal access to hydro-met and climate information. Project activities will strengthen capacity of Haiti's women as well as men to develop/improve early warning systems and

¹⁹ The four outcomes listed of 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.

²⁰ 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.

²¹World Bank and Observatoire National de la Pauvreté et de l'Exclusion Sociale (ONPES), Investing in People to Fight Poverty in Haiti, Reflections for Evidence-based Policy Making, 2014

information services for disaster and climate risk management. The Results Framework includes specific indicators to monitor the hydro-met project's contribution to reducing gender-specific inequities in the capacity building process²².

B. PDO Level Results Indicators

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

- (i) Data collected from hydro-met networks are accessible on a centralized online hydro-meteorological data management platform, with standard operating procedures for validation and storage²³;
- (ii) Number of existing sub-networks feeding data into the shared platform²⁴;
- (iii) End users' satisfaction rate towards improved hydromet information services (percentage, gender-disaggregated)²⁵.

III. PROJECT DESCRIPTION

A. Project Components (detailed description can be found in Annex 2)

19. The Project will strengthen the Republic of Haiti's capacity to collect hydro-meteorological and climate data and contribute to build its future adaptive capacity by providing access to water, weather, and climate information to end users. As project preparation coincides with a political crisis in Haiti, the project design is flexible and can be adapted to an uncertain political situation. In the first phase, the 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 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, agriculture).

20. The project will consist of the following three components:

- (i) Institutional strengthening of hydro-meteorological services and development of data management tools (*US\$3,000,000*);
- (ii) Identification of hydro-meteorological and climate services' requirements for select end users and development of information services to support decision making (*US\$1,400,000*);
- (iii) Support to project implementation, monitoring and evaluation, and PPCR knowledge management (*US\$600,000*).

²² See indicators

²³ 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")

²⁴ Contributes to PPCR Core Indicator #3 ("Quality and extent to which climate responsive instruments/investment models are developed and tested")

²⁵ Contributes to PPCR Core Indicator #3 ("Quality and extent to which climate responsive instruments/investment models are developed and tested")

21. **Component 1. Institutional strengthening of the hydro-meteorological services and development of data management tools (US\$3,000,000).** 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 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; 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\$1,400,000).** 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 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) 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, such as the Re-launching Agriculture: Strengthening Agriculture Public Services II (P126744); the Disaster Risk Management and Reconstruction (P126346). It is expected that several other priority sectors supported by the World Bank in Haiti will benefit from an improved access to reliable hydromet and climate information. These sectors include: public works (e.g. update return periods for select hazards in order to better integrate climate resilience measures into infrastructure design), and public 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\$600,000).** Component 3 will include two subcomponents. (i) 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 cost. (ii) Supporting MARNDR M&E capacity and PPCR knowledge management. An M&E specialist financed through the 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 project and disseminating them across the PPCR national and regional partners. 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.

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. The project will be processed in compliance with CIF and World Bank investment project finance procedures.

Project Cost and Financing

25. The project will be entirely financed by a grant of the Strategic Climate Fund (SCF) as outlined in the table below.

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

26. *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) Implementation Completion and Results Report²⁶. In light of this, throughout preparation the task team carried out regular dialogue with the MARNDNR as well as with the main end users of hydromet and climate information. In particular, responding to a request of the MARNDNR, 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 Concept Note. In September 2014, during PAD preparation, MARNDNR hosted a 2-day workshop on “Hydro-meteorological services at the service of development”, which brought together more than 30 representatives of hydromet data producers, and end users, as well as the main donors.

27. *When the project is implemented directly by the Ministry without a Project Implementation Unit (PIU), then project design and implementation arrangements must be simple and well defined at the preparation and design stage.* The Project does not foresee the creation of a PIU and relies as much as possible on the MARNDNR structure to achieve the institutional development objective of the project. Against this background, project design has been kept relatively simple (e.g. Procurement Plan; Results Framework). Furthermore, Component 3 of the Project provides human and financial resources to strengthen key services of the MARNDNR (i.e. M&E, financial management, procurement).

28. *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 was 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 MARNDNR and overseeing both the World Bank and WMO projects will help ensure synergies and complementarity.

29. *An inter-institutional process will be needed throughout the project to ensure relevance for the main end users.* An institutional analysis²⁷ carried out at the outset of project preparation underscored the need for stronger linkages between data producers and end-users. In particular, the analysis underlined that end-users need to provide sector-specific added value thus increasing the socio-economic value of data. An inter-ministerial Steering Committee bringing together MARNDNR, MDE, CIAT, CNIGS and the main end users (aviation, civil protection) will ensure

²⁶ Relaunching Agriculture Project I (RESEPAG I) Implementation Completion and Results Report, The World Bank, 2015 (the report is being finalized at the time of PAD preparation).

²⁷ Expertise Institutionnelle des Services Hydro-Meteo d’Haiti, World Bank, 2014

strategic input from different sectors. At the technical level, a Project Committee will ensure technical input from the different sectors involved in the activities.

30. *Client ownership of results framework is critical.* 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 task team involved the Monitoring and Evaluation team at the MARNDR's *Unité d'Etudes et Programmation* (UEP) in the design of the project's results framework. Indicators were chosen with a view to not overburden MARNDR M&E capacity.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

31. The 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 project. A project coordinator hired through the 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-meteorological Unit²⁸ during the project timeframe, the project coordinator will be reporting to its director. The 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 project-based approach.

32. 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.

33. 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, MARNDR will convene a technical-level multi-sector Project Committee, created from the existing "Hydromet Commission" (MARDNR, MDE, CNIGS, and CIAT) with the addition of other key stakeholders for the project (e.g. DPC, CNSA, MTPTC and other end users targeted by the project). This group would meet regularly (once a month or as needed) in order to carry out, among others, the following tasks: prepare technical specifications and terms

²⁸ 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. The merging of CNM and SNRE is also one of the pre-conditions for the upcoming IDB budget support operation to the GoH (Haitian Fiscal Year 2015) and it is expected to take place by project effectiveness.

of reference, monitor project activities, etc. A Memorandum of Understanding signed by the DGs of MARNDR and of the institutions participating in the project will create the Project Committee.

34. 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 strategic oversight of the World Bank hydromet project. The Steering Committee includes the following government institutions: MARNDR, MDE, CIAT, CNIGS, OFNAC, DPC, SEMANAH. The Committee is expected to meet twice a year. Greater detail on the Project implementation arrangements is provided in Annex 3.

B. Results Monitoring and Evaluation

35. The overall results and monitoring framework, presented in Annex 1, has been developed in coordination with the Hydromet Commission and the Planning and Studies Unit (UEP) of MARNDR. Project indicators were reviewed in line with PPCR core indicators and MARNDR programmatic indicators in order to simplify reporting of results. The UEP, through its M&E and statistics units will be in charge of monitoring all indicators (including PPCR) and providing all relevant data to the Project Coordinator. Component 3 of the 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 project committee 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 responsible for providing timely input on the SPCR implementation to the national PPCR focal point.

C. Sustainability

36. 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 project by all stakeholders involved and, ultimately, increase the sustainability of project’s results.

37. During project preparation MARNDR has started exploring the possibility of allocating annual resources to cover operations and maintenance cost of the network (to date these costs have largely been covered by externally funded projects). The Bank has worked closely with MARNDR and other stakeholders to evaluate both investment and operating costs of hydromet services (see Economic Analysis section). This evaluation provided MARNDR 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. Systematic Operations Risk-Rating Tool (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	High
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	
OVERALL	Substantial

B. Overall Risk Rating Explanation

38. Overall risk is substantial given the fragile political situation (parliament dissolved in January 2015, transition government appointment, election date pending), the ongoing restructuring of the MARNDR and capacity constraints related to fiduciary responsibilities. Implementation risk will be mitigated by supporting the institutional reform and providing funding and capacity building to strengthen staff at the UPMP, UEP and RESEPAG II financial management unit.

39. The institutional Capacity for Implementation and Sustainability risk is deemed high given the recent change of government and the ongoing restructuring of the MARNDR. In spite of general consensus at the technical level on the need for a reform and on the merging of CNM and SNRE into a new “Hydromet Unit”, the exact future of the institutional framework of hydromet services and its execution timeline are not yet known and cannot be guaranteed to date. Therefore, there is a high risk of that the institutional fragmentation and overlap between the GoH’s institutions in charge of delivering hydromet services will persist.

40. In order to mitigate this risk during project implementation, the Bank, in close coordination with other donors, will continue to help the GoH develop its own strategic vision for the reform of hydromet and climate services. Since the outset of project preparation, the Bank has provided technical support for institutional reform, including international best practices, and a related implementation roadmap. The Bank also supported the September 2014 MARNDR workshop by (i) supporting stakeholders to identify specific needs of end users of hydromet information; (ii) facilitating the discussion between SNRE and CNM representatives

on the new “Hydromet Unit” organization structure; and (iii) presenting the results of the economic assessment, which aimed to quantify the costs of existing networks and the benefits of the rationalization of hydromet services. Regardless of the outcomes of the reform, the Bank will continue to support the reform process and a better coordination between the partners involved in the hydromet services.

41. MARNDR’s limited fiduciary capacity was identified as substantial risk. The project will include several activities of relatively small amount and mainly consisting in consulting services, training and workshops, which may be cumbersome given the implementing capacity of the MARNDR. In order to mitigate the risk, project design strategically focused on a few areas to avoid the multiplication of disconnected activities. The project plans to bundle technical assistance activities as much as possible and minimize the number of contracts to be processed by the UPMP. Additionally, the Project will provide funding and capacity building support to strengthen staff involved in fiduciary tasks, according to the needs of the project.

VI. APPRAISAL SUMMARY

A. Economic Analysis

42. 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)²⁹. 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 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 management³⁰.

43. 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 period for both projects together. 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.

²⁹ Technical assessment carried out by WMO in 2010 (Strengthening of Hydrological and Meteorological Services in Haiti: Proposals for Medium Term Action, WMO, 2010)

³⁰ Project amount in Canadian Dollars (CAD). The indicated amount assumes exchange rate 1 CAD = 0.78 US\$.

44. **Rationale for Public Sector Provision/Financing.** The 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.

45. **Specific World Bank Value Added.** The World Bank has experience in supporting complex institutional reforms and is providing broader institutional support to the 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).

B. Technical considerations

46. Project design benefitted from several assessments carried out during the past few years, which contain detailed analysis about the institutional and technical context of Haiti's hydro-meteorological services: WMO (2010), WMO (2012), PPCR (2012), IDB-PNAP (2012), WB (2014). Additionally, close monitoring of the comprehensive institutional reform currently undertaken by the MARNDR with support from IDP contributed to incorporate and mitigate certain institutional risks in project preparation.

C. Financial Management

47. A financial management capacity assessment was carried out during project preparation to ensure that the systems to be used to manage the funds satisfy the Bank's minimum Financial Management (FM) requirements under OP/BP 10.00. The assessment concluded that the Unit meets the Bank/s minimum FM requirements as it has adequate staff with experience in implementing Bank-financed projects. However, some actions to strengthen financial management are needed before the Unit's capacity is deemed fully acceptable by the Bank. Therefore, at first, the Project will share the FM consultant of the RESEPAG II (P126744) project, considering the additional reporting responsibilities and the newly installed SYSCOP accounting software that needs to be fully used for the project implementation. More details are presented in Annex 3.

D. Procurement

47. MARDNR's centralized procurement unit (UPMP) will be responsible for managing procurement for the Project. Members of the multi-sectoral Project Committee will provide technical assistance in preparing 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 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.

48. UPMP prepared a procurement plan for the first 18 months of project implementation. The Operational 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)

49. The 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 project is not expected to have any negative social impacts or risks related to social safeguards.

50. The 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 don't affect users' livelihoods. The Environmental and Social Management Framework 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)

51. The Project is a category B investment under the World Bank's Operational Policy on Environmental Assessment (OP/BP 4.01) and has a very low environmental risk. The 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 project may fund the installation of new observation sites, which will be limited to public land and building or voluntarily donated by the community. The main 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. A short Environmental and Social Management Framework (ESMF) is being prepared by the Government and is currently in draft form. The ESMF will address: (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 ESMF will be disclosed in the country and on the Bank's website. The framework will also be incorporated into the Project's Operational Manual.

Safeguard Policies Triggered by the Project	Yes	No
<u>Environmental Assessment (OP/BP 4.01)</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Natural Habitats (<u>OP/BP 4.04</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pest Management (<u>OP 4.09</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Indigenous Peoples (<u>OP/BP 4.10</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Physical Cultural Resources (<u>OP/BP 4.11</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Involuntary Resettlement (<u>OP/BP 4.12</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Forests (<u>OP/BP 4.36</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Safety of Dams (<u>OP/BP 4.37</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects on International Waterways (<u>OP/BP 7.50</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Projects in Disputed Areas (<u>OP/BP 7.60</u>)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Annex 1: Results Framework and Monitoring
Haiti – Strengthening of Hydromet Services (P148259)

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

Project Development Objective Indicators	Core	Unit of measure	Baseline	Cumulative Target Values						Frequency	Data Source/ Methodology	Responsibility for data collection	Description
				2015	2016	2017	2018	2019	2020				
Data collected from hydro-met networks are accessible on a centralized online data management platform, with standard operating procedures for validation and storage ³¹		Platform operational and accessible	No	No	No	No	Yes	Yes	Yes	Annual	Project reports	UEP	Development of data sharing tools
Number of sub-networks feeding into the centralized platform ³²		Number of sub-networks	0	0	2	3	4	4	5	Annual	Project reports	UEP	Hydromet inter-institutional collaboration
End users’ satisfaction rate towards improved hydromet information services (gender disaggregated) ³⁴		% of users surveyed	0	0	10	20	30	40	50	Annual	Project reports	UEP	Satisfaction rate towards improved services for population and farmers (gender-disaggregated)
		% of female users surveyed	0	0	10	20	30	40	50	Annual	Project reports	UEP	

³¹ 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”)

³² Contributes to PPCR Core Indicator #3 (“Quality and extent to which climate responsive instruments/investment models are developed and tested”)

³³ This will be assessed through a beneficiary survey which will also assess gender-specific aspects (e.g. access to hydromet information; behavioral impact; etc.)

³⁴ Contributes to PPCR Core Indicator #3 (“Quality and extent to which climate responsive instruments/investment models are developed and tested”)

Project Development Objective Indicators	Core	Unit of measure	Baseline	Cumulative Target Values						Frequency	Data Source/ Methodology	Responsibility for data collection	Description
				2015	2016	2017	2018	2019	2020				
Intermediate Results Indicators													
Component 1. – Institutional strengthening of the hydro-meteorological services and development of data management tools													
Number of users and instructors trained on the use of the centralized data platform ³⁵	Number of people	0	0	0	20	50	70	80	Annual	Project reports	UEP	Capacity to use the data system. % of women	
	% of women	-						20	Annual	Project reports	UEP		
Rehabilitated or improved stations (physical structure) ³⁶	Number of stations	TBD	baseline	baseline + 10	baseline + 25	baseline + 35	baseline + 45	baseline + 50	Annual	Project reports	UEP	Improvement of observation infrastructure	
Hydrological and meteorological stations reporting data to the platform in line with agreed SOPs ³⁷	Number of stations	TBD ³⁸	TBD	TBD	TBD	TBD	TBD	TBD	Annual	Project reports	UEP	Standardized raw data feed into the platform	

³⁵ Contributes to PPCR Core Indicator #2 (“Evidence of strengthened government capacity and coordination mechanism to mainstream climate resilience”)

³⁶ Contributes to PPCR Core Indicator #3 (“Quality and extent to which climate responsive instruments/investment models are developed and tested)

³⁷ Contributes to PPCR Core Indicator #3 (“Quality and extent to which climate responsive instruments/investment models are developed and tested)

³⁸ A realistic value for this indicator will be determined by the baseline assessment to be carried out in Year 1 of the project

Project Development Objective Indicators	Core	Unit of measure	Baseline	Cumulative Target Values						Frequency	Data Source/ Methodology	Responsibility for data collection	Description
				2015	2016	2017	2018	2019	2020				
Component 2 – Identify hydro-meteorological and climate services’ requirements for select end users and developing information services to support decision making													
Number of Civil Protection Committees using the customized application from the centralized data platform ³⁹		Number	0	0	10	20	30	35	40	Annual	Project reports	UEP	Contribution to the security of goods and people
Number of Departmental Agricultural Directions (DDA) using the customized application from the centralized data platform ⁴⁰		Number	0	0	2	4	6	8	10	Annual	Project reports	UEP	Contribution to food security
Number of direct project beneficiaries (gender-disaggregated) ⁴¹	X	Number of beneficiaries	0						1 million	Annual	Project reports	UEP	Impact of project on the population (disaggregated by gender)
Component 3 - Support to project implementation, monitoring and evaluation, and PPCR knowledge management													
Timely submission of project procurement and financial management reports		-	yes	yes	yes	yes	yes	yes	yes	Quarterly	Project reports	UEP	Monitoring of fiduciary and coordination capacities

³⁹ 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”)

⁴⁰ 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”)

⁴¹ This is a Bank core sector indicator and it also contributes to the CIF Core Indicator #5 (“Number of people supported by the PPCR to cope with the effects of climate change”)

Annex 2: Detailed Project Description

Haiti – Strengthening Hydro-meteorological Services (P148259)

Component 1. – Institutional strengthening of the hydro-meteorological services and development of data management tools (US\$3,000,000)

1.1 – 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 MARNDR⁴², 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.

1.1.1. 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.

1.1.2. – 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

⁴² Finance, Health, and Agriculture are the three Ministries in the GoH piloting an institutional reform.

management, maintenance and repair of stations as well as IT/communication equipment for the new SNRE-CNM joint office facility.

1.1.3. – 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 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.

1.2. – 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.

1.2.1. –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. Once the baseline assessment completed, the situation will be compared to an optimal network, which would meet priority national needs while taking into account the maintenance and operational budget. The second 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 third step will be the development of standard operating procedures for 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 project will support the development of and training on standard operating procedures (collection, verification, interpretation) for managing hydro-meteorological equipment and data

1.2.2. – 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) disaster risk management (under the leadership of DPC), (ii) food security (under the leadership of CNSA and the DIA), (iii) infrastructure design and development planning in a climate change context (under the leadership of MTPTC). It is expected that once these three first interfaces will be

operational, additional interfaces could be developed at marginal cost for other sectors, such as aviation, maritime services, public health.

1.2.3. – 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.

1.2.4. – Optimization of the hydro-meteorological networks (repairs, replacement and maintenance of equipment): The baseline assessment (activity 1.2.1) 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 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 project budget will only support repair, upgrade, calibration, and replacement of equipment, while operation and maintenance cost will be supported by the Government.

1.2.5. – Inter-ministerial coordination of the hydromet platform (MARNDR, CIAT, MDE, CNIGS and end-users) (provided in-kind by the Government): the Project Committee, led by MARNDR, will ensure a multi-stakeholder management of the platform and allow interactions between the data producers and users. The committee will play a critical advisory role on issues including: management of the platform, IT solutions and architecture for data management, feedback from end-users on hydro-met and climate applications, etc. The committee will not receive direct support from the project; however it 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\$1,400,000)

2.1. – 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 food security/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.

2.2. – Update and implement operating procedures for optimal use of hydro-meteorological services for agriculture and food security (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 sub-component, the 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 project will pilot an information service for farmers, designed following the specific requirements expressed by users from the food security and agricultural communities. 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 RESEPAG2, 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.

2.3. – Update and implement operating procedures for optimal use of hydro-meteorological services for civil protection: This sub-component 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 pilot zones, and the sub-component will also support the participation of users and civil servants in pilots.

2.4. – Update return period of selected hazards in order to enable mainstreaming climate variability and change into development processes and infrastructure design: Most 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 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\$600,000)

3.1 - 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 cost. As the 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 project partners. For monitoring and evaluation, a full time M&E specialist will be hired in support of the MARNDR's Unité d'Etude et Planification (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.

3.2 - Supporting MARNDR M&E capacity and PPCR knowledge management. The M&E specialist financed through the 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 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 and WMO hydromet projects: Close coordination with the main development partners already involved in Haiti's hydromet sector took place throughout project preparation. In particular, the task team worked closely with the Inter-American Development Bank and the EU in order to capture and build on lessons learnt from their previous hydromet projects. One of the main lessons learned by hydromet projects worldwide is that, to be effective, they need 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-fledge service⁴³. In order to achieve this transformational impact, the Bank team joined forces with WMO and developed strong synergies between the PPCR project and a Canada-funded project implemented by WMO. Together, the two 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

⁴³ David Rogers and Vladimir Tsirkunov, Weather and Climate Resilience: Effective Preparedness through National Hydrological and Meteorological Services, The World Bank, 2013

institutional and financing model; (ii) improve service delivery, primarily for food security/agriculture and civil protection.

Figure 3: 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) + <i>government co-financing for maintenance</i>		
		1.2.5. – Inter-ministerial coordination of the hydromet platform (MARNDR, CIAT, MDE, CNIGS and users) - <i>government co-financing</i>		
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 Hydromet Services (P148259)

Project Institutional and Implementation Arrangements

Project administration mechanisms.

1. The 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 project. A project coordinator, to be hired through the project, will be responsible for the successful implementation of all the project 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 project timeframe⁴⁴, 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 procurement unit (*Unité de Passation des Marchés Publics*, UPMP) will carry out all procurement for the Project-financed activities. The 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 Project will be transferred to MARNDR. M&E responsibilities for the project will lie with the Planning and Studies Unit (UEP) of the MARNDR, who will have a dedicated staff (financed by the project) liaise regularly between the hydro-meteorological units and the other stakeholders of the project. More details on fiduciary arrangements can be found in Section 2 of this Annex.

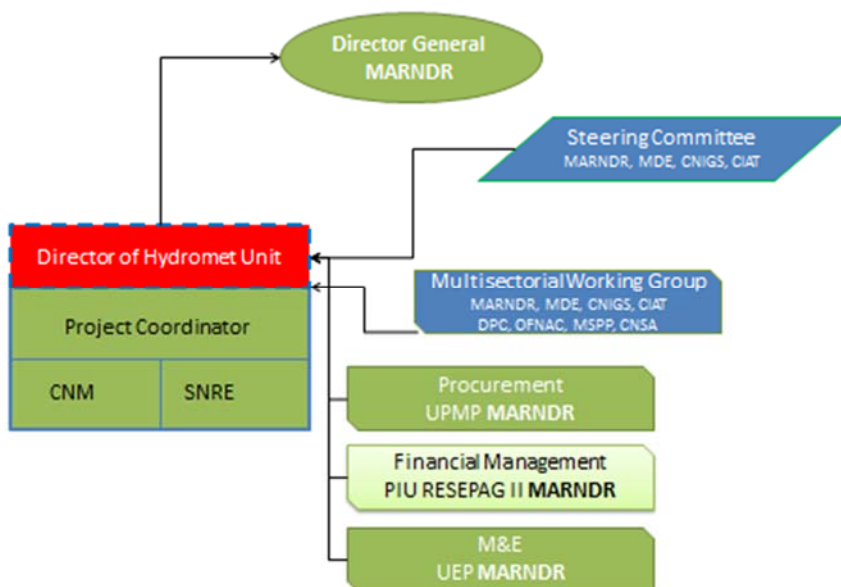
3. Hydro-meteorological and climate services are critical for resilience of a vast array of sectors to climatic shocks. While MARNDR will have a primary role in the execution of this project, it is expected that several end-users will benefit from activities of this project. In order to include sector-specific input in the preparation and implementation of project activities, MARNDR will convene a multi-sector Project Committee which builds on the existing "Ad-hoc Commission" (MARDNR, MDE, CNIGS, and CIAT) with the addition of other key stakeholders for the project (e.g. DPC, MSPP, MTPTC and other end users targeted by the project). This technical group would meet regularly (once a month or as needed) in order to carry out, among others, the following tasks: prepare technical specifications and terms of reference, monitor

⁴⁴ 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.

project activities, etc. A Memorandum of Understanding signed by the DG MARNDR and the institutions participating in the project will create the Project Committee.

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 2: Project reporting structure



5. The project will be implemented in accordance with the Project Appraisal Document (PAD), the Operation Manual (OM), which will be prepared prior to project effectiveness, and 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). CIAT will

also be 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 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 project will be transferred there. In order to maintain adequate FM arrangements to handle the activities generated by the 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) Include in the existing audit contract under RESEPAG II project, the audit of the proposed project's financial statements within four months of project Effectiveness, based on TORs acceptable to IDA.

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

9. *Staffing:* The Financial management 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 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 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. A financial management section will be prepared as part of the project's Operational Manual (OM) and will include appropriate accounting policies and financial reporting procedures. A financial management consultant will be provided to support the MARNDR in preparing the OM. The consultant 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 Project. The OM shall be subject to review and acceptance by the World Bank and will be finalized prior to negotiations.

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 project expenditures in accordance with the Bank's financial management requirements. These requirements have already been met for RESEPAG I and RESEPAG II 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 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. The format and content of the IFRs will be agreed by negotiations.

16. *Auditing Arrangements.* RESEPAG I and II 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. However, this first audit report was not transmitted to the World Bank in the agreed time frame i.e. by end of March 2014. Transmission of the next audit report, for the fiscal year ending September 2014 report will be a negotiation condition. 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 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 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*). Subsidiary, 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 project's auditors.

21. The 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 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 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 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 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 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 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 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 Project Team 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	Consultants to develop specific applications for the hydromet data interface	320,000	IC	Ex-Post	No	1-Mar-16	Design offices, research laboratories and consortiums
3.3	Financial Audit of the project	50,000	QCBS	Prior	No	31-Jan-16	
3.4	Individual Consultant Project Coordinator	335,000	IC	Prior	No	31-Aug-15	Local consultant
3.5	Short term individual consultants to provide technical assistance to the project coordination	60,000	IC	Prior	No	31-Jan-16	Various
3.6	Individual consultant to provide UEP staff with technical assistance for M&E (including during mid term and final evaluation of the project)	67,000	IC	Prior	No	31-Jan-18	Various
3.7	Individual consultants to strengthen the RESEPAG fiduciary unit in charge of the Hydromet Project	42,000	IC	Ex-Post	No	31-Aug-15	Various
3.8	Consultants to provide UEP staff with technical assistance to comply with safeguard instruments	21,000	IC	Ex-Post	No	31-Aug-15	Various
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. Works	>2,000	ICB	≥500
	Entre 200 et 2,000	NCB	≥500
	≤200	Shopping	None
2. Goods, non-consulting services	>500	ICB	≥150
	≤500	NCB	≥150
	≤50	Shopping	None
3. Consultants - 3.A Firmes nationales	> 200	QCBS, QBS, FBS, LCS	≥50
	≤300	CQS	≥50
	Regardless of Value	Single Source	All
- 3.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 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 management, 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, currently in draft form, will detail (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 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 will be elaborated that gives procedural guidance to the contractor regarding how to remove and dispose of mercury. The contract should also refer to relevant sections of the ESMF for contractors to follow these procedures.

30. *Anticipated Impacts.* The 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.

31. *Applicable Safeguards Policies.*

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

32. *Safeguards Compliance Procedure during Implementation.* An environmental management specialist will be assigned to the 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.

33. *Borrower's Capacity to Implement Safeguards.* The Borrower's capacity to implement safeguards is generally weak. While there is a unit within the Ministry of Agriculture 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.

34. *Consultations and Disclosure of Safeguards Documents.* The ESMF has been prepared in draft form and when finalized, the PAD will be updated to reflect that content. The process to prepare the ESMF has included consultations with all stakeholders including land owners and users in and around the equipment sites, where known. This is the first contact with stakeholders and therefore the consultant has given appropriate information related to the positive and potential negative impacts of these meters. The views and opinions of stakeholders will be incorporated into the finalized ESMF. The finalized ESMF will be disclosed on the bank's website as well as the website of the Ministry of Agriculture and/or other public location.

Monitoring and Evaluation

35. 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.

36. 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 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 project (e.g. Civil Protection Directorate; CNSA; and other members of the Project Committee) and will provide regular updates to the Project Coordinator. The Project's Operation Manual will provide specific details regarding monitoring and evaluation responsibilities, data collection requirements, timing and use of information.

**Annex 4 - Systematic Operations Risk- Rating Tool (SORT)
Haiti – Strengthening of Hydromet Services (P148259)**

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

Annex 5: Implementation Support Plan
Haiti – Strengthening of Hydromet Services (P148259)

Strategy and Approach for Implementation Support

1. The strategy for Implementation Support Plan (ISP) stems from the nature of the 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 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 project.

Implementation Support Plan

<i>Time</i>	<i>Focus</i>	<i>Skills Needed</i>	<i>Resource Estimate</i>	<i>Partner Role</i>
<i>First twelve months</i>	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 setting up the project committee which includes the end-	Hydrologist/Meteorologist Public sector reform specialist/economist	18 Staff weeks	Ensure coherent approach

	users			
	Establishing linkages between M&E unit in MARNDR (UEP) and CNM-SNRE; establishing linkages between MARNDR and CIAT (PPCR focal point)	M&E	8 staff weeks	
	Fiduciary aspects	FM and Procurement	8 staff weeks (combined from support to other projects)	
<i>12-60 months</i>	Regular support for development of ToR, implementation of activities, capacity building; Ensuring input from inter-ministerial project committee	Hydrologist/Meteorologist DRM	10 staff weeks/year	

Skills Mix Required

<i>Skills Needed</i>	<i>Number of Staff Weeks</i>	<i>Number of Trips</i>	<i>Comments</i>
Team Leader	10-12 weeks/year	4-5	
Technical (Hydromet) Specialist	8-10 weeks/year	4-5	
Procurement Support	8 weeks/year	2-3	
Environmental Specialist	2 weeks/year	2	
Social Specialist	2weeks/year	2	

Annex 6: Economic Analysis

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 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 management⁴⁵.

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 period for both projects together. 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 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 project will create the basis for future private sector activities. One of the main objectives of the project is to give momentum to the hydromet sector so it reaches critical size and quality to attract private interest and investments towards the development of further user-based needs. It has been shown empirically that the private sector rarely gets involved in this field without well-identified business applications. Over the long term, private sector development is also seen as a key to ensure financial sustainability of hydromet services

⁴⁵ Assumes exchange rate 1 CAD = 0.78 US\$

(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 has experience in supporting complex institutional reforms and is providing broader institutional support to the 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 Project

6. The benefits of the 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 operational costs 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 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 costs⁴⁶ 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.
 - 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.

⁴⁶ A ball park figure for the saving in operating cost could be US\$ 50,000/year.

Reduction in damages and losses

8. Overall, based on available historic data, natural disasters⁴⁷ 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 GDP⁴⁸. 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 sectors⁴⁹. 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 GDP⁵⁰. 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.).
- Contributing to more forward-looking applications, such as big data ones (almost any field can be contemplated here from traffic management to crime prevention).

⁴⁷ Hurricanes, floods and earthquakes

⁴⁸ 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)

⁴⁹ Ibid.

⁵⁰ A similar approach was used to estimate benefits from improved hydromet services in Yemen (PPCR, 2013) and Nepal (PPCR, 2012)

Annex 7: List of main donor-funded hydro-met initiatives⁵¹

Donor	Project	Status	Amount (mln US\$)	Main activities	Potential linkages with PPCR Hydro-met Project
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)	Active	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 national and decentralized level - Public awareness and education.	- Integration into national network of stations and central database - Re-vamping of EWS
IDB	PNAP TA – follow up	Closed in Dec 2014	0.44	- Technical assistance to define institutional arrangements for the EWS and hand-over to MARNDR - Improve data collection and analysis for the EWS at the local level.	Support to MARNDR during PPCR project preparation
EU	Territorial Information Program for Sustainable Development	Closed in June 2014	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

⁵¹ 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.

	(PITDD):				
WMO	Climate Services to Reduce Haiti's Vulnerability	Active	5.1	<ul style="list-style-type: none"> - Construction of a joint building for CNM and SNRE and equipment - Business plan for hydro-met services-Training in weather forecast - Central database of hydromet data and repair of existing stations - Pilot weather radio networks. 	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - TA to MDE for environmental impact evaluation - Local adaptation pilot projects 	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - More than 5 weather stations and 2 EWS in Tabarre and Gonaive (currently not functioning) - Significant financial support to CNSA (10 departmental observatories and more than 120 rain gauges) 	<ul style="list-style-type: none"> - Integration of stations and data into national network and central database - Leverage of CNSA departmental network

Annex 8: Haiti’s Strategic Program for Climate Resilience (SPCR)

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	IBRD	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	IBRD	7.0
Investment Project 4: Strengthening Knowledge Management of Hydro-meteorological, Water Resources, and Climate Data to Inform Decision Making and Policy Dialogue	IBRD	5.0
	TOTAL	25.0

PPCR Core Indicators and their link to the proposed Project indicators

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	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - Direct project beneficiaries (number), of which female (percentage)