

**INVESTMENT PROJECT 1
STRATEGIC PROGRAMME FOR CLIMATE
RESILIENCE**

**ENVIRONMENTAL MANAGEMENT FRAMEWORK
(EMF)**

April 2014



**FINAL
REPORT**

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ACRONYMS

ADA	Association of Development Agencies
CARIMAC	Caribbean Institute of Media and Communication
CBO	Community Based Organization
CCKAP	Climate Change Knowledge, Attitude and Behavioural Practice
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CDB	Caribbean Development Bank
FAO	Food and Agriculture Organisation
GIS	Geographic Information System
GDP	Gross Domestic Product
IT	Information Technology
JCF	Jamaica Constabulary Force
JIS	Jamaica Information Service
JPSCo	Jamaica Public Service Company
MGD	Mines and Geology Division
MLSS	Ministry of Labour and Social Security
MOAF	Ministry of Agriculture and Fisheries
MTWH	Ministry of Transport, Works and Housing
MSJ	Meteorological Services of Jamaica
NEPA	National Environment and Planning Agency
NIC	National Irrigation Commission
NSDMD	National Spatial Data Management Division
NWA	National Works Agency
ODPEM	Office of Disaster Preparedness and Emergency Management
PIOJ	Planning Institute of Jamaica
PPCR	Pilot Program for Climate Resilience
RADA	Rural Agricultural Development Authority
SDC	Social Development Commission
SPCR	Strategic Program for Climate Resilience
WRA	Water Resources Authority
UNDP	United Nations Development Agency
UWI	University of the West Indies

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PART I GENERAL PROJECT AND SITE INFORMATION

INSTITUTIONAL & ADMINISTRATIVE				
Country	Jamaica			
Project title	Strategic Program for Climate Resilience (SPCR) Investment Proposal 1 <i>The Improving Climate Data and Information Management Project</i>			
Scope of project and activity	As presented below			
Institutional arrangements (Name and contacts)	WB (Project Team Leader)	Project Management	Local Counterpart and/or Recipient Planning Institute of Jamaica	
Implementation arrangements (Name and contacts)	Safeguard Supervision	Local Counterpart Supervision Planning Institute of Jamaica (PIOJ)	Local Inspectorate Supervision PIOJ	Contractor Meteorological Services of Jamaica (MSJ) Water Resources Authority of Jamaica (WRA) Ministry of Agriculture /Rural Agricultural Development Agency (RADA)

1.0 INTRODUCTION

This Environmental Management Framework (EMF) is prepared for **Investment Proposal I (IP I)** of the Strategic Program for Climate Resilience (SPCR) in Jamaica. Entitled ***The Improving Climate Data and Information Management Project, (ICDIMP)*** the **IP I**, states the development objective is *to improve the quality and use of climate related information for effective planning and action at local and national levels.*

The World Bank's Environmental and Social Safeguard policies seek to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for Bank and borrower staff in the identification, preparation, and implementation of programs and projects. The policies are further described as a cornerstone of the Bank's support to sustainable poverty reduction.

The World Bank (WB) has noted that the ICDIMP will contribute to one of the Strategic Objectives of Vision 2030 Jamaica: National Development Plan, which is to adapt to climate change through mainstreaming climate risks into government policies and plans, identifying strategic priorities and adoption of best practice, as well as promote greater public awareness of the issues. Hazard Risk Reduction and Adaptation to Climate Change is presented as one of the outcomes for Goal number four, and the strategies articulated to achieve the outcome include:

- ✚ Improve resilience to all forms of hazards
- ✚ Develop measures to adapt to Climate change
- ✚ Contribute to Efforts to Reduce Global Rate of Climate Change

This **Investment Proposal I** is seeking to contribute to the knowledge platform to improve decision-making with regard to strategies for achieving disaster risk reduction.

Further, the project fits into the current World Bank Country Partnership Strategy (CPS) Results Area 3: *Contributing to addressing vulnerability to natural disasters and climate change.*

The structure of the Framework is described as follows: Part I describes the scope and activity of the project, the environmental setting, legal and regulatory context, consultation process and institutional capacity arrangements. Part II presents the Safeguards Information including environmental and social screening and in Part III mitigation measures are recommended. Part IV briefly describes Monitoring and Evaluation, and four Annexes present legal and regulatory information and stakeholder consultation considerations.

2.0 PROJECT SCOPE AND ACTIVITY

ICDIMP will provide investments for upgrading and providing new, critically needed equipment, systems and operator training for improved collection, processing and forecasting of hydro-meteorological and agrometeorological data. The objective is to ultimately improve the availability and reliability of data for climate change scenario modeling, risk analyses, warning systems, and knowledge sharing. Four sub-components are included in this investment project.

Sub-component 1.1: Hydro- and agro-meteorological high priority equipment and spare parts. The subcomponent will provide investments in the:

- Supply, installation, calibration and training of staff for 26 automatic weather stations;
- Communications repeaters for transmitting data in real time;
- Eight agro-meteorological stations;
- Automatic recording rain gauges to augment/replace the existing manual gauges;
- Stream flow/ river gauging loggers for flood and drought forecasting (6 new loggers, 9 replacements and upgrades); upgrades to the rainfall intensity gauging network;
- Ground water monitoring equipment;
- Back-up power supplies for the Jamaica Meteorological Services (JMS), the Water Resources Authority (WRA) and the Rural Agricultural Development Authority (RADA).

The equipment will be used to upgrade instrumentation in key watersheds for measurement and monitoring of water supply potential as well as flash-flood potential and risk. Particular attention will be paid to those parts of the island which are most susceptible to short duration high intensity events and generally erratic rainfall. Further, it is important to infill data gaps between stations and to provide near real-time data to facilitate improved forecasting and early warning systems. The investments will also enable provision of accurate and timely wind speed information to trigger payments administered under the Caribbean Catastrophe Risk Insurance Facility (CCRIF). Sites will not be new, but instrumentation will be.

Sub-component 1.2: New Doppler radar - Radar observations are critically important in Jamaica for tracking weather systems to facilitate warning to the public and to enable strategic placement of resources particularly during the hurricane season. Effective use of the data produced through the radar can support disaster mitigation. The investment will replace the existing timeworn S-band weather radar system that was acquired in 1999. The system, although still functioning, is an older model, is considered obsolete and spare parts are generally unavailable. Occasionally parts have to be custom built, and this is a slow and time consuming process. Long radar down times is a constraint to tracking weather systems, and can therefore have significant negative economic consequences. The new radar will be installed on the existing site.

Sub-component 1.3: Sea level monitoring station, Port Royal. Jamaica has a coastline of some 1,000 km. Approximately 90 percent of the country's GDP is generated in coastal areas and 60 percent of the population lives within 2kms of the coast. The coastal ecosystems are already being adversely impacted by climate change,

including increased intensity and frequency of tropical storms and hurricanes that damage mangrove forests, sea grass beds, beaches and coral reefs. The sub-component will provide a state-of-the-art tidal gauge with a complete automatic weather monitoring station at Port Royal, Kingston Harbour. The station will generate data on water level, seawater temperature, air temperature, barometric pressure and wind speed and direction, and will have high resolution measuring capabilities. The monitoring station will provide real time information on changes in sea level height for climate impact monitoring and for use by the Kingston Harbor Master's Department. Data will also be used as an input for the tsunami early warning system which is managed by the MSJ.

Sub-component 1.4: Data management and staff training. The current state of the hydro-meteorological data base is diffuse. The sub-component will complement the equipment investments (sub-components 1.1 – 1.3 above) with a number of activities:

- Fill current spatial and temporal gaps in the climate data records (data rescue, e-formatting historic data files, data infilling software and data back-up arrangements¹);
- Staff training and mentoring on hydro-meteorological data quality assurance and data management, including the introduction and appropriate use of proven open-source database software
- Mentoring staff to identify long term (historical) 'special study' monitoring sites
- Identify key watersheds for water supply and flash flooding that are to be more appropriately instrumented for improved agency analytical capabilities.

The project outcomes have been identified as fourfold and are related to the sub-components outlined above:

1. More accurate predictions and early warning of extreme weather events
2. Increased capacity to interpret climate change scenarios and translate them into the sectoral planning processes
3. Improved understanding of the vulnerability of health facilities and the cost of making them climate resilient
4. Increased awareness of the impacts of climate change and adoption of initiatives to improve resilience
- 5.

At the end of the project therefore, it is expected that there will be relevant and accessible hazard risk and adaptation information; sector and area specific climate scenarios; and sectoral vulnerability assessments.

In summary, **Investment 1** will assist in setting the framework for action, and improving the systems necessary for the integration of climate change in decision-making processes. This involves the generation of data and information that will form the basis on which policies, programmes and projects are designed and implemented. The data management and sharing platform is therefore a significant output of this investment.

¹ E.g. make use of cost-effective cloud computer services provided by reputable vendors to ensure data permanence and regular transfer of basic data to approved agencies such as WMO or U.S. National Climatic Data Center for archival storage.

2.1 Types of Activities Anticipated

Activities under this project component will include both physical and “non-physical” activities. **Physical activities** will involve mainly environmentally benign activities, as well as limited physical works with some potential for environmental impacts. These include:

- Replacement of the currently obsolete RADAR system
- Replacement or retrofitting of manually-read rain gauges with automatic recording systems linked to satellite or other real-time transmission systems
- Installation of Agro meteorology stations with soil moisture and soil temperature probes ➤ Installation and/or upgrading of hydrologic data collection stations.
- Upgrading of potable water supplies at the relevant stations
- Installation of backup electricity supplies at the relevant stations
- Installation of a fully serviced marine observational station at Port Royal on the site of the existing tide gauge.

Non-physical activities are also by their very nature environmentally benign or indeed may be contributory to improvements in environmental management. The proposed such activities include:

- Outlining requirements of a vulnerability assessment of the health sector
- Staff training and data management

Civil works may entail:

- Rehabilitation of buildings and upgrading of the respective potable water and back-up electricity supplies
- Improvements of access to instrumentation sites
- Selection of existing sites for the installation and emplacement of metering towers or soil moisture pads, rain gauges, or stream gauges. No new sites will be developed.

These works may involve the demolition and removal of structures and obsolete monitoring equipment, and disposal of wastes or materials.

It is important to note that the locations of the monitoring stations to be upgraded have not yet been decided, but will be defined during implementation based on an evaluation of data gaps and needs. Some stations may require access road improvements, or improvements to existing sites to accommodate new equipment, while other stations may not require any improvements other than the addition of recorders, anemometers, a small solar backup battery, or the like. Some of the stream gage stations may require simple maintenance or improvement, while other new stations may require control structures to be built (restrictions to pool the stream flow and direct it into a specified channel for measurement) and possibly may require improvements in access roads to reach the sites for installation or upgrading. Soil moisture monitoring stations have yet to be

decided but would be most likely placed on existing fields and farmed lands. Accordingly, this EMF provides a framework for managing the future effects of these activities once specific details are known.

Installation of marine observation equipment is also a noteworthy contribution. The current tide gauge is located at the seaward entrance of the Kingston Harbour within the facilities of the Jamaica Defense Force Coast Guard at Port Royal. The gauge site is equipped with a weather monitoring station and can be utilized for the tsunami early warning system. The gauge can provide real time information on sea level height to the Harbour Master's Department and can be used to observe sea level changes as part of climate change monitoring.

Kingston Harbour and the encircling shoreline is a key economic zone. It accommodates the main port facilities of Jamaica, as well as commercial, manufacturing, service, and residential uses. The rate of sea level rise is of general concern for Jamaica as the coastal zone accommodates major settlements, economic activity, and key infrastructure.

The marine observation works (tide gauge) may involve the demolition and removal of obsolete equipment, site preparation and installation of the new equipment. The works will be done at the same location as the existing station, which is situated on an old concrete tide monitoring house located on the eastern end of the Coast Guard station of the Jamaica Defence Force (JDF). Works are likely to entail repair and upgrade of the existing concrete shelter for the equipment. No new foundation is anticipated.

3.0 ENVIRONMENTAL SETTING

Climate triggered extreme events have been the bane of Jamaica's social and economic development for decades. Over the ten year period 2001-2012 in particular, hydro-meteorological hazards have caused damage and losses estimated at over J\$113 billion - more than J\$11 billion per year. Further, the damage and loss suffered due to these hydro-meteorological events have been estimated as 1-2% of Jamaica's GDP. Climate change projections for Jamaica suggest that changes in temperature, precipitation and sea level rise will increase vulnerability to disasters, and therefore initiatives to build climate resilience are imperative. The database required to inform the required programs is currently inadequate, making this IP I essential for Jamaica at this time.

Jamaica's location and culture history have imbued the island with distinctive physical characteristics, patterns of human settlements, and forms of economic activity. The land area which covers approximately 11,000km² is exceeded by the area of territorial seas - 16,000km². A coastline of approximately 1,022 km hosts major settlements, key infrastructure, the tourism product, and other key economic and social infrastructure.

The island sits toward the northern boundary of the Caribbean Plate, and active faults lie within its terrestrial and marine boundaries. Seismic risk is a significant aspect of the island's natural hazard profile.

A mountainous interior surrounded by mostly narrow coastal plains gives rise to a distinctive drainage pattern. The central backbone acts as the major drainage divide between north and south flowing rivers. The island's geology is dominated by limestone and the resulting karstic features dominate much of the landscape and interior drainage characteristics. Flooding of interior basins is common after prolonged rainfall and the consequent dislocation of agriculture, commerce and social infrastructure can only be aggravated by the projected increase in intensity and variability of extreme events attendant on climate change. Slope instability is characteristic of many areas, and the rapid response to intense or prolonged rainfall often as a result of deforestation and degraded conditions, makes landslide vulnerability another feature of Jamaica's hazard profile.

Climate change projections as revealed through modelling and scenario building, to date indicate increasing variability in precipitation patterns. A summary of projected climate scenarios is presented below.

Jamaica's annual rainfall pattern is bimodal with two rainy seasons and intervening dry periods. Hurricanes have been increasing in intensity and frequency over the past century and the last decade shows an anomalous rise in the 2000-2010 decade (Figure 3.0a).

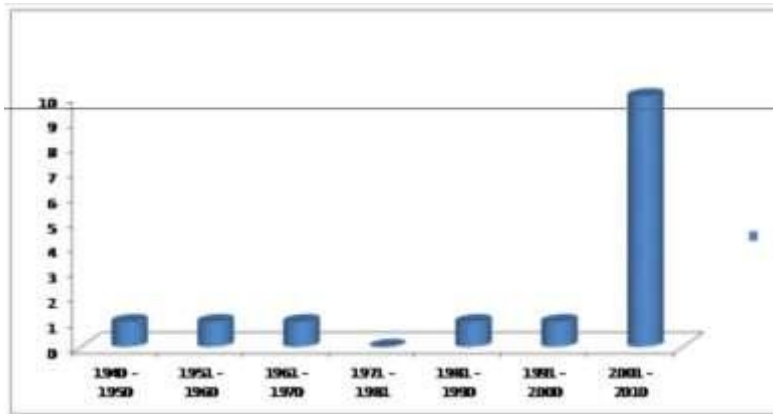


Figure 3.0a: Frequency of Hurricanes in Jamaica 1940 – 2010 (ODPEM, PIOJ)

Table 3.0a: Summary of Regional Climate Model Projections for Jamaica

Parameter	PRECIS Model	SDM
Temperature	<p>Increase of: 0.4-0.9°C by 2015 0.5-1.0°C by 2030s 0.7-1.8°C by 2050s 1.8-3.5°C by 2080s</p> <p>South-western Jamaica will experience the greatest change in the 2050s</p>	<p>Increase of: 0.5-0.7°C by 2015 0.8-1.3°C by 2030s 1.1-1.8°C by 2050s 1.9-2.6°C by 2080s</p> <p>March - May will see greatest increase</p>
Precipitation	<p>Rainfall decrease in most regions by the 2050s</p> <p>By 2080s, decrease ranging from 25% to 40% of current rainfall levels will take place in all regions</p>	<p>General pattern of decreased rainfall overtime</p> <p>Significant decrease in rainfall starting in 2050s</p> <p>June - November will have most pronounced decrease</p>
Other	N/A	Stream flow of some major rivers will decrease due to reduced rainfall

Source: Climate Studies Group Mona

Location of the Radar

The existing radar is located at Shoucair Circle on an isolated hill at an elevation of 729 metres in the general area of Cooper's Hill, St. Andrew. The predominant land cover of this hilly terrain is broad leaf forests, much of which has been disturbed to varying degrees due to human activities. Residential land use is also widespread as a result of the many subdivisions over the years. The new radar facility will occupy the same footprint as the old facility (see photograph below).



Plate 3.0 Current Radar installation at Cooper's Hill

The communities in proximity to the site include Cooper's Hill to the southwest, Padmore to the north east and Swain Spring to the south. Cooper's Hill is essentially an upper income community with a small population dispersed throughout the area. Padmore is a middle income community while the community of Swain Spring is of mixed income. Swain Spring is the only one of the three communities with community facilities such as a school and a health clinic.



Figure 3.0b: Map of St. Andrew showing location of Copper's Hill and Surrounding Areas

Climate Change Analysis

Coopers Hill lies within Grid 5² of the PRECIS Regional Climate Model (RCM) projections outlined in the **2012 State of the Jamaican Climate** report. Relative to present conditions, annual temperatures in the area may increase by as much 4.3°C by the 2080s under the B2 (“worst-case”) scenario. Regarding rainfall, the projections are showing reduced annual rainfall of about 28-51% annually. The highest reduction is likely during the rainy season, from August to October. The dry season is also expected to experience reduced precipitation.

Table 3.0b: Climate Projections for Cooper’s Hill, St Andrew from 2071-2099 (under the A2 and B2 Climate Scenarios) Relative to Present Conditions

Time	Temperature Increase/°C (B2-A2)	Rainfall Change/% (B2-A2)
November to January	2.34 – 3.39	-21.6 to -51.5
February to April	2.91– 3.95	-5.1 to +1.4
March to July	3.03– 4.89	-24.3 to -58.0
August to October	2.96– 4.90	-40.4 to -62.4
Annual	2.81– 4.28	-27.6 to -51.5

Source: 2012 State of the Jamaican Climate

The area is also likely to experience an increased number of heavy rainfall events. These are likely to result in flooding and landslides, particularly following periods of drought. Whilst there are no specific quantitative predictions on wind speeds and relative humidity for Cooper’s Hill and surrounding areas, it is possible that there will be significant reductions. Hurricanes are also a threat as the country could be exposed to more intense storms.

3.1 Spatial Distribution of Existing Hydrological and Meteorological Monitoring Network

The network of rainfall and flood monitoring loggers are deployed throughout Jamaica’s drainage basins. These basins are managed through 26 watershed management units. Figures 3.1a-b generated by the Water Resources Authority, illustrate the spatial distribution of existing rainfall loggers operated by the WRA and the Met Service, and the stream gauge network of the WRA. Data generated is inadequate to facilitate rainfall to runoff modeling, and flood and drought forecasting. Increased variability in flows expected from climate change requires that the network be upgraded to obtain continuous data.

² Each grid is 50km in length and width over Jamaica

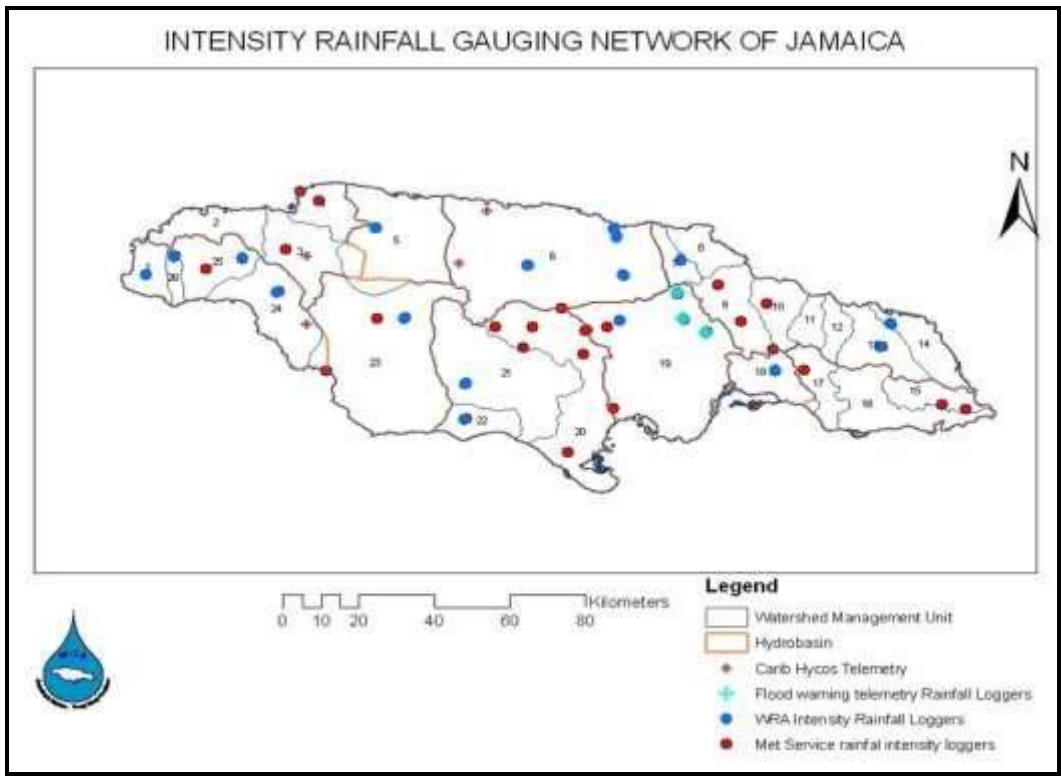


Figure 3.1a: Intensity Rainfall Gauging Network of Jamaica

A typical rain gauge station, and the associated instrumentation, is shown below. The proposed upgrades would use the same footprint, but would add software and hardware to improve the design and functionality of the stations. See photograph below.



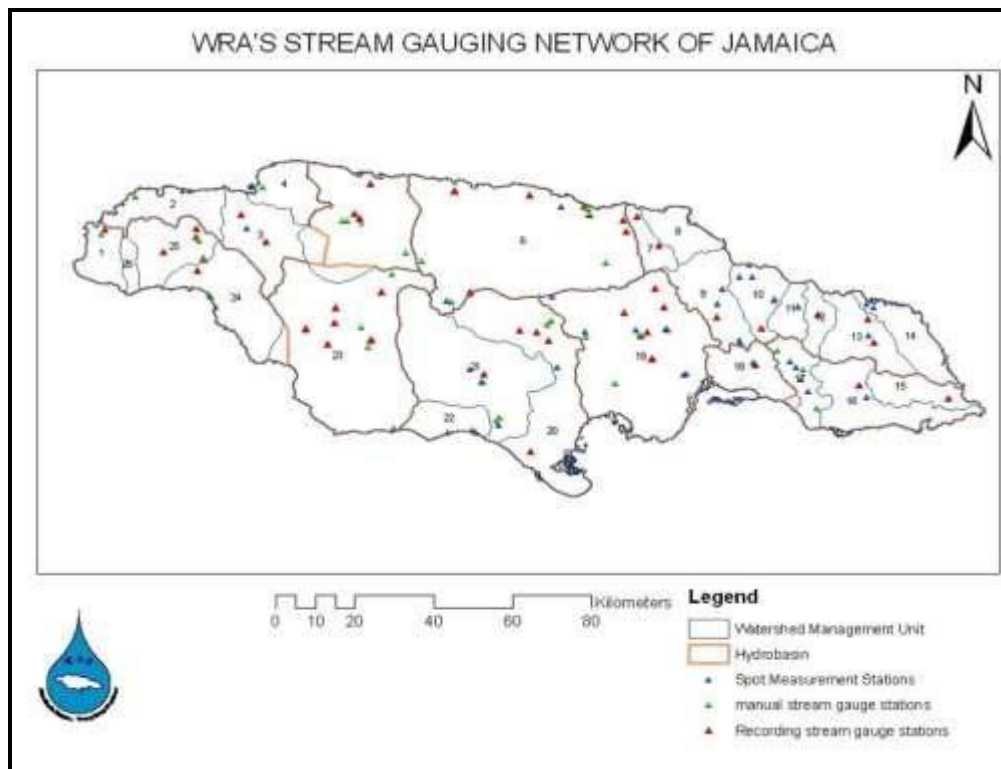


Figure 3.1b: WRA's Stream Gauging Network of Jamaica

A typical stream monitoring station is shown below (on the Rio Cobre), and the existing recording equipment which is to be upgraded from manual (paper records) to digital, with resulting improvements in quality and accessibility of data.



Groundwater monitoring is also crucial to the management of water resources and flood projections. The western two-thirds of the country is underlain by karstic limestone formations, which form the major aquifers. These aquifers accommodate the greater portion of the island's groundwater resources. Installation of loggers on some of these monitoring wells will enhance the capacity of the WRA to better develop, calibrate and verify

groundwater models for managing water resources, and for forecasting in times of groundwater induced flooding. The current distribution of monitoring wells is shown below in Figure 3.1c.

3.2 Analysis and Management Activities

Further to the project sub-components described above, the following outputs are also significant to the building of climate resilience. A data sharing platform and a coherent formal collaboration mechanism is needed to facilitate a streamlined system of data capture, analysis, interpretation and dissemination among the agencies. Data sharing will facilitate sound decision-making in various sectors including agriculture, transport, infrastructure, and housing. Multiple public and private agencies including Meteorological Services of Jamaica (MSJ), Water Resources Authority (WRA), Ministry of Agriculture and Fisheries (MoAF), as well as mining and sugar companies collect climate data independently or somewhat jointly. However, data sharing across agencies is currently not fluid. The project would support measures to streamline the sharing of climate data among the different stakeholders (see Figure 3.2).

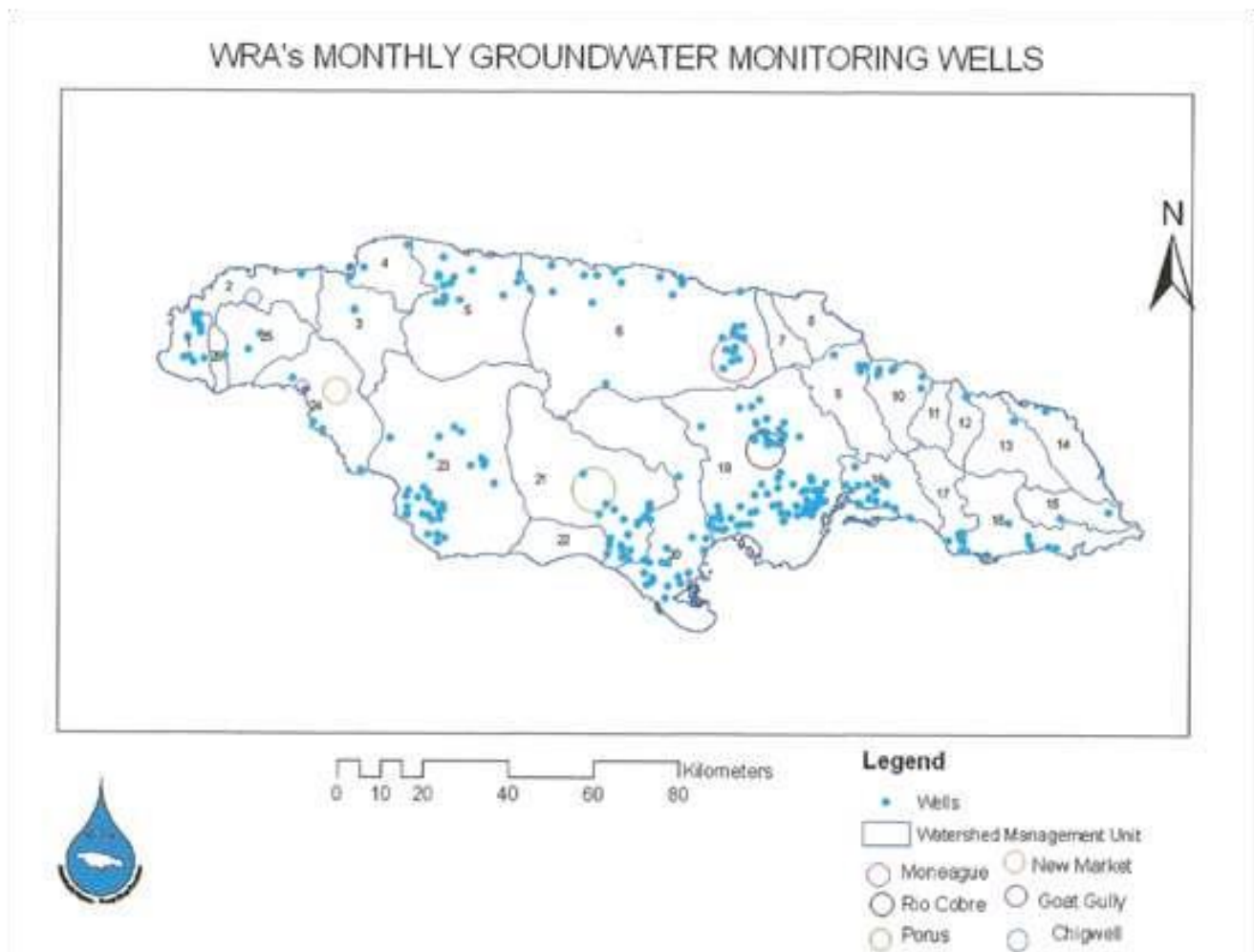


Figure 3.1c Groundwater Monitoring Wells

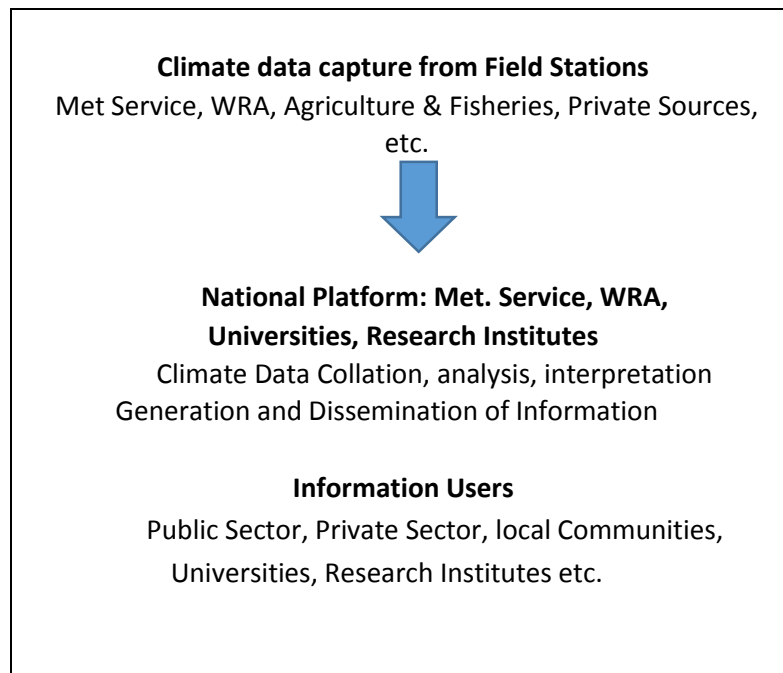


Figure 3.2: Concept Diagram of Climate Data and Information Platform (adapted from Aide Memoire, 2013)

Training and capacity enhancement of staff at both MSJ and WRA is essential. Both agencies are currently understaffed and the deepening of services will require more technical personnel as well as further training to meet the needs of the program of expansion and/or replacement of equipment and software.

Data sharing will help to inform the Risk Information platform to be developed under IP 2. This platform will be populated by high resolution climate change scenarios at the national and sectoral levels. This output is a key ingredient for national and sectoral development planning, in the light of potential climate change impacts. Vulnerability assessments for key sectors will complement the database.

The Climate change **education and awareness** program will partner with various media and communications organizations in message design and testing, media planning, monitoring and evaluation of communication-related activities as well as media and communication training and knowledge translation. Vulnerable and special groups (e.g., persons with disabilities, maroon communities, women, and youth) will be targeted using appropriate messages and platforms. The environmental message should be clearly inserted.

As noted above the environmental footprint of the investment is minimal. However, there is a clear synergy between the generation of data and sound environmental management. The potential negative environmental effects would occur due to the civil works, and consequently the mitigation measures and management plans of this EMF will focus on those components, and should be included in the contractual agreements.

4.0 LEGAL, REGULATORY AND POLICY FRAMEWORK

Jamaica's national environmental regulatory requirements are prescribed by the Environmental Permit & License System (P&L) of 1997 which is administered by the National Environment and Planning Agency (NEPA). The P&L is a mechanism to ensure that all Jamaican facilities and development projects meet the relevant standards and procedures to minimize adverse environmental impacts during construction and operation of a facility.

The proposed projects are not likely to have major impacts, but they must be screened and analyzed so as to mitigate any potential negative effects and /or enhance potential positive spinoffs. In addition the regulatory requirements of the Government of Jamaica must be met.

Major pieces of environmental legislation and associated regulations as may be relevant to this project are presented in Annex I.

A recent review of policy, plans, legislation and regulations for climate resilience in Jamaica, commissioned by the Planning Institute of Jamaica (PIOJ), presented a large compendium of items, but indicated that at present the current policy and legislative framework is not adequate to respond to the ongoing requirements of climate change (McCalla, 2012). The paper further lists several legislative measures required, and these are also presented in Annex I.

In terms of priority, the paper noted that during the 2012-2013 legislative agenda the following legislation needed to be enacted:

- Water Resources (Amendment) Act
- Disaster Management Act
- Town and Country Planning Act
- Meteorological Act
- National Building Act and promulgation of the Building Code
- Renewable Energy Act

4.1 Permitting Requirements and Agencies

The Environmental Permit and License System (P&L), as mentioned above was introduced in 1997, as a mechanism to ensure that all developments in Jamaica meet required standards in order to minimize negative environmental impacts. The P&L System is administered by the National Environment and Planning Agency (NEPA), through the Applications Section (formerly the Permit and License Secretariat). Permits are required by persons undertaking new developments that fall within a prescribed category. A list of the categories is provided in **Annex II**.

Under the NRCA Act of 1991, the NRCA is authorized to issue, suspend and revoke permits and licenses where facilities are not in compliance with the environmental standards and conditions of the approval stipulated. An applicant for a Permit or License must complete an application form as well as a Project Information Form (PIF) for submission to the NRCA.

The overall activities of IP1 do not fall within any of the prescribed categories. However, any aboveground fuel storage in excess of 880 gallons or underground storage in excess of 1,100 gallons that may be associated with standby power generation, will need a license. Solar power is planned for installation of the radar and support services, so this may not apply. However, if the diesel or gasoline generator is to be used then the capacity will need to be checked and the appropriate permitting requirements followed.

4.2 World Bank Safeguard Policies

Based on the purpose of the safeguards as stated by the Bank, environmental assessments should be integrated with the project cycle such that environmental screening occurs at the project identification stage and scoping and preliminary analysis at the prefeasibility stage. The magnitude and sensitivity of the project and the attendant issues determine whether a full assessment is required. The emphasis of the environmental assessment should be on identifying environmental issues early in the project cycle, designing environmental improvements into projects, and avoiding, mitigating, or compensating for adverse impacts. The objective is to address environmental issues as early as possible, so as to avoid costs and delays in implementation due to unanticipated problems (World Bank, 1999). This EMF document is addressing those requirements.

The Bank categorizes projects according to their environmental and social sensitivity as follows:

Table 4.2-World Bank Classification of Projects for Environmental Assessments

Category A	A full EIA is required, as the project may have diverse and significant environmental impacts
Category B	Although a full EIA is not required, environmental analysis is appropriate, as the project may have specific environmental impacts
Category C	Environmental analysis is normally unnecessary, as the project is unlikely to have any environmental impacts

In the case of Investment Proposal I no major negative issues are projected, and the overall outcome will have a strong positive impact. Some aspects of the project need to be assessed for environmental impact, but the specific actions are not yet known and therefore this EMF has been prepared. As noted above, the project has been placed in Category B.

Sites have not yet been finalized for the data collection activities, but the WB Safeguard policies that could be triggered by actions are as follows:

- ✚ *Environmental Assessment OP/BP 4.01*: The project activities are expected to have largely positive environmental and social impacts as improving weather and climate information and forecasting will

contribute to increased productivity, strengthening disaster risk management and reduced vulnerability. However, as there are some physical works involved (replacement of radar; upgrading monitoring stations), there may be some minor and reversible environmental impacts from construction activities. Therefore this EMF provides an assessment of impacts and the planning framework to mitigate negative effects."

- ✚ *Natural Habitats OP/BP 4.04*: It is necessary to determine whether the installations will affect natural habitats since it is possible that there may be construction of works in regions or areas where natural habitats may be affected. While project activities are not expected to affect natural habitats, some meteorological stations may be located in protected or sensitive areas and the exact locations and potential impact are not yet known. There would need to be limitation on the construction of new, permanent access roads within protected or sensitive areas. Screening criteria and mitigation measures to avoid any negative impacts are presented in Parts II and III of this EMF document.
- ✚ *Physical/ Cultural Resources OP/BP 4.11*: The project includes minor construction works and physical cultural resources could be affected during earthworks. Although highly unlikely given the small footprint of the installations, it is necessary to include screening procedures to ensure that construction sites are assessed for the presence of any physical cultural resources and to ensure that no works will affect known cultural sites. Mitigation procedures for handling resources that are identified during the site preparation and construction phase - "chance find procedures" are presented in Parts II and III of this EMF document.
- ✚ *Involuntary Resettlement OP/BP 4.12*: Based on the project footprint this safeguard policy will not be triggered. The radar will have the largest single footprint, and that site is already occupied by the MSJ. No new sites will be developed for precipitation or stream flow monitoring stations. It is important that the implementing agencies related to installing and upgrading hydrological and AWS stations and other works take cognizance of the policy in selection of sites and access routes and use only established routes. No acquisition of lands, permanent or temporary, will be eligible under this project, nor will actions involving removal of crops or restriction of access.

These triggers have been assessed and recommendations indicated above, as well as in Sections II and III for cases where the safeguards apply.

5.0 STAKEHOLDER CONSULTATIONS

5.1 SPCR Consultations

Extensive consultations with wide-ranging stakeholders were held across the island to inform the development of Investment Proposals for the Strategic Program for Climate Resilience (SPCR). Stakeholders were drawn from the public, private and civil sectors and workshops were convened in Kingston, Mandeville, Negril and Port Antonio. The geographic spread covered the south, central, north-eastern and north-western sections of the island.

Four regional workshops were held between January and February 2011 in Portland, Manchester, Westmoreland and the Kingston Metropolitan area. The private sector, NGO's, Community based organizations (CBO's) and public sector stakeholders participated. As part of the Programme Appraisal for IP 1 and to inform the EMF, additional sector consultations have been held. The objectives of the national 2011 workshops were:

- To secure feedback from participants as to how they were being impacted by climate change; what they are doing currently to cope with the impacts of climate change at the community/parish levels
- To review the strategies and actions being implemented at the parish level, and receive recommendations for strategies and actions to be implemented at the national levels to improve resilience to the impacts of climate change.

Following the consultations organizations playing leadership roles in the priority sectors were invited to submit project concepts to address the most critical needs as agreed from previous consultations, and these concept notes were strengthened through further consultations. The first draft of the SPCR embodied information gleaned from consultations and national climate change documents, and was submitted for review and feedback. The revised version of the SPCR and the investment proposals were further presented to representatives of the private sector, public sector, environmental and other NGOs, local government, agricultural and academic institutions for comment and feedback. The investment proposals for the SPCR project reflect the contributions of the multiple stakeholders engaged with hazard vulnerability and the imperative to build climate resilience through data generation, information sharing and mainstreaming.

5.2 Data Use Consultations

Involvement of stakeholders is essential for generating successful project engagement and buy-in. It is therefore important to recognize stakeholders according to the level of influence, interest and/or stake in the programme. Influence is defined as the power to affect implementation of the project, and use of the data generated, either positively or negatively. Interest or stake refers to the direct and indirect beneficiaries and/or users of project outputs. The stakeholder engagement plan for IP 1 has been submitted as a separate document. A summary of Stakeholder Identification and Interest is presented in Annex III, and **Annex IV** describes needs for varying stakeholder groups.

Key stakeholders have been identified by the requirements of the subcomponents. They include representatives from the Met Services, Water Resources Authority (WRA) , ODPEM, Ministry of Health, Ministry of Agriculture and Fisheries, Rural Agricultural Development Agency (RADA), National Irrigation Commission (NIC), Hydrology Consultants, University of the West Indies – Climate Studies, Caribbean Institute of Mass Communication (CARIMAC), Jamaica Information Service(JIS), Environmental Professionals, National Environment and Planning Agency(NEPA), Community-Based Organisations (CBOs),Ministry of Transport, Works and Housing (MTWH) . **Annex IV** elaborates.

5.3 EMF Consultations

The development of the EMF was supported by consultations and discussions with the relevant line agencies during project preparation in 2013. These consultations were particularly relevant to the civil works. Further consultations were held with community members, and representatives of NGOs, academic institutions and the private sector. **Annex V** elaborates.

Annex VI presents a summary of the disclosure undertaken on the EMF document. The first draft was presented in a PPCR workshop in January 2014, and the draft final which included revisions, was presented at a workshop in March 2014. Several issues of clarification were raised but there were no changes necessary for the EMF.

Participants were fully engaged and provided beneficial feedback to the presentation, seeking clarification and making recommendations. Discussion centred around four areas as outlined below.

1. Hosting and sharing of data

In response to questions regarding whether the data would be hosted by the PIOJ and shared, it was noted that the project is intended to facilitate/streamline a system of not only data capture, analysis and interpretation but also dissemination. The project is going to support data sharing mechanisms through training, capacity building and public awareness building. It was further noted that the objective of the project is to improve the availability of real time hydro meteorological data, to inform scenario building. UWI is currently working on climate scenarios which will need to be disseminated to inform development planning. There is a Communication Strategy and Action plan element of the project which will be implemented to facilitate targeted dissemination of data.

With respect to hosting of information, it was reported that the project designers had approached the National Land Information Council and Spatial Data Management Division of the Ministry of Land, Water, Environment and Climate Change, which has an elaborate and very well-structured GIS capability. The proposal is for the project to support the strengthening of the Spatial Data management capacity to handle the required platform for data management.

Some participants indicated that data must be treated with the value it has, therefore, not all data can be fully available to all and sundry. Access to data will have to be based on the needs of users. The onus will be on the MSJ to share information gathered, and the product to be generated and the charge to be levied would depend

on the end use. It is important that costs to be recovered so as to contribute to the financial sustainability of the agency.

2. Radar Installation

Coopers Hill residents raised concerns regarding “electrical interruptions” at home because of the wave frequency from the site where the radar is located. One resident was very concerned as he stated that a member of his household had a pacemaker. Another resident indicated fear of the possibility of dangerous emissions from the site affecting residents. The representative from the MSJ and from the Physics Dept. at UWI indicated that the radar emits the same wave frequency as a television and would therefore not be a major threat. They noted, however, that a number of towers owned by other entities were located at the same site as the radar, and that perhaps issues experienced may be related to the towers.

Oil from the radar site was also reported as flowing on to adjacent properties. The MSJ reported that the facility experienced an oil leak on the generator in the past, and it was surmised that the leak may have been the cause of the flow of oil. The leak has since been fixed.

It was emphasized that no hazardous waste is involved with the radar installation.

3. Tide Gauge

Regarding generation of data for tsunami warnings, participants sought clarification on how the information would be handled. It was re-emphasised that the MSJ is the focal point for receiving messages for tsunami warnings, but ODPEM is responsible for issuing warnings to the public.

It was noted that Port Royal was the only location for tide gauge installation under this project, and the coastal zone unit of NEPA would be notified of the installation if so required.

4. General Comments

Clarification was sought on the combination of new and replacement sites for the 26 automatic weather stations. MSJ indicated that in some cases the manual weather stations will be replaced by the automatic stations, and whereas loggers will be new, sites will be the same. The Bank was concerned that new sites would have implications for the time span of the project.

Concerns were raised regarding maintenance and availability of spares for equipment. In the past equipment had been purchased and the respective agencies did not have the resources to maintain. Suppliers also go out of business. MSJ indicated that based on their experience with the current radar, they would ensure that the supplier for the new radar “will be in business for a while.” The PIOJ indicated that the project has allocated resources for spare parts, and training is a critical element of the project. It was suggested that allocations for training should be put in the recurring budget for MSJ as project funds were limited.

Another participant suggested that the project should ensure that local suppliers who are engaged are linked to international companies, as they will assist in matters such as maintenance and warranty, among other things. It was also suggested that the project should ensure that money is budgeted for preventive maintenance.

Regarding gender and vulnerable groups participants were assured that the second subcomponent of the investment project has a specific area that focuses on youth and gender considerations.

Regarding sharing of information on the project with the communities and stakeholders well in advance of the commencement of the project, participants were told that the Communications Strategy and Action Plan and the stakeholder engagement plan have outlined procedures for sharing information, and these would be carried out during the project implementation stage. The MWLECC has also received an allocation for working with schools.

Summary notes from the second disclosure are attached in **Annex VI**.

The EMF document will be further disclosed using the following methods: i) online through a PIOJ electronic portal of free access to the public; through the MSJ and WRA ii) hard copy will be placed at the radar site. Information on how and where the EMF has been disclosed, is contained in Annex VI.

6.0 INSTITUTIONAL CONSIDERATIONS

6.1 Data use

The ICDIMP will be directed by the SPCR Steering Committee which has already been constituted. The PIOJ functions as the executing agency and three Ministries, one executive agency and one Division will be responsible for implementation of the subcomponents. The Ministry of Water, Land, Environment and Climate Change (MWLECC) has a substantial portfolio which includes climate change and the newly formed Climate Change Division (CCD). The MSJ is also as a division under this Ministry. The WRA, an executive agency within the GOJ, also falls under the umbrella of the MWLECC. The Ministry of Agriculture and Fisheries (MoAF) and its agency, RADA, is the second Ministry and agency with implementing responsibilities. Both entities are significant stakeholders for use of weather and climate data to be generated under the ICDIMP. The health sector has been included for specific attention with respect to vulnerability assessment under this ICDIMP, and therefore the Ministry of Health is the other Ministry involved. Each of the agencies has specific functions for effective implementation of the project. The Institutional Analysis has been submitted as a separate document. However, some observations need to be highlighted.

The MSJ has primary responsibility in Jamaica for recording, monitoring and analyzing the island's weather and climate data. It will be the agency responsible for receiving and installing the upgraded Doppler radar, and the upgraded and expanded observation and AWS stations. The agency is currently understaffed with respect to the technical skill sets and personnel required to implement the ICDIMP effectively. Staffing and training need to be emphasized as critical success factors for the project.

Subcomponent 4 describes the training needs and the proposed activities and outputs. As noted above, training of staff in the respective agencies in equipment maintenance, data analysis and data interpretation will be necessary, given the upgrade and expansion of the respective networks.

The procurement process is also a matter of concern and will need to be finalized in the Project Appraisal process. Such procurement includes acquisition of equipment as well as employment of contractors to carry out the works and the other non-physical aspects of the ICDIMP. An essential element of this process involves the environmental and social due diligence obligation of the implementing agency as well as the contractors. The environmental screening and mitigation requirements have been outlined in Parts II and III of this document, and supervisory function for monitoring adherence must be assigned appropriately. The technical expertise will have to be contracted where it does not reside in the respective agency.

The MSJ is a division within the MWLECC and is therefore stymied in any effort to take on some of the responsibilities which require autonomy in decision-making. The recently formed Climate Change Division appears to have superseded the climate branch of the MSJ, and it will be important to clarify and confirm the role of the CCD in project implementation. The appropriate skill sets such as reside partially in the MSJ must be brought to bear on this highly technical project.

The WRA, by virtue of its executive status and experience in handling data and projects, is a small but well organized entity with more autonomy. Hydrological equipment and data gathering will be the mandate for this

agency. WRA also operates some weather stations particularly for extreme event recording as it affects flood flows and early warning systems. The data sharing platform will be essential for optimizing the data gathering and analysis necessary to inform the scenario building and other aspects of data generation for decisionmaking.

The Ministries of Health and Agriculture/RADA will be users of the data for the several aspects of vulnerability assessments related to the sectors. For agriculture, food security and export commodities are important considerations for flood and drought assessments. Climate change has implications for the health sector in terms of the vector –borne diseases, and the incidence of extreme events on physical structures as well as operating systems. An outline approach to vulnerability of the sector has been prepared and provided under separate cover for consideration.

6.2 Civil Works

The implementing agencies for the civil works will be MSJ and WRA. The former will be involved with the upgrading of the tidal and rain gaging stations and the weather radar station, and the latter will be involved with the stream gauge and some of the rain gauge stations. MJS and WRA will be responsible for ensuring that the environmental measures described in this EMF are included in contracting provisions, and for inspecting and supervising any works in the field to make sure that the measures in this EMF are indeed carried out. The MSJ and WRA will collaborate and coordinate with PIOJ throughout the project lifetime in contracting and supervision of the works.

PART II ENVIRONMENTAL SCREENING AND SCOPING

This section II provides the elements necessary for screening of each of the subprojects and activities in the future, once specifics are known about a particular location or action. It is the responsibility of the Implementing Agency (MSJ, WRA, or others) to review each proposed activity based on the specifics of each proposed location as details become available during project implementation.

The first Table II-1 presents an evaluation of whether a particular activity would potentially affect natural habitat or physical cultural resources, or involve any land acquisition, use or access. In such cases the associated World Bank Safeguard Policy would be triggered and the project activity would be ineligible and excluded from consideration. This would be the screening function applicable to all proposed activities.

Table II-1: Project Screening & Exclusion Criteria

CRITERIA	YES / NO	
Does the proposed project require the major construction or upgrading of new roads or opening new access routes?		
Does the proposed project require the acquisition of any land, either temporarily or permanently; the removal of crops or destruction of any personal property; or, create any new restrictions to access of any sites, locations or roadways?		
Would the works require leveling and clearing of lands with natural habitat (those water or land areas where most of the original plant and animal species are still present)?		
Would the works affect cultural property, including any archeological or historical sites?		
Is the project in a natural protected area, or could the project impact or affect the habitat of endangered species of plants or animals?		
Could the project adversely affect natural resources (water intakes) or waterways (streams, rivers, or wetlands) by sedimentation, pollution, flooding, draining, or filling?		
Will the project modify any coastal zone feature, reef or marine features?		

The second Table II-2 provides the framework for the scoping and preliminary identification of potential negative environmental impacts from the proposed project activities. It is the duty of the Implementing Agency (WRA and MSJ) to review the particulars of each proposed activity and determine whether any of the potential impacts could occur, and if so then considerations are provided for mitigation measures which would be required. In this

way, the table provides further indicative impact and mitigation considerations and a listing of further potential impacts given that many sites have not yet been confirmed. It is intended to serve as a guide for the WRA and MSJ during the scoping of particular locations, actions, and plans.

These screening/scoping and mitigation measures can be inserted in the contractual agreement with selected contractors as described in Section III. Each location or action must be screened by WRA and/or MSJ to ensure that all the pertinent environmental factors are being taken into account.

Table II-2: Indicative Impacts and Mitigating Measures

Issues/Impact	Mitigation Consideration	Subcomponent
Site assessment for new and existing installations	Hazard vulnerability- flood and seismic risk, slope failure, etc.	All sites, especially AWS and stream gages
Property ownership, use or access	Prohibit any land acquisition (temporary or permanent), change in land use (such as prohibition of access or removal of crops)	All sites
Ease of Access	Minimal vegetation clearance and earthwork – minimize vegetation clearance and habitat destruction	All sites
	Prohibit expansion of roads or acquisition of lands for access	All sites
Waste management	Proper disposal of packaging for material - off site Avoid any burning	All sites
Installation of cables or trenches	Minimize earthworks and slope instability	All sites
Work in stream beds	Maintain riparian rights and do not affect water use or diversion	Stream gages
	Control sediment generation and discharge	Stream gages
	Prohibit heavy equipment in streams or on banks; use manual labor and	Stream gages
Refurbish old buildings	Appropriate disposal of debris generated, packaging, paint containers, chemical residue, etc.	Radar site Stream gauge sites AWS
	Use licensed waste disposal contractors to ensure disposal at licensed sites.	
New structures	Minimise earthworks, consider site vulnerability to hazards	Stream gauge sites AWS

Issues/Impact	Mitigation Consideration	Subcomponent
Materials Supply (Gravel, Concrete, Asphalt, etc.)	Environmental compliance of suppliers re dust control, and material spillage/loss during transport, delivery and storage	Stream gauge AWS Radar site
Noise	Close to residential area so consider time of day for installation. Ensure muffler systems attached for operating equipment	Radar site
Dust	Regular wetting	All sites where necessary
Chance Find of Cultural Artifacts	Contact relevant authorities – Jamaica National Heritage Trust	All sites – weather and hydrological installations
Management of Solid Wastes (Non-Hazardous)	Collection, transport, and disposal of any debris	All sites
Management of toxic substances	Enforce use of safety gear for workers. Package empty containers for disposal by contractor.	All sites
Management of Hazardous waste	Contain waste and Contact NEPA	All sites
Emissions from Construction Equipment/vehicles	Keep equipment/vehicles in good running order	All sites
Management of spills from equipment	Appropriate clean up	All sites
Worker Health and safety	Sensitize workers and adhere to safety standards – protective gear as appropriate.	All sites
Management of wastewater from refurbishing and maintenance	Avoid runoff	Radar site

PART III MITIGATION MEASURES

The mitigation measures that are required for good environmental management will be the same for most of the projects and activities being undertaken. The mitigation measures that are listed in Table III-1 below can be considered standard, and should be included in all Contract documents for the civil works being considered. These measures will form the minimum performance requirements.

After screening and reviewing each of the proposed subprojects or activities (using Table II-2 above), or after visiting a particular project in the field to scope and screen the potential effects, it is possible that additional measures may be necessary to prevent any negative impacts. In this case, it is the duty of the WRA and MSJ to ensure that those additional protection measures are included into any Contract documents, as well as and in addition to the standard measures in Table III-1 below.

The mitigation measures described in Table III-1 and the accompanying contract language, and any additional mitigation measures identified during screening and scoping (Table II-2), together form the core component of the Environmental Management Plan (EMP) that must be followed by each implementing agency and their contractors, as described in Part IV of this EMF.

Table III-1: Standard Contract Language for Mitigation Measures

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
1. General Conditions	Notification and Worker Safety	<p>(a) The Parish Council and respective communities have been notified of upcoming activities</p> <p>(b) The public has been notified of the works through appropriate notification in the media and/or at publicly accessible sites e.g. Library, post office, parish council office, site of the works, etc.</p> <p>(c) All legally required permits have been acquired for construction and/or rehabilitation</p> <p>(d) The Contractor formally agrees that all work will be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment.</p>

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
		<p>(e) On site construction workers will comply with international good practice (always hardhats, as needed masks and safety glasses, harnesses and safety boots)</p> <p>(f) Appropriate signposting of the radar site will inform workers of key rules and regulations</p>
A. General Rehabilitation and /or Construction Activities	Air Quality	<p>(a) During interior refurbishing old carpeting, windows, doors etc. will be carefully removed and debris transported to temporary storage area on site</p> <p>(b) Debris shall be kept in controlled area and covered with tarpaulin</p> <p>(c) The surrounding environment (sidewalks, roads) shall be kept free of debris to minimize dust</p> <p>(d) There will be no open burning of construction / waste material at the site</p> <p>(e) There will be no excessive idling of construction vehicles at sites</p>
	Noise	<p>(a) Construction noise will be limited to day time.</p> <p>(b) During operations the engine covers of generators, air compressors and other powered mechanical equipment shall be closed. Equipment should be in good working order to further minimize noise</p>
	Water Quality	<p>(a) The site will establish appropriate erosion and sediment control measures such as e.g. or silt fences to prevent sediment from moving off site and causing excessive turbidity in nearby streams and rivers. No equipment should be used in or near channel bed and sides</p>
	Waste management	<p>(a) Waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities. (b) Construction waste will be collected and transported to landfill by licensed</p>

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
		collectors
B. Wastewater treatment	Water Quality	<p>(a) Existing system for handling sanitary wastes and wastewater from radar site to be inspected and upgraded if deemed necessary.</p> <p>(b) Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute natural surface water bodies.</p>
C. Historic building(s)	Cultural Heritage	<p>(a) If installations of any new equipment are close to a designated historic structure, or located in a designated historic district, notification shall be made and approvals/permits obtained from Jamaica National Heritage Trust, Parish Councils</p> <p>(b) Provisions must be made for artifacts or other possible “chance finds” encountered in excavation or construction to be noted and registered, responsible officials at JNHT contacted.</p>
D. Acquisition of land	Land Use or Access	<p>(a) If acquisition or temporary use of land was not expected but is required, or if loss of access to income of legal or illegal users of land was not expected but may occur, then the Bank’s Task Team Leader shall be immediately consulted.</p>

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
E. Toxic Materials	Asbestos management	<p>(a) If asbestos is located on the project site, it shall be treated as hazardous material.</p> <p>(b) Asbestos should be handled and disposed by skilled & experienced professionals</p> <p>(c) If asbestos material is to be stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately.</p> <p>(d) Security measures will be taken against unauthorized removal from the site.</p>
	Toxic / hazardous waste management	<p>(a) Temporary storage on site of all hazardous or toxic substances will be in safe containers labeled with details of composition, properties and handling information</p> <p>(b) The containers of hazardous substances shall be placed in a leak-proof container to prevent spillage and leaching</p> <p>(c) As far as practicable paints with toxic ingredients or solvents or lead-based paints should not be used</p> <p>(d) Any use of pesticides must be made by licensed and trained companies.</p>
F. Affected forests, wetlands and/or protected areas	Protection	<p>(a) All recognized natural habitats, wetlands and protected areas in the immediate vicinity of the activity will not be damaged or exploited, all staff will be strictly prohibited from hunting, foraging, logging or other damaging activities.</p> <p>(b) A survey and an inventory shall be made of large trees in the vicinity of the construction activity, large trees shall be marked and cordoned off with fencing, their root system protected, and any damage to the trees avoided</p>

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
		(c) Adjacent wetlands and streams shall be protected from construction site run-off with appropriate erosion and sediment control features - e.g. silt fences (e) No work is allowed in any Protected Area or Natural Habitats.
G Traffic and Pedestrian Safety	Direct or indirect hazards to public traffic and pedestrians by construction activities	<p>(a) In compliance with national regulations the contractor will ensure that the construction site is properly secured and construction related traffic regulated.</p> <p>This includes but is not limited to</p> <p>Signposting, warning signs, barriers and traffic diversions: site will be clearly visible and the public warned of all potential hazards</p> <p>Traffic management system and staff training, especially for site access and transportation of radar from port to installation site.</p> <p>Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours.</p> <p>Active traffic management by trained and visible staff at the site, if required, for safe and convenient passage for the public.</p>

PART IV ENVIRONMENTAL MANAGEMENT PLAN

This Part IV of the EMF is the Environmental Management Plan (EMP). It includes information on 1) definition of mitigation measures, 2) enforcement of contract provisions, 3) record keeping of screening and inspections, and 4) reporting to PIOJ and the World Bank.

The appropriate mitigation measures will be defined by the Implementing Agencies (WRA and MSJ) using the methods described in Part II of this EMF. The Implementing Agencies will keep written records of the screening and scoping of each of the proposed subproject activities, and provide them for review to PIOJ and/or World Bank upon request.

Once defined, the mitigation measures will be written into the contracts for works as described in Part III. The Implementing Agencies will keep written copies of the contracts, and will make sure that the contractors are aware of the environmental requirements.

WRA and MSJ will supervise their contractors in the field to ensure that the mitigation measures are indeed carried out, by the monitoring program/schedule described below.

The monitoring and evaluation system that is developed for the ICDIMP should include indicators for environmental and social screening, scoping, contracting, and supervision with respect to locational analyses, and siting/transportation/installation/ maintenance of equipment. The indicators are to be taken from the Parts II & III – Screening and Mitigation Planning.

A simple monitoring program would entail:

- A. Project start-up. site selection, equipment transport and installation, installation of data systems, installation of tide gauge, refurbishing of Coopers Hill site offices for Radar installation
- B. Three month intervals for the first year - monitor on-going site selection and installation - AWS, stream gauges
- C. Twice per year after Year 1 to the end of the project for the longer duration subcomponents.

Finally, the monitoring activities and EMP will be periodically reviewed by the World Bank and will form the criteria for safeguards compliance in future evaluations. The final evaluation will be guided by the indicators for environmental quality objectives for the small works as outlined for outputs and activities.

ANNEX I - LEGAL AND REGULATORY CONSIDERATIONS

This section presents the legislation and regulations pertinent to the Improving Climate Data and Information Management project.

Natural Environment

Natural Resources Conservation Authority Act (1991)

The Natural Resources Conservation Authority Act was passed in the Jamaican Parliament in 1991 and provided the basis for the establishment of the Natural Resources Conservation Authority (NRCA) with primary responsibility for ensuring sustainable development in Jamaica through the protection and management of Jamaica's natural resources and control of pollution. Sections 9 and 10 of the NRCA Act stipulate that an Environmental Impact Assessment (EIA) is required for new projects and existing projects undergoing expansion.

The body is also responsible for investigating the effect on the environment of any activity that may cause pollution or which involves waste management. Sections of the Act that relate specifically to pollution control state that:

- (i) No person shall discharge on or cause or permit the entry into waters, on the ground or into the ground, of any sewage or trade effluent or any poisonous noxious or polluting matter.
- (ii) No person is allowed to construct or reconstruct or alter any works designed for the discharge of any effluent.

The Act also empowers the authority to require of any owner or operator of a pollution control facility, information on the performance of the facility, the quantity and condition of effluent discharged, and the area affected by the discharge of such effluent.

The Authority has the right to consult with any agency or department of Government having functions in relation to water or water resources to carry out operations to:

- a) Prevent pollutants from reaching water bodies.
- b) Remove and dispose of any polluting matter or remedy or mitigate any polluted water body in order to restore it.

Environmental Review and Permitting Process (1997)

The Environmental Permit and License System (P&L), introduced in 1997, is a mechanism to ensure that all developments in Jamaica meet required standards in order to minimize negative environmental impacts. The P&L System is administered by NEPA, through the Applications Section (formerly the Permit and License Secretariat). Permits are required by persons undertaking new development which fall within a prescribed category. Under the NRCA Act of 1991, the NRCA is authorized to issue, suspend and revoke permits and licenses if facilities are not in compliance with the environmental standards and conditions of approval stipulated. An applicant for a Permit or License must complete an application form as well as a Project Information Form (PIF) for submission to the NRCA.

Wildlife Protection Act (1945)

The Wildlife Protection Act of 1945 prohibits removal, sale or possession of protected animals, use of dynamite, poisons or other noxious material to kill or injure fish, prohibits discharge of trade effluent or industrial waste into harbours, lagoons, estuaries and streams, and authorizes the establishment of Game Sanctuaries and Reserves. Protected under the Wildlife Protection Act are six species of sea turtle, one land mammal, one butterfly, three reptiles and several species of birds including rare and endangered species and game birds.

The existence of the legally protected American Crocodile in the project area brings this legislation into context in the project site.

The Endangered Species (Protection, Conservation and Regulation of Trade) Act (2000)

This Act deals with restriction on trade in endangered species, regulation of trade in species specified in the schedule, suspension and revocation of permits or certificates, offences and penalties, and enforcement. Many species of reptile, amphibian and birds that are endemic to Jamaica but not previously listed under national protective legislation, or under international legislation, are listed in the Appendices of this Act.

The Natural Resources (Prescribed Areas) (Prohibition of Categories of Enterprise, Construction and Development) Order (1996)

The island of Jamaica and the Territorial Sea of Jamaica have been declared a Prescribed Area. No person can undertake any enterprise, construction or development of a prescribed description or category except under and in accordance with a permit. The Natural Resources Conservation (Permits and Licenses) Regulations (1996) give effect to the provisions of the Prescribed Areas Order.

Water Resources Act (1995)

The Water Resources Act of 1995 established the Water Resources Authority (WRA). This Authority is mandated to regulate, allocate, conserve and manage the water resources of the island. The Authority is also responsible for water quality control and is required under Section 4 of the Act to provide upon request to any department or agency of Government, technical assistance for any projects, programmes or activities relating to development, conservation and the use of water resources.

It is the responsibility of the WRA as outlined in Section 16 to prepare, for the approval of the Minister, a draft National Water Resources Master Plan for Jamaica. Areas to be covered in this Draft Master Plan of 1990 included objectives for the development, conservation and use of water resources in Jamaica with consideration being given to the protection and encouragement of economic activity, and the protection of the environment and the enhancement of environmental values.

Section 25 advises that the proposed user will still have to obtain planning permission, if this is a requirement, under the Town and Country Planning Act. In addition, Section 21 of the Act stipulates that if the water to be used will result in the discharge of effluents, an application for a license to discharge effluents will have to be made to the Natural Resources Conservation Authority or any other relevant body as indicated by the Minister.

With regard to underground water, Section 37 states that it is unlawful to allow this water to go to waste. However, if the underground water "interferes or threatens to interfere with the execution or operation of any underground works", it will not be unlawful to allow the water to go to waste in order to carry out the required works provided

that there is no other reasonable method of disposing of the water. The Authority also has the power to determine the safe yield of aquifers (Section 38).

Beach Control Act, 1956

The NRCA Act, 1991 names the NRCA as the governing body of The Beach Control Act of 1956. This Act states that:

No person shall encroach on or use the foreshore or floor of the sea for any public purpose or in connection with any trade or business, or commercial enterprise without a proper license.

The Minister may, upon the recommendation of the Authority, declare any part of the foreshore and the floor of the sea together with the water lying on such a part of the floor of the sea to be a protected area.

The Minister may declare an order that prohibits activities such as fishing, the use of boats, the disposal of rubbish or waste, water-skiing, dredging, the destruction of marine organisms or the search for and removal of artefacts from protected areas.

No person may erect, construct or maintain any dock, wharf, pier or jetty on the foreshore or the floor of the sea, unless expressly permitted to do so through a license granted by the Minister.

The Authority is empowered to maintain, use and develop beaches for the benefit of the public and to take steps for the establishment of the right of the public to use beaches or to gain access to such.

The Natural Resources Conservation Authority (Air Quality) Regulations, 2006

Part I of this Act speaks to license requirements and states that every owner of a major facility or a significant facility, shall apply for an air pollutant discharge license. Part II speaks to the stack emission targets, standards and guidelines. The regulations define primary and secondary ambient air quality standards. The standards for the primary pollutants are shown in the table below.

POLLUTANT	AVERAGING TIME	STANDARD µg/m	
Total suspended particulates	Annual 24h		
PM10 (particulates with diameter <10 microns)	Annual	50	
Sulphur dioxide	Annual	Primary	Secondary
	24hr	80	60
		365	280
Carbon monoxide	8h	10,000	
	1hr	40,000	
Carbon dioxide	Annual	100	

According to the regulations additional sources within the air shed should not create a significant impact. This is defined in the Regulations as the additional increment that should not exceed the following concentration values:

POLLUTANT	24-h, $\mu\text{g}/\text{m}^3$	Annual, $\mu\text{g}/\text{m}^3$
PM10 (particulates with diameter <10 microns)	80.5	21
	80.5	21
Nitrogen Dioxide	80.5	21

Clean Air Act (1964)

This act refers to premises on which there are industrial works, the operation of which is in the opinion of an inspector likely to result in the discharge of smoke or fumes or gases or dust in the air. An inspector may enter any affected premise to examine, make enquiries, make tests and take samples of any substance, smoke, fumes, gas or dust as he considers necessary or proper for the performance of his duties.

Noise Standards

Jamaica has no national legislation for noise, but World Bank guidelines have been adopted by the National Environment and Planning Agency (NEPA) and are used for benchmarking purposes along with the draft National Noise Standard that is being prepared. The guidelines for daytime perimeter noise are 75 decibels and 70 decibels for nighttime noise.

The Office of Disaster Preparedness and Emergency Management Act (1998)

This Act established the Office of Disaster Preparedness and Emergency Management (ODPEM) to develop and implement policy and programmes to achieve and maintain an appropriate state of national and sectoral preparedness for coping with emergency situations.

Petroleum and Oil Fuel (landing & storage) Act

Petroleum and Oil Fuel (landing & storage) Act extends to the storage of petroleum in quantities greater than one hundred and twenty imperial gallons in a building specially appointed for this purpose by the Minister.

Quarries Control Act (1983)

The Quarries Control Act of 1983 established the Quarries Advisory Committee, which advises the Minister on general policy relating to quarries as well as on applications for licenses. The Act provides for the establishment of quarry zones, and controls licensing and operations of all quarries. The Minister may on the recommendation of the Quarries Advisory Committee declare as a specified area any area, in which quarry zones are to be established and establish quarry zones within any such specified area.

Section 5 of the Act states that a license is required for establishing or operating a quarry. However, this requirement may be waived by the Minister if the mineral to be extracted is less than 100 cubic metres. Application procedures are outlined in Section 8. The prescribed form is to be filed with the Minister along with the prescribed

fee and relevant particulars. The applicant is also required to place a notice in a prominent place at the proposed site for a period of at least 21 days starting from the date on which it was filed.

Socio-Economic Environment

Town and Country Planning Act (1958)

Section 5 of the Town and Country Planning Act authorizes the Town and Country Planning Authority to prepare, after consultation with any local authority, the provisional development orders required for any land in the urban or rural areas, so as to control the development of land in the prescribed area. In this manner, the Authority will be able to coordinate the development of roads and public services and conserve and develop the resources in the area.

Any person may, under Section 6 of the Act, object to any development order on the grounds that it is:

- Impractical and unnecessary;
- Against the interests of the economic welfare of the locality.

However, if the Minister is satisfied that the implementation of the provisional development order is likely to be in the public interest, he may, under Section 7 (2) of the Act, confirm it with or without modification by publishing a notice in the Gazette. Section 8 of the Act also gives the Minister the authority to amend a confirmed development order.

Section 10 of the Act states that a development order must include:

- Clearly defined details of the area to be developed;
- Regulations regarding the development of the land in the area specified; Formal granting of permission for the development of land in the area.

If the provisions of section 9A of the Natural Resources Conservation Authority (NRCA) Act apply to the development, the application can only be approved by the Planning Authority after the NRCA has granted a permit for the development (Section 11 (1A)). The Authority may impose a "tree preservation order" under Section 25 of the Act if it considers it important to make provision for the preservation of trees and woodlands in the area of the development. This order may:

- Prohibit the cutting down, topping, lopping or willful destruction of trees;
- Secure the replanting of any section of the woodland area in which trees were felled during the forestry operations permitted under the order.

The tree preservation order is not applicable to the cutting down of trees which were already dead, dying or had become dangerous and the order can take effect only after it has been confirmed by the Minister.

The Minister can, under Section 26 of the Act, make regulations to restrict and regulate the display of advertisements in any area to be developed if he considers this to be in the interest of public safety. Section 28 of the Act empowers the local authority to require the owner or occupier of land in the development area to take the steps necessary to ensure its proper maintenance.

Land Development and Utilization Act (1966)

Under Section 3 of the Land Development and Utilization Act (1966), the Land Development and Utilization Commission is authorized to designate as agricultural land, any land which because of its "situation, character and other relevant circumstances" should be brought into use for agriculture. However, this order is not applicable to land, which has been approved under the Town and Country Planning Act for development purposes other than that of agriculture. Among the duties of the Commission outlined in Section 14 of the Act is its responsibility to ensure that agricultural land is "as far as possible, properly developed and utilized".

Public Health Act (1976)

The Public Health (Air, Soil and Water Pollution) Regulations 1976, aim at controlling, reducing, removing or preventing air, soil and water pollution in all possible forms. Under the regulations given:

- I. No individual or corporation is allowed to emit, deposit, issue or discharge into the environment from any source.
- II. Whoever is responsible for the accidental presence in the environment of a contaminant must advise the Environmental Control Division of the Ministry of Health and Environmental Control, without delay.
- III. Any person or organization that conducts activities which release air contaminants such as dust and other particulates is required to institute measures to reduce or eliminate the presence of such contaminants.
- IV. No industrial waste should be discharged into any water body which will result in the deterioration of the quality of the water.

Country Fires Act (1942)

Section 4 of the Country Fires Act of 1942 prohibits the setting of fire to trash without prior notice being given to the nearest police station and the occupiers of all adjoining lands. In addition, a space of at least fifteen feet in width must be cleared around all trash to be burnt and all inflammable material removed from the area. Section 6 of the Act empowers the Minister to prohibit, as may be necessary, the setting of fire to trash without a permit.

Offences against this Act include:

- I. Setting fire to trash between the hours of 6.00 p.m. and 6.00 a.m. (Section 5a);
- II. Leaving open-air fires unattended before they have been completely extinguished (Section 5b);
- III. Setting fires without a permit and contrary to the provisions outlined in Section 6 (Section 8);
- IV. Negligent use or management of a fire which could result in damage to property (Section 13a);
- V. Smoking a pipe, cigar or cigarette on the grounds of a plantation which could result in damage to property (Section 13b)

The National Solid Waste Management Authority Act (2001)

The National Solid Waste Management Authority Act (2001) is "an act to provide for the regulation and management of solid waste; to establish a body to be called the National Solid Waste Management Authority and for matters connected therewith or incidental thereto". The National Solid Waste Management Authority (NSWMA) is to take all steps as necessary for the effective management of solid waste in Jamaica in order to

safeguard public health, ensure that waste is collected, sorted, transported, recycled, reused or disposed of, in an environmentally sound manner and to promote safety standards in relation to such waste.

Jamaica National Heritage Trust Act (1985)

The Jamaica National Heritage Trust Act of 1985 established the Jamaica National Heritage Trust (JNHT). The Trust's functions outlined in Section 4 include the following responsibilities:

- To promote the preservation of national monuments and anything designated as protected national heritage for the benefit of the Island;
- To carry out such development as it considers necessary for the preservation of any national monument or anything designated as protected national heritage;
- To record any precious objects or works of art to be preserved and to identify and record any species of botanical or animal life to be protected.

Section 17 further states that it is an offence for any individual to:

- willfully deface, damage or destroy any national monument or protected national heritage or to deface, damage, destroy, conceal or remove any mark affixed to a national monument or protected national heritage;
- alter any national monument or mark without the written permission of the Trust;
- remove or cause to be removed any national monument or protected national heritage to a place outside of Jamaica.

Land Acquisition Act (1947)

Section 3 of the Land Acquisition Act (1947) empowers any officer authorized by the Minister to enter and survey land in any locality that may be needed for any public purpose. This may also involve:

- Digging or boring into the sub-soil;
- Cutting down and clearing away any standing crop, fence, bush or woodland;
- Carrying out other acts necessary to ascertain that the land is suitable for the required purpose.

The Minister is authorized under Section 5 of the Act to make a public declaration under his signature if land is required for a public purpose provided that the compensation to be awarded for the land is to be paid out of the:

- Consolidated Fund or loan funds of the Government;
- Funds of any Parish Council, the Kingston and St. Andrew Corporation or the National Water Commission.

Once the Commissioner enters into possession of any land under the provisions of this Act, the land is vested in the Commissioner of Lands and is held in trust for the Government of Jamaica in keeping with the details outlined in Section 16. The Commissioner shall provide the Registrar of Titles with a copy of every notice published as well as a plan of the land. The Commissioner will also make an application to the Registrar of Titles in order to bring the title of the land under the operation of the Registration of Titles Act.

Registration of Titles Act (1989)

The Registration of Titles Act of 1989 is the legal basis for land registration in Jamaica, which is carried out using a modified Torrens System (Centre for Property Studies, 1998). Under this system, land registration is not

compulsory, although once a property is entered in the registry system the title is continued through any transfer of ownership.

International Legislative and Regulatory Considerations

Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (1983)

Adopted in March 1983 in Cartagena, Colombia, the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, also known as the Cartagena Convention, is the only legally binding environmental treaty for the Wider Caribbean. The Convention came into force in October 1996 as a legal instrument for the implementation of the Caribbean Action Plan and represents a commitment by the participating governments to protect, develop and manage their common waters individually and jointly.

Ratified by twenty countries, the Cartagena Convention is a framework agreement which sets out the political and legal foundations for actions to be developed. The operational Protocols, which direct these actions, are designed to address special issues and to initiate concrete actions. The Convention is currently supported by three Protocols. These are:

- The Protocol Concerning Co-operation in Combating Oil Spills in the Wider Caribbean Region (The Oil Spills Protocol), which was adopted and entered into force at the same time as the Cartagena Convention;
- The Protocol Concerning Specially Protected Areas and Wildlife in the Wider Caribbean Region (The SPAW Protocol), which was adopted in two stages, the text in January, 1990 and its Annexes in June, 1991. The Protocol entered into force in 2000;
- The Protocol Concerning Pollution from Land-based Sources and Activities in the Wider Caribbean Region (LBS Protocol), which was adopted in October, 1999.

Convention on Biological Diversity

The objectives of the Convention on Biological Diversity are "the conservation of biological diversity, sustainable use of its components and the fair equitable sharing of the benefits arising out of the utilization of genetic resources". This is the first global, comprehensive agreement which has as its focus all aspects of biological diversity: genetic resources, species and ecosystems. The Convention acknowledges that the "conservation of biological diversity is a common concern of humankind and an integral part of the development process". In order to achieve its goals, the signatories are required to:

- Develop plans for protecting habitat and species.
- Provide funds and technology to help developing countries provide protection.
- Ensure commercial access to biological resources for development.
- Share revenues fairly among source countries and developers.
- Establish safe regulations and liability for risks associated with biotechnology development.

Jamaica's Green Paper Number 3/01, entitled *Towards a National Strategy and Action Plan on Biological Diversity in Jamaica*, speaks to Jamaica's continuing commitment to its obligations as a signatory to the Convention.

The following priorities were listed for attention by the McCalla review:

□ A new **Watershed Protection Act** □ A new **Town and Country Planning Act** □ **Water Resources (Amendment) Act** (Draft) to be finalized

- Finalization and promulgation of the **Development Orders and Development Plans** for **Kingston and St. Andrew, Manchester, Santa Cruz and Negril** whilst ensuring that climate change is mainstreamed into these Orders and Plans.
- **Existing Development Orders and Plans** need to be **revised** to ensure that they reflect climate change considerations.
- A new **Environmental Management Act** that will update the existing NRCA Act and also reflect climate change considerations.
- Review and revise the **Natural Resources (Prescribed Areas) (Prohibition of Enterprise, Construction and Development Order 1996 and the Natural Resources (Permits and Licenses) Regulations** to specifically include climate change considerations. Thus climate change considerations should be explicitly integrated in the EIA process;
- A new **Disaster Management Act**
- Finalization and implementation of the **Fisheries Bill** ○ The finalization and enactment of a **Meteorological Act** ○ The development and finalization of a **Renewable Energy Act**
 - Establish legislation to include levying a prohibitive tax on the conversion and subdivision of prime lands to non-farm uses without approval.
 - Enact a **National Building Act** ○ Amend the **Housing Act**
 - Amend the **Urban Development Corporation Act** ○ Preparation of Agricultural Zoning Order/Districts ○ Finalize the draft **Natural Resources (Portland Bight Protected Area) Regulations**; ○ Review and amend the **Natural Resources (Air Quality) Regulations, 2006**; ○ Review and revise the **Natural Resources (Montego Bay Marine Park) Order & the Natural Resources (Marine Parks) Regulations**;

ANNEX II NEPA PRESCRIBED CATEGORIES

If a project falls within the first 24 categories, then a permit under Section 9 of the NRCA Act is required:

1. Power generation plants
2. Electrical transmission lines and substations greater than 69 kV
3. Pipelines and conveyors, including underground cables, gas lines and other such infrastructure with diameter of 15 cm and over.
4. Port and harbour developments
5. Development projects
 - Subdivisions of 10 or more lots
 - Housing projects of 10 houses or more
 - hotel/resort complex of more than 12 rooms
 - Airports including runway expansion greater than 20%
 - Office complex greater than 5000 square metres
6. Ecotourism projects
7. Water treatment facilities including water supply, desalination plants, sewage and industrial waste water
8. mining and mineral processing
 - Bauxite
 - Minerals - including aggregate, construction and industrial minerals
 - Peat metallic
 - Sand non-metallic
9. metal processing
 - Non-ferrous metals
 - Ferrous metals
 - Foundry operations, metal plating
10. Industrial projects
 - Chemical plants

Pulp, paper and wood processing

Petroleum production, refinery, storage and stockpiling

Food processing plants

Fish and meat processing plants

Tanneries

Detergents manufacturing, including manufacturing of soap

Distillery, brewing and fermenting facilities

cement and lime production

Manufacture of textiles

Manufacturing of pesticides or other hazardous or toxic substances

Paint manufacture

Boxing plants

Manufacture of containers and packaging materials including cans, bottles, boxes and cartons

Manufacturing of edible fats, oils and associated processes

Citrus, coffee, cocoa, coconut, sugarcane processing factories

Solar salt production

11. Construction of new highways, arterial roads and major road improvement projects
12. River basin development projects
13. Irrigation or water management projects including improvements
14. Land reclamation and drainage projects
15. Watershed development and soil conservation projects including river training, check dams, and retaining walls
16. Modification, clearance or reclamation of wetlands
17. Solid waste treatment and disposal facilities
18. Hazardous waste storage or treatment or disposal facilities
19. Processing of agricultural waste

- 20. Cemeteries and crematoriums
- 21. Introduction of species of flora, fauna and genetic material
- 22. Slaughterhouse and abattoir
- 23. Felling of trees and clearing of land of 10 hectares or over for agricultural development
- 24. Clear cutting of forested areas of 3 hectares and over on slopes greater than 25 degrees
- 25. Other. Please specify _____

The Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013

Application (pursuant to regulations 5, 6, 7, 12 and 13) for:

- Licence to Operate Treatment Plant for the Discharge of Trade Effluent or Sewage Effluent
- Licence to Construct a Treatment Plant
- Licence to Reconstruct or Alter a Treatment Plant
- Licence to Discharge Trade Effluent or Sewage Effluent into the Environment

ANNEX III STAKEHOLDER IDENTIFICATION AND INFLUENCE/INTEREST

Component 1 - Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services				
Tasks/Subcomponent	Objective	Stakeholders	Category	
			Influence Rating (L,M,H)	Interest Rating (L,M,H)
Project Development	Develop project proposals for the various activities.	Executing agency	High	High
		Minister of Water Land Environment & Climate Change	High	High
		Donor agency	High	High
		Member of Parliament	High	High
		District Councillor	High	High
		CBOs	Low	High
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Upgrade data acquisition network of the met services	Strengthen Jamaica's meteorological observation and data collection systems to enhance climate monitoring, weather forecasting and early warning systems	MSJ	High	High
		ODPEM	Medium	High
		WRA	High	High
		MoAF/RADA	Medium	High
		CBOs	Low	Medium
		Ministry of Tourism	Low	Medium/High

Component 1 - Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Objective	Stakeholders	Category	
			Influence Rating (L,M,H)	Interest Rating (L,M,H)
		Ministry of Health	Low	Medium/High
		Insurance sector	Low	Medium
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Upgrading hydrological data	Strengthen Jamaica's meteorological observation and data collection systems to enhance climate monitoring, weather forecasting and early warning systems	WRA	High	High
		ODPEM	Low/Medium	High
		MoAF/RADA	Low	High
		Environmental Professionals	Low	High
		NEPA	Medium	High
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Enhanced flood control	Using technology such as telemetric/ real-time river gauges for early flood warning and access to data during flooding for flood hazard analysis.	MTWH	High	High
		WRA	High	High
		ODPEM	High	High
		JCF/ Emergency Responders	Low	High
		CBOs	Low	Medium
		CARIMAC	Low	Medium
		JIS	Low	Medium
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts	To enhance the capacity of the WRA to better develop, calibrate and verify groundwater models for managing the water resources	WRA	High	High
		ODPEM	Medium	High
		Ministry of Health	Medium	High

Component 1 - Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Objective	Stakeholders	Category	
			Influence Rating (L,M,H)	Interest Rating (L,M,H)
Groundwater monitoring	and for forecasting in times of groundwater induced flooding.	National Water Commission	Medium	High
		National Irrigation Commission	Low	High
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Soil moisture surveillance	To facilitate proactive approach to agricultural drought management	WRA	High	High
		RADA	Medium	High
	To provide critical information for agricultural production.	MoAF	Medium	High
		ODPEM	Low	Medium
	To contribute to a landslide warning system	MSJ	Medium	Medium
		MTWH	Low	Medium
		MGD	Low	High
		CBOs	Low	Medium
Sub-component 1.2 New Doppler Weather Radar	Facilitate monitoring of oncoming severe weather and providing early warning.	MSJ	High	High
		JPSCo	Low	Medium
		MoAF/ RADA	Low	Medium/High
		Ministry of Transport Works and Housing (MTWH)*	Low	Low
		CBOs	Low	Medium
		ODPEM	High	High

Component 1 - Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Objective	Stakeholders	Category	
			Influence Rating (L,M,H)	Interest Rating (L,M,H)
Sub-component 1.3 Installation of marine observational station	Develop tsunami early warning system and provide real time information on changes to sealevel.	MSJ	High	High
		JDF Coast Guard	Medium	Medium
		Harbour Masters Dept.	Medium	High
		Port Authority	Medium	High
		UWI Climate Studies Group	Medium	High
		ODPEM	High	High
		Earthquake Unit	Medium	High
		NEPA	Medium	High
		WRA	Medium	Medium
		MoAF	Low	High
		Ministry of Tourism	Low	High
		MTWH	Low	High
Sub-component 1.4 Data Management Data filling	To provide stakeholders with a continuous record of data especially for very remote areas	MSJ	High	High
		JPSCo	High	Medium
		Solar Providers	High	Medium
		UWI Climate Studies Group	High	High
		WRA	High	High

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Tasks/Subcomponent	Objective	Stakeholders	Category	
			Influence Rating (L,M,H)	Interest Rating (L,M,H)
		ODPEM	High	High
Subcomponent 1.4 Data Management Data rescue	To provide data to assist in Climate change modeling and medium to long term climate prediction for long term planning	MSJ	High	High
		UWI Climate Studies Group	High	High
		WRA	Medium	High
		ODPEM	Low	High
Subcomponent 1.4 Data Management and staff training Support to the agricultural sector	Provide sector with reliable rainfall data with real time transmission to assist crop and livestock performance and management. Resultant trends can facilitate prediction of production, thereby guiding planning and decision-making in areas such as planting dates, pest, nutrition, and water management;	MoAF	Medium	High
		WRA	High	High
		RADA	Medium	High
		Minister of Agriculture and Fisheries	High	High
		CBOs	Low	Medium
		Jamaica Livestock Association	Low	High
		MSJ	High	High
		Banana Growers	Low	Medium
Subcomponent 1.4 Data Management and staff	To facilitate a streamlined system of data capture, analysis, interpretation and	MoAF	High	High
		RADA	High	High

Component 1 - Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Objective	Stakeholders	Category	
			Influence Rating (L,M,H)	Interest Rating (L,M,H)
training Data sharing platform	dissemination among the agencies. This is essential to promote sound decisionmaking in various sectors.	MTWH	High	High
		NWA	High	High
		MSJ	High	High
		WRA	High	High
		Ministry of Tourism	High	High
		MGD	High	High
		Ministry of Health	High	High
		Jamaica Sugar Industry Research Institute	Medium	High
		Sugar Company of Jamaica	Medium	High
		IT and GIS Specialists	High	High
		CBOs	Low	High
Private sector data users	Low	High		
Subcomponent 1.4 Data	To enhance capacity of staff in	MSJ	High	High

Component 1 - Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Objective	Stakeholders	Category	
			Influence Rating (L,M,H)	Interest Rating (L,M,H)
<i>Management and staff training</i>	regard to use and maintenance of new equipment and software	WRA	High	High
Training and capacity enhancement		Specialist Trainers	High	High

ANNEX IV- STAKEHOLDER ENGAGEMENT PLAN

Identification of Needs for Stakeholders Groups

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services			
Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
Project Development	Executing agency	Involve, Collaborate, Empower	Prepare project documents and identify Consultant or Contractor to execute the various projects. Identify funding agency/source for project execution. Monitor and evaluate the progress of the project.
	Donor agency	Transact	Agree on terms of reference and provide funding for project.
	Minister of Water Land Environment and Climate Change	Involve, Empower	To support the project through endorsements. Political endorsement will help donor endorsement and public/community endorsement as well.
	Member of Parliament	Involve, Empower	To support the project through endorsements. Political endorsement will help public/community endorsement.
	District Councillor	Involve, Empower	To support and endorse the project which will help public/community endorsement. To be informed of activities within the local area.
	CBOs	Inform, consult	Prior to major project activities such as installation of the radar and other devises, communities should be sensitized.

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
<p>Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts</p> <p>Upgrade data acquisition network of the Met services</p>	MSJ	Consult, Involve, Collaborate, Empower	Funding, equipment Consistent data, improved forecasting, improved warning systems
	ODPEM	Involve, Collaborate, Empower	Consistent data, improved forecasting, improved warning systems and DRM planning
	WRA	Consult, Involve Collaborate, Empower	Data to support hydrologic monitoring and early warning
	MoAF/RADA	Involve, Collaborate, Empower	Weather and Climate data for crop planning and production management
	Minister of Water Land Environment and Climate Change	Involve, Empower	To support the project through endorsements. Political endorsement will help donor endorsement and public/community endorsement as well.
	CBOs	Consult, Involve, Collaborate	Awareness - messages to meet the needs of vulnerable groups (e.g. women, youth, disabled sight/hearing impaired)
	Ministry of Tourism	Involve, Collaborate, Empower	Forecasting and warning systems to inform tourism sector planning for extreme events.
	Ministry of Health	Involve, Collaborate, Empower	Forecasting and warning systems to inform health sector plans to manage and remain operational during variable weather and extreme events as well as manage any public health issues that may arise as a result of climatic changes (e.g.

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
			Epidemics)
	Insurance sector	Transact	Data for risk analysis and financial risk management
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Upgrading hydrological data	WRA	Consult, Involve Collaborate, Empower	Equipment, funding consistent data, improved forecasting, improved warning systems, Mapping of high risk areas, Inform adaptation strategies
	ODPEM	Consult, Involve, Collaborate, Empower	Data particularly for extremes, and variability droughts
	MoAF/RADA	Involve, Collaborate, Empower	Training, data collection, forecasting for extreme weather /climate, livelihood protection
	Environmental Professionals	Consult, Involve, Collaborate	Use of hydrological data to guide project development
	NEPA	Involve, Collaborate, Empower	Use of hydrological data to inform project development approvals and monitoring requirements.
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Soil moisture surveillance	WRA	Consult, Involve, Collaborate, Empower	Equipment upgrade to provide complete data sets to inform mapping of high risk areas, Inform adaptation strategies
	RADA	Consult, Involve, Collaborate, Empower	Training to collect and interpret - livelihood planning – e.g. drought and pest management
	MoAF	Consult, Involve, Collaborate, Empower	Training, data livelihood planning – e.g. drought and pest and disease management.

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
	ODPEM	Consult, Involve, Collaborate, Empower	Landslide and drought data for improved warning systems and DRM planning
	MSJ	Consult, Involve, Collaborate, Empower	Completion of data sets to inform adaptation strategies
	NEPA	Consult, Involve, Collaborate, Empower	Data to inform decision-making and development siting
	MGD	Consult, Involve, Collaborate, Empower	Completion of data sets for mapping landslide hazards
	CBOs	Consult, Involve, Collaborate	Awareness – messages for livelihood planning – e.g. drought and pest management
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Enhanced flood control	WRA	Consult, Involve, Collaborate, Empower	Data for monitoring, design of flood control works, training, funding for community flood management initiatives involving women - structural and nonstructural
	MTWH	Consult, Involve, Collaborate, Empower	Data to inform river training needs and CC adaptation strategies
	ODPEM	Consult, Involve, Collaborate, Empower	Data for flood hazard and vulnerability assessments and mapping
	Jamaica Constabulary Force and other emergency agencies	Consult, Involve, Collaborate,	Early warning systems, response Flood risk awareness

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
	CBOs	Consult, Involve, Collaborate,	Awareness – messages to meet the needs of disabled (sight/hearing impaired)
	CARIMAC	Monitor, inform	To inform message for awareness
	JIS	Monitor, inform	To inform message for awareness
Sub-component 1.1 Hydro- and agrometeorological high priority equipment and spare parts Groundwater monitoring	WRA	Consult, Involve, Collaborate, Empower	Equipment, funding, complete data sets for monitoring water quality and flood control
	ODPEM	Consult, Involve, Collaborate, Empower	Complete data sets to identify flood risks
	Ministry of Health	Consult, Involve, Collaborate, Empower	Complete data sets for monitoring water quality against public health standards
	National Water Commission	Consult, Involve, Collaborate	Complete data sets for monitoring water quality for potable uses
	National Irrigation Commission	Consult, Involve, Collaborate	Complete data sets for monitoring water quality for watering crops
Sub-component 1.2 New Doppler Weather Radar	MSJ	Consult, Involve, Collaborate, Empower	Forecasting, data interpretation and analysis training, funding, supporting equipment, building repairs and refurbishment. Water supply enhancement and standby power
	JPSCo	Consult, Involve, Collaborate	Power supply - early warning to inform activation of emergency procedures and crisis communications
	MoAF/ RADA	Consult, Involve,	Utilisation of data on extreme events and

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
		Collaborate, Empower	variability in weather to inform sector plans – livelihood planning
	Ministry of Transport Works and Housing (MTWH)	Consult, Involve, Collaborate, Empower	Funding for physical works – building refurbishment
	CBOs	Consult, Involve, Collaborate	Need to be aware of extreme events and threats faced. Wherever a radar is being installed the community members in that area should be sensitized.
	ODPEM	Consult, Involve, Collaborate, Empower	Data for real time monitoring of extreme events – facilitate early warning, evacuation planning, data analysis
Sub-component 1.3 Installation of marine observational station	MSJ	Consult, Involve, Collaborate, Empower	Training for use of new equipment, data interpretation and analysis Inform CC adaptation strategies
	JDF Coast Guard	Consult, Involve, Collaborate	Training for management of station
	Harbour Masters Dept.	Consult, Involve, Collaborate	Data for marine conditions for ships and port activity.
	Port Authority	Consult, Involve, Collaborate	Data for marine conditions for ships and port activity.
	UWI Climate Studies Group	Consult, Involve, Collaborate	Data for modeling sea level rise
	ODPEM	Consult, Involve,	Sea level data for coastal risk

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
		Collaborate, Empower	management planning
	Earthquake Unit	Consult, Involve, Collaborate	Data to inform seismic studies
	NEPA	Consult, Involve, Collaborate, Empower	Data to guide development approvals and environmental monitoring activities
	WRA	Consult, Involve, Collaborate, Empower	Supporting climate and marine (tidal) data
	MoAF	Consult, Involve, Collaborate, Empower	Fisheries adaptation strategies to sea level rise
	Ministry of Tourism	Consult, Involve, Collaborate, Empower	Sea level rise data to inform adaptation strategies for coastal hotel and tourism operations
	MTWH	Consult, Involve, Collaborate, Empower	Data to inform sector adaptation strategies to sea level rise which can affect coastal infrastructure and settlements
Sub-component 1.4 Data Management Data filling	MSJ	Consult, Involve, Collaborate, Empower	Equipment, consistent power for remote areas using solar panels, funding, Completion of data sets for interpretation and analysis of weather and climate data
	JPSCo	Consult, Involve, Collaborate	Power supply
	Solar Providers	Consult, Involve, Collaborate	Solar power supply
	UWI Climate Studies Group	Consult, Involve, Collaborate	Accurate and complete data for modeling

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
	WRA	Consult, Involve, Collaborate, Empower	Accurate and complete data for hydrologic monitoring
	ODPEM	Consult, Involve, Collaborate, Empower	Accurate and complete data
Sub-component 1.4 Data Management	MSJ	Consult, Involve, Collaborate, Empower	Equipment, funding, completion of data sets for forecasting and informing adaptation strategies
Data rescue	UWI Climate Studies Group	Consult, Involve, Collaborate, Empower	Daily data to complete datasets for modeling and development climate scenarios
	WRA	Consult, Involve, Collaborate, Empower	Completion of data sets to informing adaptation strategies
	ODPEM	Consult, Involve, Collaborate, Empower	Accuracy and timeliness of data
Subcomponent 1.4 Data Management and staff training	MoAF	Consult, Involve, Collaborate, Empower	Training to collect and interpret data, to inform climate resilient crops, livelihood planning – e.g. drought and pest management
Support to the agricultural sector	WRA	Consult, Involve, Collaborate, Empower	Data provided to the agriculture sector to support the management of livelihoods
	MSJ	Consult, Involve, Collaborate, Empower	Data for management of livelihoods, crop production planning
	RADA	Consult, Involve, Collaborate, Empower	Training to collect and interpret data; climate resilient crops
	Minister of Agriculture	Involve, Empower	To support the project and endorse it. Endorsement will encourage donor

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
	and Fisheries		support and public/community support.
	CBOs	Consult, Involve, Collaborate	Awareness - messages to meet the needs of disabled (sight/hearing impaired)
	Jamaica Livestock Association	Consult, Involve, Collaborate	Climate Change (CC) adaptation strategies for livestock farming
	Banana Farmers	Consult, Involve, Collaborate	CC Adaptation strategies climate resilient crops awareness
Subcomponent 1.4 Data Management and staff training Data sharing platform	MoAF	Consult, Involve, Collaborate, Empower	Access to data for livelihood planning, supply data collected
	RADA	Consult, Involve, Collaborate, Empower	Access to data for livelihood planning, supply data collected
	MTWH	Consult, Involve, Collaborate, Empower	Access to data and sharing of information for analytical and planning purposes
	NWA	Consult, Involve, Collaborate, Empower	Access to data to inform adaptation strategies
	MSJ	Consult, Involve, Collaborate, Empower	Supply data to inform sector planning, utilize data for accurate forecasting
	WRA	Consult, Involve, Collaborate, Empower	Supply data flooding and drought data to inform sector planning, utilize data for identifying flood risks
	Ministry of Tourism	Consult, Involve, Collaborate, Empower	Access to data to inform tourism adaptation strategies such as building hazard resilient hotels, Informing sharing
	MGD	Consult, Involve, Collaborate	Access to data for conducting hazard

Component 1 – Updating of the Data Collection, Processing and Forecasting System of the Hydromet Services

Tasks/Subcomponent	Stakeholders	Level of Engagement	Participation/ Needs
			assessments, sharing of data and findings of analysis
	Ministry of Health	Consult, Involve, Collaborate, Empower	Access to data to inform adaptation strategies for the health sector, hazard resilient health facilities, climate induced public health issues
	Jamaica Sugar Industry Research Institute	Consult, Involve, Collaborate	Supply data collected, utilize complete data sets to inform the adaptation of crop production to climatic changes
	Sugar Company of Jamaica	Consult, Involve, Collaborate	Supply data collected, utilize complete data sets to inform improvements in crop production and adaptation to climate change
	IT and GIS Specialists	Inform, Consult, Involve	Set up of a data sharing facility, training for software users.
	CBOs	Consult, Involve, Collaborate	Awareness – forecasting and climate change adaptation messages to meet the needs of vulnerable groups: women disabled sight/hearing impaired)
	Private sector data users	Consult, Involve, Collaborate	Access to data for independent project and to inform private sector adaptation to climate change
Subcomponent 1.4 Data Management and staff training	MSJ	Consult, Involve, Collaborate, Empower	Training to use equipment and data interpretation
Training and capacity	WRA	Consult, Involve, Collaborate, Empower	Training to use equipment and data interpretation
enhancement	Specialist Trainers	Inform, Consult	Contract to train, terms of reference

ANNEX V- CONSULTATION DURING PREPARATION

List of organisations consulted in national workshops - January - February 2011

Type of Organization	Organizations That Participated
Community Based Organisations	National Association of Parish Development Committee; Cockpit country south-east Forest Management Committee; Manchester Parish Development Committee; Dolphin Head Local Area Forestry Management Committee; Hanover Parish Development Committee; Westmoreland Parish Development Committee; Portland Parish Development Committee; St. Mary Parish Development Committee; Buff Bay Local Forest Management Committee; Clarendon Parish Development Committee
Environmental NGOs	Jamaica Conservation Development Trust; Caribbean Coastal Area Management (CCAM); Fletchers Grove Environment Group; Negril Environmental Protection Trust; Portland Environmental Protection Association
NGOs	Combined Disability Association, Association of Development Agencies, PANOS Caribbean; Women Resources & Outreach Centre; Construction Resource & Development Centre; Peoples Action for Community Transformation; Jamaica Agricultural Society; Caribbean Christian Centre for the Deaf
Private Sector Organisations	Jamaica Hotel & Tourist Association-Negril Chapter; Private Sector Association of Jamaica; Jamaica Institute of Environmental Professional; Manchester Chamber of Commerce; Canadian Urban Institute; Negril Chamber of Commerce

Type of Organization	Organizations That Participated
Local Government Organizations	St. Thomas Parish Council; Kingston & St. Andrew Corporation (KSAC), St. Elizabeth Parish Council; Westmoreland Parish Council; Manchester Parish Council; Negril-Green Island Area Local Planning Authority; St. Mary Parish Council;; Portland Parish Development Committee; Portland Parish Council;
Agricultural & Fishing Organizations	Jamaica Agricultural Society, Jamaica Fishermen Co-operative, Farmers; White House Fishermen Co-operative; Banana Board
Indigenous Groups	Moore Town Maroon Council; Maroon Indigenous Women Circle
Academic Institutions	UWI- Climate Studies Group, Physics Department, CARIMAC, College of Agriculture Science & Education;
Public Sector Organizations	Social Development Commission; Urban Development Corporation, National Environmental Education Committee; Rural Agricultural Development Authority (RADA), National Environment and Planning Agency (NEPA), Meteorological Service, Jamaica (MSJ); PIOJ; Dept. Of Local Government; National Solid Waste Management Authority.

List of Participants – Kingston Workshop

NAME	ORGANIZATION
Abrahams, Donna	People Action for Community
Amsale, Maryam	ADA
Beale, Marlon	JCDT
Bernard, Claire	PIOJ
Brown, Philbert	Department of Local Government
Brown, Ronald	UDC
Creary, Marcia	JIEP
Daley, Albert	PIOJ
Dattendean, Merrick	St. Thomas Parish Counsel
Davis, Steven	PSOJ
Donaldson, Andrea	NEPA
Emanuel, Collet	JAS St. Catherine
Griffith, Carmen	CRDC
Harrison, Claudette	Womens Resource & Outreach Centre
Hyman, Tracy-Ann	University of Tokyo
Lafayette, McLymont Indi	Panos Caribbean
McLaren, Andrine	KSAC
McLean, Eistein	RADA
Meikle, Michelle	Jamaica Fishermen Co-operative
Milbourn, Maureen	NEPA
Morris, Hyacinth	PIOJ
Peterson, Hopeton	PIOJ
Pullen, Jannett	JAS, St. Catherine
Reid, Wayne	RADA
Roper, Le-Anne	PIOJ
Spence, Trevor	Participatory Planning Specialist –
Swaby, Stacy	NEEC / Voices for Climate Change
Taylor, Michael	Climate Studies Group, UWI
Thorney, George	Association of Development Agency
Williams, Kemesha	Rapporteur

List of Participants - Mandeville

NAME	ORGANIZATION
Bellonfante, Rickey	RADA, St. Elizabeth
Brown, Delroy	St. Elizabeth Parish Council
Dale, Albert	PIOJ
Douglas, Eurica	National Association of Parish Development Committees (PDC)
Foster, Herbert	Chairman, Cockpit Country, Southeast Forestry Management
Gunning, Gary	RADA, St. Elizabeth
Harris, Samuel	RADA
James, L Duane	Manchester Chamber of Commerce
Johnson, Rupert	National Solid Waste Management Authority
Lafayette, McLymont Indi	Panos Caribbean
Lee, Maro	RADA, St. Elizabeth
Legg, Andrea	RADA, Clarendon
Mahlung, Clifford	Met. Service, Jamaica - Presenter
Miller, Samuel	Manchester PDC
Panton, Hopeton	RADA, Manchester
Peart, Michael	Member of Parliament
Peters, Morgan	National Association of Parish Development Committees
Peterson, Hopeton	PIOJ
Powell, La-jean	Manchester Parish Council
Rodrigues, Phil	Canadian Urban Institute
Sutton, Ann	Clarendon Coastal Area Management (CCAM)
Taylor, Cecil	RADA, Clarendon
Williams, Kemesha	Rapporteur
Wright, Lora	Caribbean Christian Centre for the Deaf

List of Participants – Negril

NAME	ORGANIZATION
Artley Muir	Fletchers Grove Environment Group
Barnes Ransford	RADA , Hanover
Bisasor Mashario	Social Development Commission
Brown Yalthise	AOC
Campbell Eric	Dolphin Head Local Forest Management Committee
Daley, Albert	PIOJ
Daley Robert	Fletchers Grove Environment Group
Daley Ron	Social Development Commission
Diana McPherson	NEPA
Drummond Evernette	AOC
Evans Kirk	RADA, St. James
Haye Angela	Hanover Parish Development Committee
Holt Recorgo	RADA, Hanover
Lorene Holness- Muir	Fletchers Grove Environment Group
Honegghon Hayden	Fishermen Co-operative White House
Lee Grace	Negril Chamber of Commerce
McKenzie Anthony	NEPA
Moore Burtel	Mayor– Savanna-La-mar
Morrison Ryan	Negril Cluster
Myrie Nigel	PDC– Westmoreland Cluster of Commerce
Peterson Hopeton	PIOJ
Reid Kareen	Social Development Commission
Simms Doneika	Negril Environment Protection Trust
Smith Evelyn	JHTA, Negril Chapter
Stennett Norman	Dolphin Head local Forrest Management Committee
Stewart Linton	Social Development Commission
Swaby, Stacy	NEEC
Taylor Barrington	NEPA
Vassel Roan	RADA Hanover
Wallace Carey A.M	Negril Chamber of Commerce
White John	Social Development Commission
Whittley Grace	Westmoreland Parish Council
Wilks Ray	RADA St. James
Williams Kemesha	Rapporteur
Williams Lambert	Negril Cluster
Williams St. John	RADA
Wilson Carlton	Westmoreland Parish Development Committee
Woodit Tamara	Negril-Green Island Area Local Planning Authority

List of Participants – Port Antonio

NAME	ORGANIZATION
Alvaranga, Denton	Rural Agricultural Development Authority
Baugh, Norman	Rural Agricultural Development Authority
Benjamin, Jaya	Portland Environmental Protection Association
Bennett, Cleo	Social Development Commission
Brown, Marcia	Portland & Boundbrook Parish Development Committees
Condappa, Nicole	St. Mary Parish Council
Cousins, Francine	Portland Environmental Protection Association
Daley, Albert	PIOJ
Doyley, Omar	Drivers River District Area Council
Hartley, Dorrel	St. Mary Parish Development Committee
Hoffard, Angela	Portland Environmental Protection Association (Peace Corp)
Hope, Ishiwawa	Social Development Commission
Howard, Kavil	Rural Agricultural Development Authority
Jankie, Yolande	St. Mary Parish Council
Lafayette – McLymon, Indi	Panos Caribbean
Lawes, Stanford	Rural agricultural Development Authority (St. Mary)
Lawrence, Doreen	Boundbrook Community Development Committee
Lewis, Denise	Portland Parish Council
McKenzie, Anthony	National Environment & Planning Agency
McKenzie, Burchell	Moore Town Maroon Council
McPherson, Diana	National Environment & Planning Agency
Miller, Ewart	Rural Agricultural Development Authority
Morgan, Delford	College of Agriculture, Science and Education
O'Hare, Howard	Rural Agricultural Development Authority (Portland)
Parks, Everton	Banana Board
Protz, Maria	CARIMAC & Food and Agricultural Organization/ CSDI Project
Richards, Talman	(Not stated)
Richardson, Barabra	Balcarres Community Development Committee
Simms, Gloria	Maroon Indigenous Woman Circle
Spence, Trevor	Independent consultant - Facilitator
Sterling, Col. Wallace	Moore Town Maroon Council
Taylor, Michael	University of the West Indies
Thompson, Phillip	Buff Bay Local Forest Management Company
Walker, Uriah	Community Development Committee
Wilks, Lennette	Portland Parish Development Committee
Williams, Kemesha	Rapporteur

List of Meetings and Participants - April 2013

	Meeting Participants	Title & Organization	Contact Information
Monday, April 8, 2013			
9:00am-12:00pm: Field trip to Bog Walk, Hydromet Station			
	Steve Dale Hudson	Technician, Water Resources Authority	402-3395
2:00pm – 3:30pm: Ministry of Transport Works and Housing			
	Ms. Audrey Sewell	Permanent Secretary Chief Technical Director, Ministry of Transport Works and Housing	
	Hassim Fulton	Sr. Political Officer, Ministry of Transport Works and Housing	hfulton@mtw.gov.jm
	Valerie Simpson	Director of Transport Policy, Ministry of Transport Works and Housing	vsimpson@mtw.gov.jm
	Paula Brown	Transport Planner, Ministry of Transport Works and Housing	pbrown@mtw.gov.jm
	Doreen Pendergrast	Acting Chief Technical Director, Ministry of Transport Works and Housing	dpendergrast@mtw.gov.jm

	Meeting Participants	Title & Organization	Contact Information
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	Authrie Scott	Senior Director, Housing Directorate, Ministry of Transport Works and Housing	ascarlett@mtw.gov.jm
	Janine Dawkins	Chief Technical Director, Ministry of Transport Works and Housing	ctd@mtw.gov.jm
	Talia Gibson	Senior Works Policy Officer, Ministry of Transport Works and Housing	tgibson@mtw.gov.jm
<p>Day 2 Tuesday April 9, 2013</p> <p>9:00am-10:00am</p> <p>Planning Institute of Jamaica (PIOJ)</p>			
	Barbara Scott	Director, External Cooperation Management, PIOJ	Barbara_Scott@pioj.gov.jm
	Claire Bernard	Head of Sustainable Development and Regional Planning, PIOJ	Claire_bernard@pioj.gov.jm
	Hopeton Peterson	Focal Point, Pilot Project for Climate Resilience, PIOJ	Hopeton_Peterson@pioj.gov.jm
	Saskia Frater Smith	Representative for World Bank Portfolio, PIOJ	Saskia_FraterSmith@PIOJ.gov.jm

Meeting Participants	Title & Organization	Contact Information
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	JaminWedderburn	Monitoring and Disbursement Officer, Debt Management Branch, Economic Management Division, Ministry of Finance	Jamin.wedderburn@mof.gov.jm
10:30am-12:00pm			
Planning Institute of Jamaica			
	Claire Bernard	Head of Sustainable Development and Regional Planning , PIOJ	Claire_bernard@pioj.gov.jm
	Hopeton Peterson	Focal Point, Pilot Project for Climate Resilience, PIOJ	Hopeton_Peterson@pioj.gov.jm
	Saskia Frater Smith	Representative for World Bank Portfolio, PIOJ	Saskia_FraterSmith@PIOJ.gov.jm
	JaminWedderburn	Monitoring and Disbursement Officer, Debt Management Branch, Economic Management Division, Ministry of Finance	Jamin.wedderburn@mof.gov.jm
2:00pm – 5:00pm			
Site visit to RADAR station,Coopers Hill			

	Meeting Participants	Title & Organization	Contact Information
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	Evan Thompson	Acting Director, Met Office	e.thompson@metservice.gov.jm
	Earl Beecher	Radar Technician, Met Office	
	Johniel White	Instrument Department, Met Office	
	Mark Cunningham	Head of Instrument Equipment, Met Office	
	Erthon Heron	Caretaker of Radar, Met Office	

Day 3, Wednesday April 10, 2013

10:00am -11:30am **MET Services**

	Evan Thompson	Acting Director, Met Office	e.thompson@metservice.gov.jm
	Bordwill Irving	Section Head, Radar, Met Office	b.irving@metservice.gov.jm
	Jacqueline Spence	Section Head, Applied Metering	j.spence@metservice.gov.jm
	Adrian Shaw	Section Head, Data Processing	a.shaw@metservice.gov.jm
	Clifford Mahluna	Climate Branch Head	Cliffmth2000@yahoo.com
	Michelle Thompson	Systems Administrator	m.thompson@metservice.gov.jm

1:00pm-2:00pm

Caribbean Institute of Media and Communication , University of the West Indies

	Meeting Participants	Title & Organization	Contact Information

	Dr. Livingston White	Researcher and Lecturer, Caribbean Institute of Media and Communication	Livingston.white@uwimona@edu.jm
	Olivia Bravo	Marketing Officer, Caribbean Institute of Media and Communication	Olivia.bravo@carimac.com

2:30pm – 5:00pm

Water Resources Authority

	Basil Fernandez	Managing Director, Water Resources Authority	
	Herbert Thomas	Deputy Managing Director, Water Resources Authority	hthomas@wra.gov.jm
	Michael R.A. Wilson	Sr. Hydrologist	mwilson@wra.gov.jm

2:30pm – 5:00pm

Water Resources Authority, Site visit Gordon Town

	Steve Dale Hudson	Technician, Water Resources Authority	402-3395
	Herbert Thomas	Deputy Managing Director, Water Resources Authority	hthomas@wra.gov.jm

	Meeting Participants	Title & Organization	Contact Information
	Michael R.A. Wilson	Sr. Hydrologist	mwilson@wra.gov.jm

4:00pm -5:00pm			
PANOS/ Voices For Climate Change			
	Indi McLymontLafayette	Country Coordinator (Jamaica), Voices for Climate Change	indi@panoscaribbean.org
	Stacy Swaby	Project Coordinator of the Voices for Climate Change Education project	stacy@panoscaribbean.org
	Maria Protz	Communications Specialist, Voices for Climate Change	mariaprotz@cwjamaica.com
	Lloyd Lovindeer	Musician, Artist, Voices for Climate Change	
Day 4, Thursday, April 11, 2013			
8:30am- 9:30am			
Ministry of Agriculture and Fisheries			
	Michael Pryce	Director, Agriculture/ Marketing Information Division, Ministry of Agriculture and Fisheries	mapryce@moa.gov.jm

	Meeting Participants	Title & Organization	Contact Information
	Zuteikhu Budhan	Director, Planning and Policy, Ministry of Agriculture and Fisheries	Zabudhan.moa.gov.jm

	Phillip Chung	Principal Director, Technical Services, Rural Agricultural Development Agency, Ministry of Agriculture and Fisheries	chungpe@rada.gov.jm
	Pierre Dawson	Director of Planning, Rural Agricultural Development Agency, Ministry of Agriculture and Fisheries	baughs@rada.gov.jm
	Peter Thompson	Zonal Director, Rural Agricultural Development Agency, Ministry of Agriculture and Fisheries	eastzone@rada.gov.jm
	Shawn Baugh	Director, Corporate Planning, Rural Agricultural Development Agency, Ministry of Agriculture and Fisheries	baughs@rada.gov.jm
10:00am-11:30am			

	Meeting Participants	Title & Organization	Contact Information
University of the West Indies			
Physics Seminar Room, Department of Physics UWI			
	Dr. Michael Taylor	Lecturer, Department of Physics, UWI	Michael.Taylor@uwimona.edu.jm

11:30AM- 12:30PM

Ministry of Water, Land, Environment and Climate Change (MWLECC)

MWLECC

	The Honorable Robert Pickersgill	Minister, MWLECC	Robert.pickersgill@mwlecc.gov.jm
	Leonie Barnaby	Senior Officer, MWLECC	emdmle@yahoo.com
	Dr. Alwin Hales	Permanent Secretary, MWLECC	Alwin.hales@mwlecc.gov.jm
	Col. Oral Khan	Chief Technical Director	Oral.khan@mwlecc.gov.jm
	Gillian Guthrie	Senior Director, Environmental Management Division, MWLECC	emdmoh@yahoo.com
	Nicole O'Reggio	Director, Pollution Control, MWLECC	Nicole.oreggio@mwlec.gov.jm
	Kerrie-Ann Dryden	Senior Legal Officer, MWLECC	Kerrie-ann.dryden@mwlecc.gov.jm
	Conrad Douglas	Chairman, Climate Change Advisory Committee,	conraddouglas@gmail.com

	Meeting Participants	Title & Organization	Contact Information
		MWLECC	

2:00pm- 3:00pm

Association of Development Agencies

	Amsale Maryam		
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Day 5, Friday April 12, 2013

10:00am–11:00am, **Office of Disaster Preparedness and Emergency Management**

	Richard Thompson,	Acting Director General	
	Kareen Atkins- Mitchell		
	Michelle Edwards		
11:30am- 12:30 pm, PIOJ			
	Claire Bernard	Head of Sustainable Development and Regional Planning	Claire_bernard@pioj.gov.jm
	Hopeton Peterson	Focal Point, Pilot Project for Climate Resilience	Hopeton_Peterson@pioj.gov.jm
	Saskia Frater Smith	Representative for World Bank Portfolio	Saskia_FraterSmith@PIOJ.gov.jm
	Jamin Wedderburn	Monitoring and Disbursement Officer, Debt Management Branch, Economic Management	Jamin.wedderburn@mof.gov.jm
	Meeting Participants	Title & Organization	Contact Information
		Division, Ministry of Finance	

List of Meetings and Participants - September 2013- January 2014

NAME	ORGANIZATION
Cavell Rhynie	RADA
Jeffrey Spooner	MSJ
Cliff Mahlung	MSJ
Basil Fernandez	WRA
Michael Samuels	WRA
Prof. Michael Taylor	Climate Studies Group
Winston Shaw	National Irrigation Commission (NIC)
Dr. Gillian Smith	Food and Agriculture Organisation (FAO)
Z. Budhan	Min of Agriculture
Mark Codling	Nat'l Spatial Data Management Division (NSDMD)
Rohan Richards	Nat'l Spatial Data Management Division
Michael Whyte	Hydrology Consultants Ltd
Albert Gray / Gerald Hinds	Climate Change Division, MWLECC
Anthony McKenzie	NEPA
Sherine Huntley	MOH
Jasper Barrett	MOH
Nadine Brown	PIOJ
L. McKenzie	IT Specialist, NSDMD

ANNEX VI- DISCLOSURE AND CONSULTATION ON THE EMF

Disclosure Workshop 1. – January 27, 2014 – Planning Institute of Jamaica

The first disclosure of the EMF was presented at the PPCR workshop held on January 27, 2014 at the Planning Institute of Jamaica.(PIOJ) in Kingston. The agencies represented included the following:

- Ministry of Agriculture and Fisheries
- CARIMAC, UWI Mona
- Ministry of Health
- Meteorological Services of Jamaica
- National Environment and Planning Agency
- Ministry of Water, Land, Environment and Climate Change
- Environmental Foundation of Jamaica
- Ministry of Finance and Planning
- Disaster Risk Reduction Centre
- Water Resources Authority
- Office of Disaster Preparedness and Emergency Management
- Planning Institute of Jamaica
- PPCR Consultants

The initial presentation was entitled *Environmental and Social Management Safeguards* (ESMF) but in keeping with the WB approach to the project, this was later modified to exclude the social framework. The presentation is attached as **Annex VII – A**.

The World Bank Environmental and Social Safeguards were presented as the context within which the ESMF was drafted. The project classification scheme outlined the categories, noting that the ICDIMP was categorized as **B**. Identification and engagement of project beneficiaries was identified, the engagement process outlined, and stakeholders were listed by functional categories and sectors. It was noted that the project had a small footprint, activities were generally environmentally benign, and would be positive overall as they would contribute to disaster risk reduction and increased productivity. The environmental screening process was described and it was noted that no major environmental or social safeguards would be triggered. The national environmental regulations were outlined and it was emphasized that the project had to comply with national requirements. The template for the environmental Management Plan was presented. Guidelines for vulnerability assessment of the health sector and gender considerations were also presented as they formed part of the Consultant's Terms of Reference. It was later noted that these would be included in the PAD and OM.

Feedback from Participants

Participants were receptive and feedback entailed four major concerns:

1. Categorisation of the project as **B** was questioned. It was explained that some minor civil works would have environmental impacts and would need to be assessed. Further site considerations for installation of upgraded equipment might have environmental implications. No EIA would be required.
2. The Ministry of Health endorsed the approach to the Health Sector VA, noting that it fit with the Ministry's objectives.
3. Consideration of Gender, vulnerable groups and public education required more attention. It was noted that targeted approaches would be employed for the engagement of men and women farmers, fishers and other categories of workers. as required. It was noted that the process of inclusion had started from the Phase I of the PPCR project and was on-going through the SPCR.
4. The need for public education was emphasized. It was noted that the process would emphasize behaviour change activities (rather than mass public awareness campaigns). Reference was made to the Communications strategy and other initiatives completed under Phase I of the PPCR, and continuing under the SCPR.

Following this first disclosure the consultant received comments from the World Bank and the document was further revised for presentation at the second disclosure.

Disclosure Workshop II - March 14, 2014 . National Volunteer Centre, Council of Voluntary Social Services (CVSS)

The second disclosure was made on March 14, 2014 at the National Volunteer Centre of the CVSS. Participants included sector representatives, community development agencies, community based groups, non-governmental organisations, citizens of affected communities, statutory agencies of the GOJ, Parish Council, and departments of the University of the West Indies. The list of agencies represented is presented below.

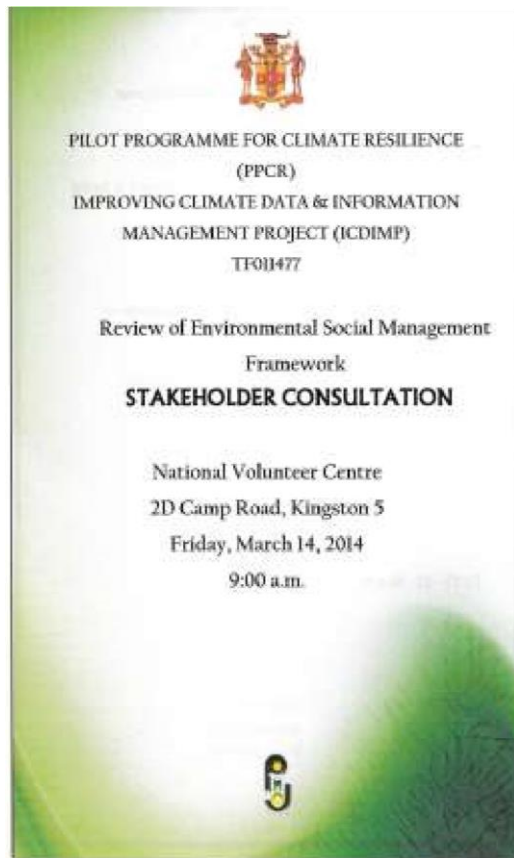
Agencies Represented

All Island Banana Growers Association
 Association of Development Agencies - ADA
 Automatic Control Engineering - ACE
 Bureau of Women's Affairs - BWA
 Council of Voluntary Social Services – CVSS
 International Centre for Environment & Nuclear Sciences
 Jamaica Defence Force, Coast Guard
 Jamaica Information Service (JIS)
 Jamaica Public Service - JPS

Jamaica Social Investment Fund – JSIF
 Kingston & St. Andrew Corporation – KSAC
 Landline Internet Mobile & Entertainment-LIME
 Manchester Parish Council - MPC
 Meteorological Service Jamaica - MSJ
 National Environment & Planning Agency - NEPA
 National Land Agency - NLA
 Planning Institute of Jamaica - PIOJ
 Residents from Coopers Hill
 Social Development Commission - SDC
 Urban Development Cooperation – UDC
 University of the West Indies, Climate Studies Group Mona – UWI CSGM

The consultant observed that the diversity of the group was particularly advantageous as each person attending was a key stakeholder in the Investment Project. Particular note was made of the presence of the Meteorological Services whose representatives would be able to elaborate on issues related to the instrumentation. Ms. Bernard from the PIOJ would be able to elaborate on the details of the Investment Proposal. Participants were urged to contribute freely and in a fulsome manner, as feedback was important to the project design and stakeholder engagement.

THE AGENDA



AGENDA	
9:00 -9:45 .am	Introduction and Welcome Project Overview Claire Bernard (Chair) Deputy Director General, Sustainable Development & Social Planning Division
9:45 -10:45 a.m	Presentation of Environmental Management Framework Eleanor Jones Consultant, Environmental Specialist
10:45 -11 :15 a.m	DISCUSSION
11:15 -11: 30 a.m	Next Steps Claire Bernard
11:30	Vote of Thanks Claudia Myers Project Officer

Presentation of the EMF

The disclosure was made in four parts which reflected the contextual setting, environmental screening approach, suggested mitigation measures and the environmental management plan.

1. Project Site and Situation
 - ▶ Background and Rationale
 - ▶ Project scope and activity
 - ▶ Environmental Setting
 - ▶ National Legal and Regulatory Requirements
 - ▶ World Bank Environmental Safeguards
 - ▶ Stakeholder Consultations
 - ▶ Institutional Considerations
2. Environmental Screening and Scoping
3. Mitigation Measures
4. Environmental Management Plan

The power point presentation is attached as Annex VII-B.

The consultant highlighted the importance of measurement for the scientific underpinning of building climate resilience, and the significance of climate resilience to development in Jamaica as in other small island developing states. The underlying geographical characteristics of the island set the frame for measuring parameters of weather and climate, and the current distribution of instrumentation was described. It was deemed important to meet national regulatory requirements as well as the World Bank environmental standards. Stakeholder engagement was noted as essential to the project development and implementation, and the institutional setting for implementation was also considered.

All EMF documents are disclosed on the following websites :

www.pioj.gov.jm

www.metservice.gov.jm

www.wra.gov.jm

PILOT PROGRAMME FOR CLIMATE RESILIENCE (PPCR)
IMPROVING CLIMATE DATA & INFORMATION MANAGEMENT PROJECT (ICIDIMP)
TF011477

REVIEW OF ENVIRONMENTAL MANAGEMENT FRAMEWORK
STAKEHOLDERS' CONSULTATION HELD AT
NATIONAL VOLUNTEER CENTRE
FRIDAY, MARCH 14, 2014

OPENING REMARKS

The workshop commenced at 9:30 a.m. with Ms. Bernard, the Chair, welcomed all the participants to the meeting and asked them to introduce themselves.

OBJECTIVE

The objective of the meeting was to obtain stakeholders' feedback on the Environmental Management Framework (EMF) that was prepared for the project.

OVERVIEW OF PROJECT

The Chair gave a presentation in which she gave an over view of:

- Objectives of PPCR Phase 1, and
- Investment Proposals 1, 2, 3

She then explained in detail Investment Proposal 1, the project for which the EMF was prepared. The presentation focused on the –

- Objectives of IP1 - Quality of information and data to effect changes and the local and national level
- Outcomes
- The purpose of the EMF
- Next Steps

PRESENTATION

Mrs. Eleanor Jones, the Environmental Social & Management Framework Specialist gave her presentation on:

- Project and Site Information
- Environmental Screening & Scoping
- Mitigation Measures
- Environmental Management Plan

Attached please see copy of presentation - Annex VII-B .

ANNEX VII-A

DISCLOSURE WORKSHOP 1

JANUARY 24, 2017

Environmental and Social Management Framework

World Bank Safeguards

- Environmental assessments should be integrated with the project cycle such that environmental screening occurs at the project identification stage
- Magnitude and sensitivity of the project and the attendant issues determine whether a full assessment is required.
- Emphasis of the environmental assessment –identify environmental issues early in the project cycle, design environmental improvements into projects, avoid, mitigate, or compensate for adverse impacts.
- Objective -address environmental issues immediately there is a project concept so as to avoid costs and delays in implementation due to unanticipated problems.

Project classification

Category A	A full EIA is required, as the project may have diverse and significant environmental impacts
Category B	Although a full EA is not required, environmental analysis is appropriate, as the project may have specific environmental impacts
Category C	Environmental analysis is normally unnecessary, as the project is unlikely to have significant environmental impacts

Project Beneficiaries

- Hydromet data Public good – entire population – reduce dislocation and loss – build resilience
- Major knowledge gap - strong demand for increased awareness and improved climate literacy.
- Messages in Communication Plan

Project Beneficiaries and engagement

List of Stakeholders - based on Sector/Function

Financing and Executing Agencies	Water resources	Met & climate data	Agriculture	Communication	Infrastructure and Utilities	Disaster Risk Management	Private Enterprise	Political representatives	Civil society	Monitoring and evaluation
Planning Institute of Jamaica (PIOJ)	Water Resources Authority	Met Services	Ministry of Agriculture and Fisheries	Caribbean Institute of Mass Communication (CARIMAC)	National Water Commission	Office of Disaster Preparedness and Emergency Management (ODPEM)	Private sector agricultural enterprise	Members of Parliament	Community-Based Organisations (CBOs)	National Environment and Planning Agency
World Bank	Ministry of Land, Water, Environment and Climate Change	University of the West Indies – Climate Studies	Rural Agricultural Development Agency (RADA)	Jamaica Information Service (JIS)	Jamaica Public Service Co (JPSCo)	Emergency Responders	Environment and Development Professionals (including engineers, architects, planners, etc.)	Councillors	NGOs- Red Cross, ADRA, Salvation Army etc. NGOs	Met Services
Ministry of Finance and Planning	National Irrigation Commission	Climate Change Division		PANOS Caribbean	Ministry of Transport, Works and Housing (MTWH)	Ministry of Health	General Insurance sector			Water Resources Authority
	National Water Commission					General Insurance sector				Planning Institute of Jamaica (PIOJ)
						Mines and Geology Division				World Bank

Application of Outputs to Messages

APPLICATION	MESSAGE
Climate and hydrological data and models - Water sector	<ul style="list-style-type: none">• water availability and quality promote micro-scale water harvesting technologies.
Climate data, modeling and scenario building- Agriculture sector and farmers	<ul style="list-style-type: none">• use of climate smart cropping methods• use of drought tolerant crops• pest management mechanisms
Climate data and modeling - Fisheries sector	<ul style="list-style-type: none">• importance of protecting mangroves to increase fish stock• respecting closed seasons• fish farming as a livelihood alternative
Hydrological and Met data – Health sector	<ul style="list-style-type: none">• Effect of water supply and quality on sanitation• likely increase of vector borne illnesses such as malaria and dengue• Early Warning systems

APPLICATION	MESSAGE
<p>Climate data and modeling Tourism sector</p>	<ul style="list-style-type: none"> • the need for tourism structures to withstand certain wind speeds • the availability of financial products that can support financial risk management • retrofitting and building adaptation • water recycling • water conservation measures • identify vulnerability • respect marine zones • consider product diversification to reduce dependence on climate sensitive resources.
<p>Climate data and scenarios – Vulnerability and risk assessments</p>	<ul style="list-style-type: none"> • importance of following building codes need for identifying “no build” zones • the linking of disaster risk management and physical planning
<p>Climate and hydrological models and scenarios - Insurance sector</p>	<ul style="list-style-type: none"> • increase in risk to properties and persons the various insurance options that exist
<p>Climate and hydrological data and scenarios – Energy sector</p>	<ul style="list-style-type: none"> • risk threatening the sustainability of hydropower energy supply in the future
<p>Improved data to be provided and the data sharing platform</p>	<ul style="list-style-type: none"> • foster community involvement in integrated river basin development planning • communities involvement in watershed management and conservation activities • sector policies and programmes

Gender considerations

- ICDIMP recognizes the need for identifying roles, responsibilities, and activities by gender and for special groups.
- Mainstreaming consideration of gender and special needs groups receiving heightened attention in disaster risk reduction
- Differentiated roles of men and women in societal activities, and the vulnerabilities attendant on special groups
- - Employment profile shows influence of males and females
 - Women –change agents – key role in rural communities
 - Climate education and early warning systems at the community level and in enterprise

Health Sector vulnerability

- **What to be assessed and where?**
- Determination of aspect of health sector to be assessed
 - Major hospital - selected parish
 - Health facilities/clinics/- selected parish
 - Central Government Capacity – MOH
 - Disease control - Vector identification and management
 - Parish focus - health facilities and services
 - Emergency Response Capacity - parish, national
 - Public Health capacity /parish/urban centre , rural towns

Health Sector

- **Hazard Identification**

- History of flooding at selected location (s) - incidence, impact on health facilities and supporting infrastructure
- Hurricane/Storm - history of impact at selected location – health facility, supporting infrastructure and services
- Landslides - Disruption of road communication

- **Vulnerability Assessment**

- Structural Vulnerability - Engage structural engineer to identify areas of weakness and to recommend mitigation measures.
- Assess vulnerability of site to flooding
- Assess vulnerability of access routes to flooding and landslides

Health Sector ...

- For each facility the following need to be assessed.
 - Emergency water supply – storage capacity , accessibility
 - Emergency power supply - standby generation, fuel, battery availability, appropriateness of site
 - Food supply - system for and safety of stores of non-perishables, access to supplies in event of emergency
 - Pharmaceuticals/medicines – system for and safety of stores, system to access and preposition emergency supplies
 - Other supplies - – system for and safety of stores, system to access and preposition emergency supplies
 - Waste management capacity - general waste, medical waste
 - System for grounds management – removal of debris to facilitate access of emergency vehicles and staff.
 - Records management - safety , back-up
 - Emergency response capacity - staffing roster, vehicles, supplies

Environmental Screening

- Environmental Screening Framework follows WB template for an ESMF/ Environmental Management Plan (EMP) for Small Works
 - footprint for ICDIMP small activities generally environmentally benign.
- No major environmental and social safeguards triggered

- Environmental Assessment OP/BP 4.01;
- Natural Habitats OP/BP 4.04;
- Physical Cultural Resources OP/BP 4.11;
- Involuntary Resettlement OP/BP 4.12 –

Project activities mainly positive environmental and social impacts improving weather and climate information and forecasting - contribute to strengthening disaster risk management, reduction of vulnerability and loss, and increased productivity.

- Must comply with national regulations

SCREENING PROCEDURE

A C T I V I T Y	ENVIRONMENTAL AND SOCIAL SAFEGUARDS												
	Environmental Assessment			Natural Habitat			Physical/Cultural Resources			Involuntary Resettlement			Any other Comment
	METEOROLOGICAL SERVICES												
	Yes	No	If Yes what action*	Yes	No	If Yes what action	Yes	No	If Yes what action	Yes	No	If Yes what action	
Installation of 26 new ordinary and AW climate stations	x			x							x		No environmental impact is anticipated

Regulatory Requirements

- NEPA Permit and License system
- No activities within prescribed categories for environmental permit
 - Screening of activities under the Met Services and the WRA.
 - Replacement of the Doppler Radar entailed some small civil works and other activities with some environmental consideration

Screening – Radar

- Transportation from port to site
- reconditioning of the tower with metal cleaning, welding and repainting
- Refurbishing of the building - removal of worn carpets, cleaning of walls, windows and doors, replacement of windows and doors, repair of roof etc.
- Disposal of waste and transportation from the site must be executed with best practice.
- Upgrade water storage - Sustainable water supply- install rainwater harvesting system - remediate existing tanks connect rainwater catchment to tank
- Install Standby power generation to support existing power supply. Install solar powered system.

Screening – WRA

- Installation of stream gauges (new and replacement)
- Rainfall intensity gauges (new and upgraded)
- Construction of instrument shelters
- Site selection, transportation and installation
- Soil moisture probes
- Loggers on monitoring wells.

Environmental Management Plan

- developed in keeping with the template of the WB Safeguards.

Layout:

- General Conditions; Occupational Health and Safety
- Rehabilitation and Construction activities
 - Air and Water Quality, Noise, dust, Waste Management
- Wastewater treatment - stormwater runoff, sewage
- Archaeological Heritage
 - Historic buildings artifacts
- Land Acquisition
- Toxic Materials/Hazardous Waste
- Natural resources –forests, wetlands, protected areas.
- Traffic and pedestrian safety

ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST	RELEVANT SUB-COMPONENT ACTIVITY	INSTITUTIONAL RESPONSIBILITY
0. General Conditions	Notification and Worker Safety	<p>(a) The Parish Council and respective communities have been notified of upcoming activities</p> <p>(b) The public has been notified of the works through appropriate notification in the media and/or at publicly accessible sites e.g. Library, post office, parish council office, site of the works, etc.</p> <p>(c) All legally required permits have been acquired for construction and/or rehabilitation</p> <p>(d) The Contractor formally agrees that all work will be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment.</p> <p>(e) On site construction workers will comply with international good practice (always hardhats, as needed masks and safety glasses, harnesses and safety boots)</p> <p>(f) Appropriate signposting of the radar site will inform workers of key rules and regulations</p>	<p>EACH ACTIVITY</p> <p>All</p>	<p>MSJ</p> <p>WRA</p> <p>MSJ</p> <p>MSJ</p> <p>MSJ</p>

A. General Rehabilitation and /or Construction Activities	Air Quality	<p>(a) During interior refurbishing old carpeting, windows, doors etc will be carefully removed and debris transported to temporary storage area on site</p> <p>(b) Debris shall be kept in controlled area and covered with tarpaulin</p> <p>(c) The surrounding environment (sidewalks, roads) shall be kept free of debris to minimize dust</p> <p>(d) There will be no open burning of construction / waste material at the site</p> <p>(e) There will be no excessive idling of construction vehicles at sites</p>	<p>Installation of the New Radar</p> <p>Rehabilitation of existing building on radar site</p>	MSJ
	Noise	<p>(a) Construction noise will be limited to day time.</p> <p>(b) During operations the engine covers of generators, air compressors and other powered mechanical equipment shall be closed. Equipment should be in good working order to further minimize noise</p>	<p>Installation of the New Radar</p> <p>Rehabilitation of existing building on radar site</p>	MSJ

E. Toxic Materials	Asbestos management	<p>(a) If asbestos is located on the project site, it shall be treated as hazardous material.</p> <p>(b) Asbestos should be handled and disposed by skilled & experienced professionals</p> <p>(c) If asbestos material is to be stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately.</p> <p>(d) Security measures will be taken against unauthorized removal from the site.</p>	Existing Building on radar site	MSJ NEPA
	Toxic / hazardous waste management	<p>(a) Temporary storage on site of all hazardous or toxic substances will be in safe containers labeled with details of composition, properties and handling information</p> <p>(b) The containers of hazardous substances shall be placed in a leakproof container to prevent spillage and leaching</p> <p>(c) As far as practicable paints with toxic ingredients or solvents or lead-based paints should not be used</p>	Radar site - supporting structure and building renovation	MSJ NEPA

<p>F. Affected forests, wetlands and/or protected areas</p>	<p>Protection</p>	<p>(a) All recognized natural habitats, wetlands and protected areas in the immediate vicinity of the activity will not be damaged or exploited, all staff will be strictly prohibited from hunting, foraging, logging or other damaging activities.</p> <p>(b) A survey and an inventory shall be made of large trees in the vicinity of the construction activity, large trees shall be marked and cordoned off with fencing, their root system protected, and any damage to the trees avoided</p> <p>(c) Adjacent wetlands and streams shall be protected from construction site runoff with appropriate erosion and sediment control features - e.g. silt fences</p> <p>(d) If any work in a Protected Area is being considered, the</p> <p>(e) Policy on Natural Habitats OP/BP 4.04 would be triggered and applicable actions in the ESMF must be followed.</p>	<p>AWS installation</p> <p>Stream gauge installation</p>	<p>MSJ</p> <p>WRA</p> <p>MSJ</p> <p>WRA</p>
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Site assessment for new and existing installations	Hazard vulnerability- flood and seismic risk, slope failure,	AWS and stream gauges
Property ownership	Avoid involuntary acquisition	
Ease of Access	Minimal clearance – minimize vegetation clearance and habitat	
	Minimal road construction and	
Waste management	Proper disposal of packaging for material - off site	
Installation of cables	Minimize earthworks and slope	
Installation of stream	Maintain riparian rights	
	Control sediment generation and	
	Avoid heavy equipment in streams or on	
Refurbish old buildings	Appropriate disposal of debris generated, packaging, paint containers, chemical residue, etc. Use licensed waste disposal contractors	Radar site Stream gauge sites AWS
New structures	Minimise earthworks, consider site vulnerability to hazards	Stream gauge sites AWS
Materials Supply (Gravel, Concrete, Asphalt, etc.)	Environmental compliance of suppliers re dust control, and material spillage/loss during transport,	Stream gauge AWS Radar site
Noise	Close to residential area so consider time of day for installation. Ensure muffler	Radar site
Dust	systems attached for operating Regular wetting	All sites where necessary
Chance Find of Cultural Artifacts	Contact relevant authorities – Jamaica National Heritage Trust	All sites – weather and hydrological installations

Management of Solid Wastes (Non-Hazardous)	Collection, transport, and disposal of any debris	All sites
Management of toxic substances	Enforce use of safety gear for workers. Package empty containers for disposal by contractor.	All sites
Management of Hazardous waste	Contain waste and Contact NEPA	All sites
Emissions from Construction Equipment/vehicles	Keep equipment/vehicles in good running order	All sites
Management of spills from Equipment	Appropriate clean up	All sites
Worker Health and safety	Sensitize workers and adhere to safety standards – protective gear as appropriate.	All sites
Management of wastewater from refurbishing Maintenance	Avoid runoff	

- Sub-components of ICDIMP have been screened according to the Environmental and Social Safeguard Framework of the World Bank.
- Mitigation measures have been identified as appropriate
- compiled in an Environmental Management Plan.
- Engagement of stakeholders pivotal to the successful implementation of the Investment Project
- Project beneficiaries have been identified, categorized and consulted.

Monitoring

- MOU with NEPA proposed
- Installation schedule to be provided
- Periodic Monitoring of sample installation sites -
Radar, Stream gauge , AWS, Tide Gauge



ANNEX VII-B

**Improving Climate Data
and
Information Management Project**

SPCR Jamaica

**ENVIRONMENTAL
FRAMEWORK**

MANAGEMENT

DISCLOSURE WORKSHOP 2

March 14, 2014

Presentation

- ▶ Part I Project and Site Information
 - ▶ Background and Rationale
 - ▶ Project scope and activity
 - ▶ Environmental Setting
 - ▶ National Legal and Regulatory Requirements
 - ▶ World Bank Environmental Safeguards
 - ▶ Stakeholder Consultations
 - ▶ Institutional Considerations
- ▶ Part II Environmental Screening and Scoping
- ▶ Part III Mitigation Measures
- ▶ Part IV Environmental Management Plan
- ▶ Annexes

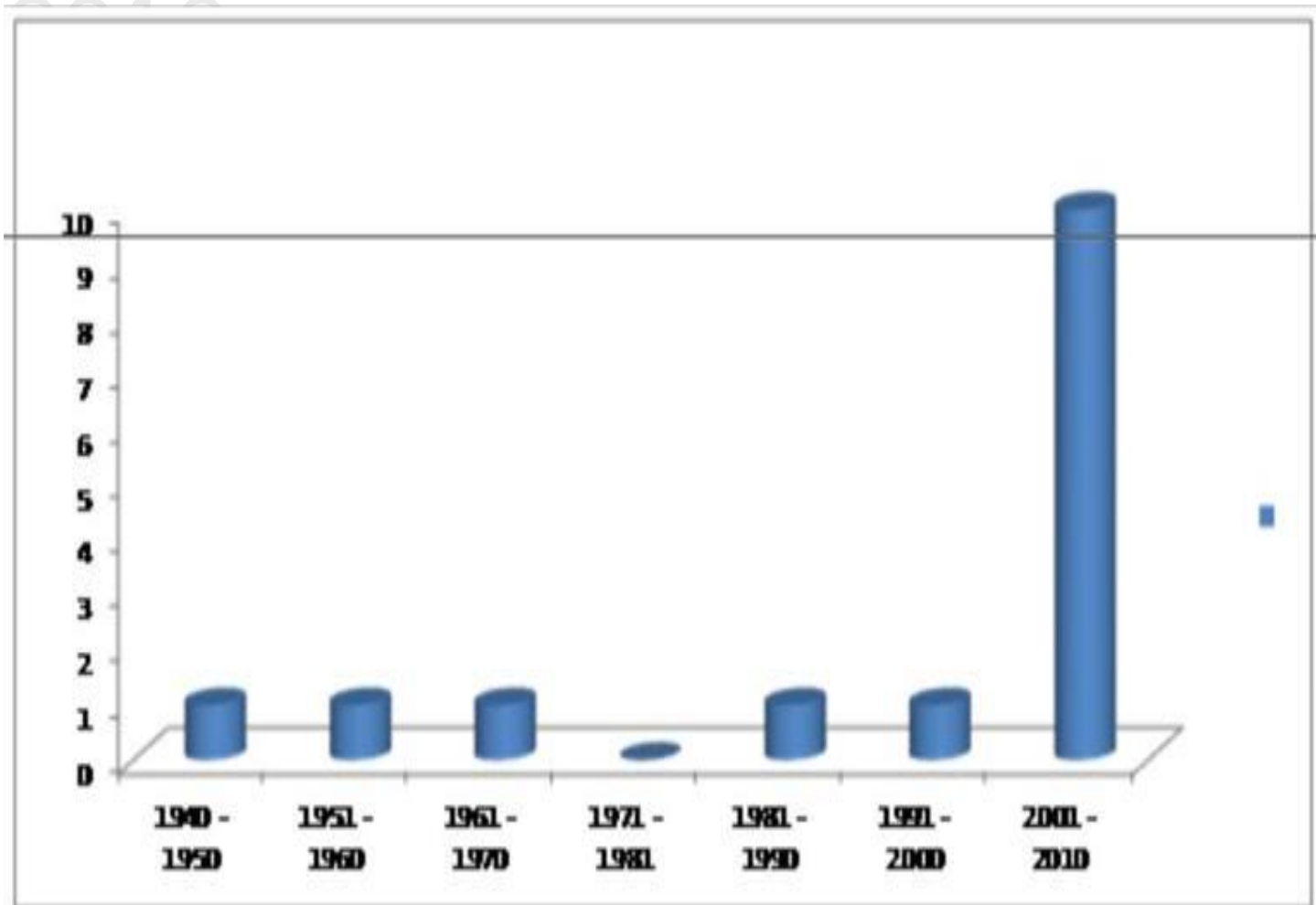
Project Background and Rationale

- ▶ Development objective
 - ▶ *to improve the quality and use of climate related information for effective planning and action at local and national levels.*
 - ▶ Contribute to the knowledge platform to improve decision-making with regard to strategies for achieving disaster risk reduction.
- ▶ *Goal Four – Vision 2030*
- ▶ Hazard Risk Reduction and Adaptation to Climate Change

Rationale

- ▶ Climate triggered extreme events have been the bane of Jamaica's social and economic development for decades.
- ▶ 2001-2012 in particular, hydro-meteorological hazards have caused damage and losses estimated at over J\$113 billion - more than J\$11 billion per year - estimated as 1-2% of Jamaica's GDP.

Climate events - 1940-2010



...rationale

- ▶ Climate change projections for Jamaica suggest that changes in temperature, precipitation and sea level rise will increase vulnerability to disasters
 - ▶ Increasing variability, unpredictability, extremes
- ▶ Initiatives to build climate resilience imperative.
- ▶ Database required to inform the required programs is currently inadequate

Parameter	PRECIS Model	SDM
Temperature	<p>Increase of: 0.4-0.9°C by 2015 0.5-1.0°C by 2030s 0.7-1.8°C by 2050s 1.8-3.5°C by 2080s</p> <p>South-western Jamaica will experience the greatest change in</p>	<p>Increase of: 0.5-0.7°C by 2015 0.8-1.3°C by 2030s 1.1-1.8°C by 2050s 1.9-2.6°C by 2080s</p> <p>March - May will see greatest increase</p>
Precipitation	<p>Rainfall decrease in most regions by the 2050s</p> <p>By 2080s, decrease ranging from 25% to 40% of current rainfall levels will take place in all regions</p>	<p>General pattern of decreased rainfall overtime</p> <p>Significant decrease in rainfall starting in 2050s</p> <p>June - November will have most pronounced decrease</p>
Other	N/A	Stream flow of some major rivers will decrease due to reduced rainfall



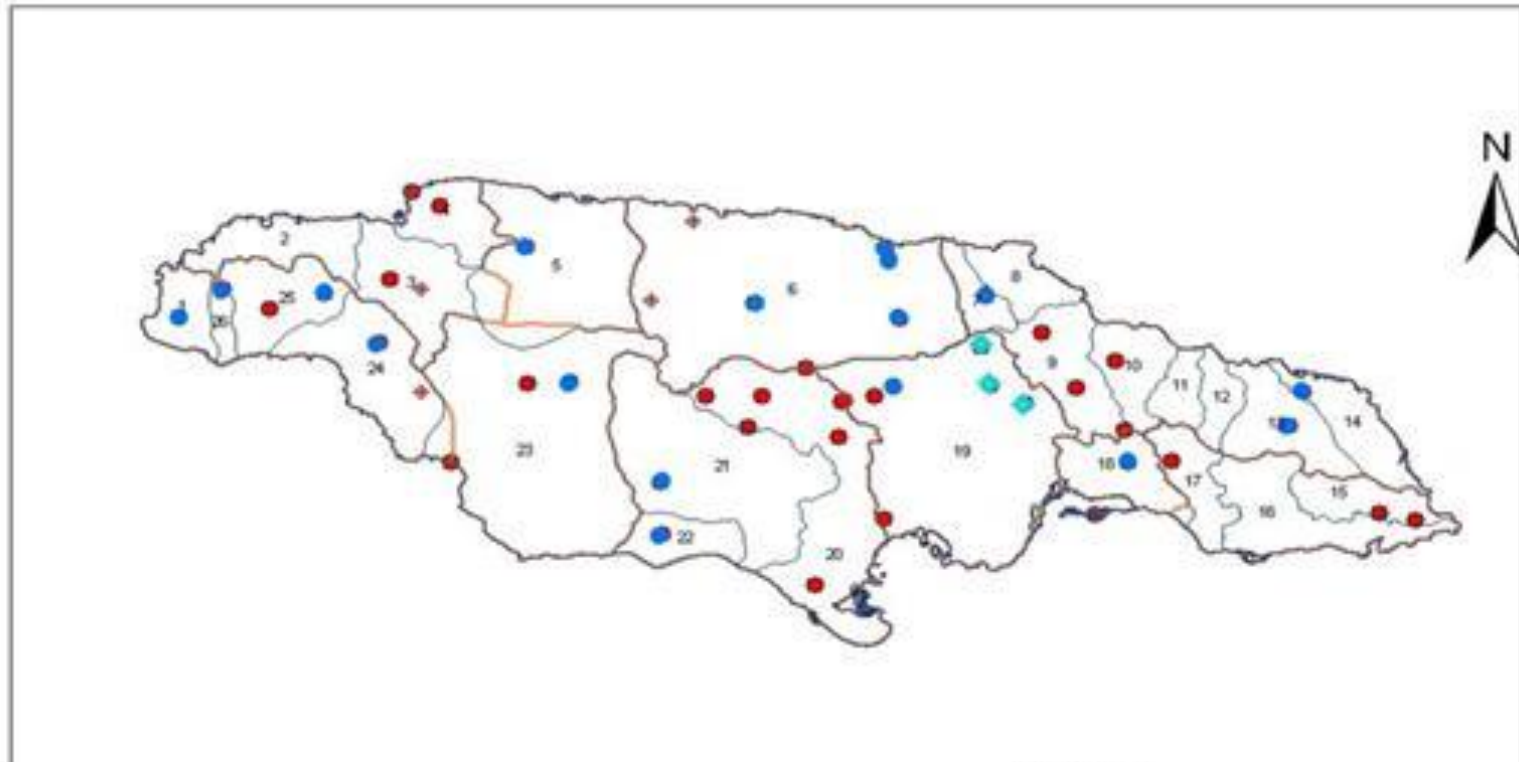
Project Scope and Activities

- ▶ Upgrading and providing new, critically needed equipment and systems
- ▶ Operator training for improved collection, processing and forecasting of hydro-meteorological and agrometeorological data
- ▶ Ultimately improve the availability and reliability of data for climate change scenario modeling, risk analysis, warning systems, and knowledge sharing

Scope

- ▶ ***Sub-component 1.1: Hydro- and agro-meteorological high priority equipment and spare parts.***
 - ▶ supply, installation, calibration and training of staff for 26 all-weather stations;
 - ▶ communications repeaters for transmitting data in real time;
 - ▶ agro-meteorological stations;
 - ▶ automatic recording rain gauges to augment/replace the existing manual gauges;
 - ▶ stream flow/ river gauging loggers for flood and drought forecasting (new loggers , replacements and upgrades)
 - ▶ upgrades to the rainfall intensity gauging network
 - ▶ ground water monitoring equipment
 - ▶ Back-up power supplies for MET services, WRA and RADA.
- ▶ **Sites will not be new, but the logging equipment will be.**

INTENSITY RAINFALL GAUGING NETWORK OF JAMAICA



0 10 20 40 60 80 Kilometers

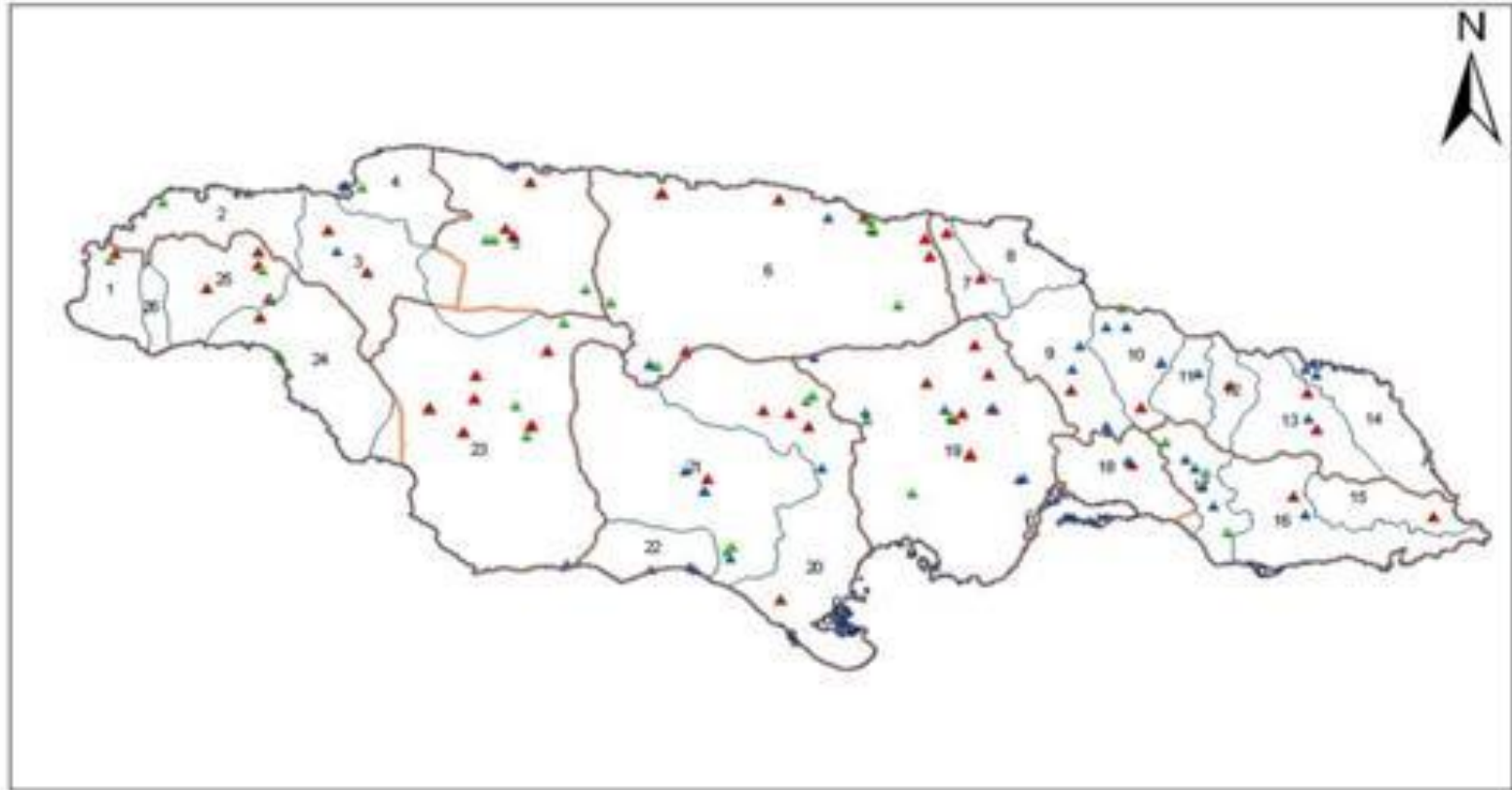
Legend

- Watershed Management Unit
- Hydrobasin
- Carib Hycos Telemetry
- Flood warning telemetry Rainfall Loggers
- WRA Intensity Rainfall Loggers
- Met Service rainfall intensity loggers





WRA'S STREAM GAUGING NETWORK OF JAMAICA



0 10 20 40 60 80 Kilometers

Legend

- Watershed Management Unit
- Hydrobasin
- Spot Measurement Stations
- manual stream gauge stations
- Recording stream gauge stations

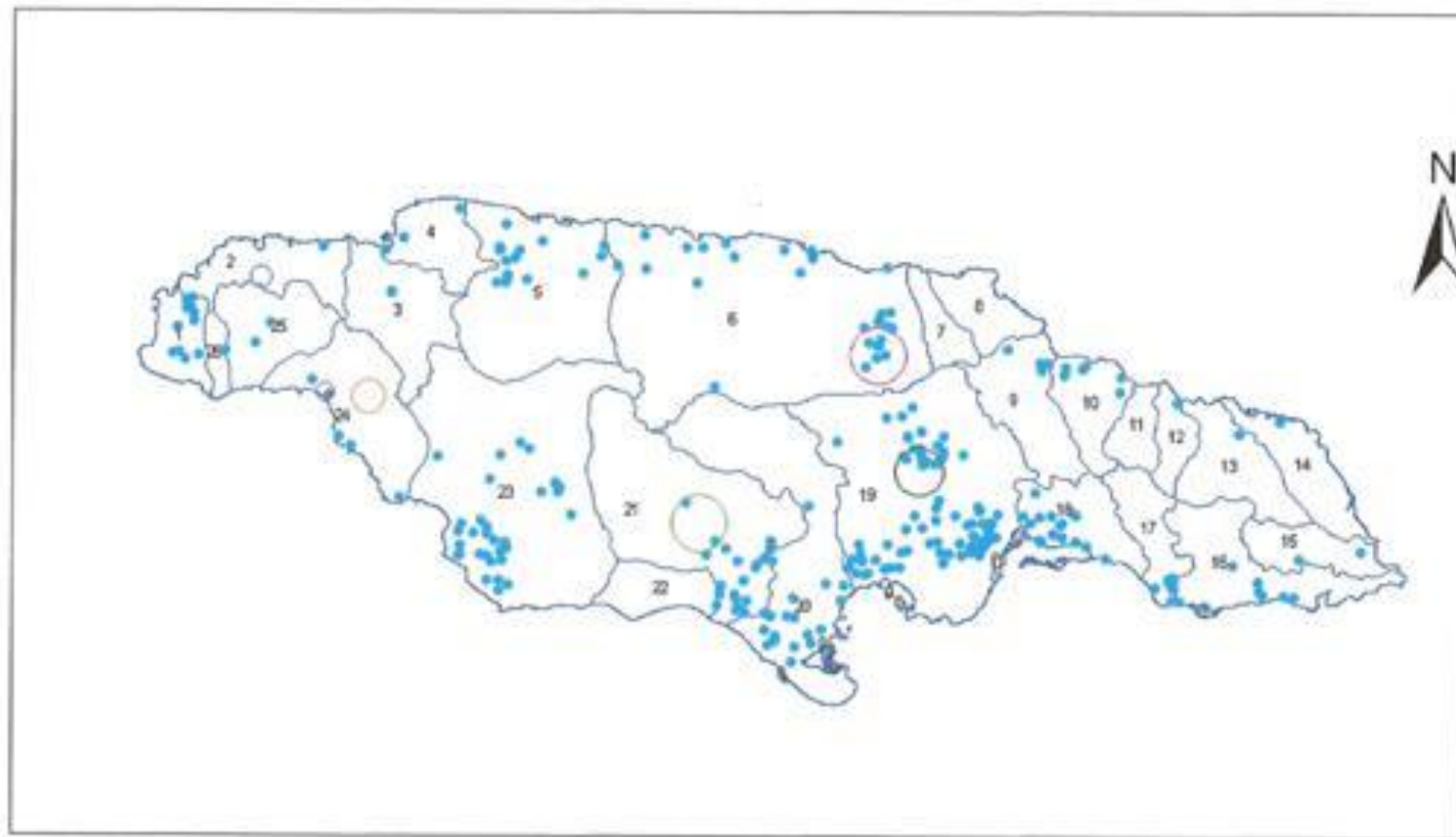




...Scope

- ▶ Equipment will be used to
 - ▶ improve instrumentation in key watersheds for measurement and monitoring of water supply potential + flash-flood potential and risk
 - ▶ infill data gaps between stations
 - ▶ provide near real-time data to facilitate improved forecasting and early warning systems.
 - ▶ enable provision of accurate and timely wind speed information to trigger payments administered under the Caribbean Catastrophe Risk Insurance Facility (CCRIF).

WRA's MONTHLY GROUNDWATER MONITORING WELLS



Legend

- Wells
- Watershed Management Unit
- Moneague
- Rio Cobre
- Porus
- New Market
- Goat Gully
- Chigwell

Groundwater monitoring

- ▶ Crucial to the management of water resources and flood projections.
- ▶ Major aquifers in western 2/3 island accommodate the greater portion of the island's groundwater resources.
- ▶ Installation of loggers on some of these monitoring wells
- ▶ Enhance WRA's capacity to develop, calibrate and verify groundwater models for managing water resources, and for forecasting in times of groundwater induced flooding.

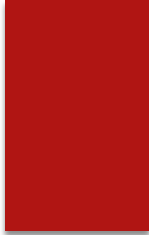



Installation requirements

- ▶ Monitoring sites not yet confirmed – will be defined during implementation phase .
- ▶ May have varying needs – access road improvement, site improvement for new equipment,

Radar Installation

- ▶ Subcomponent 2
 - ▶ Located 729 m a.s.l in the general area of Cooper's Hill, St. Andrew
 - ▶ New radar will be installed at existing location so footprint will not change.
- ▶ Replace the existing timeworn S-band weather radar system that was acquired in 1999.
- ▶ Obsolete - Significant downtime
- ▶ Constraint to tracking weather systems approaching island





Installation requirements – Radar Site

- ▶ Transportation from port to site
- ▶ Reconditioning of the tower with metal cleaning, welding and repainting
- ▶ Refurbishing of the building - removal of worn carpets, cleaning of walls, windows and doors, replacement of windows and doors, repair of roof etc.
- ▶ Disposal of waste and transportation from the site must be executed with best practice.

Radar site

- ▶ Upgrade power supply - Install solar powered system.
- ▶ Upgrade water storage - install rainwater harvesting system
- remediate existing tanks connect rainwater catchment to tank
- ▶ Install Standby power generation to support existing power supply.
- ▶ Fuel storage? Small amount may be required for emergency generation .

Marine Observation Station

- ▶ Current tide gauge situated on existing (historic) concrete tide monitoring house located on the east end of the JDF coast guard station
- ▶ Monitoring sea level rise - CC monitoring
- ▶ Real time information for Harbour Master's Dept
- ▶ Tsunami warning centre
- ▶ Weather station also mounted
- ▶ Structure in poor condition – needs repair and upgrading

....marine observation

- ▶ Demolition and disposal of obsolete equipment
- ▶ Site preparation

Non-Civil works

- ▶ Data sharing platform
- ▶ Coherent formal collaboration mechanism needed
- ▶ Facilitate streamlined system of data capture, analysis, interpretation and dissemination among the agencies.
- ▶ Multiple public and private agencies as well as mining and sugar companies collect climate data independently or somewhat jointly.
- ▶ Data sharing across agencies currently not fluid.
- ▶ Project would support measures to streamline the sharing of climate data among the different stakeholders
- ▶ Training and capacity building
- ▶ Public awareness

Climate data capture from Field Stations

Met Service, WRA, Agriculture & Fisheries, Private Sources,
etc.

National Platform: Met. Service, WRA, Universities, Research Institutes

Climate Data Collation, analysis, interpretation
Generation and Dissemination of Information

Information Users

Public Sector, Private Sector, Local Communities,
Universities, Research Institutes etc.



National Legal and Regulatory Framework

- ▶ National environmental regulatory requirements are prescribed by the Environmental Permit & License System (P&L) of 1997
- ▶ No major negative issues projected, overall outcome will have a strong positive impact.
- ▶ Some aspects of the project need to be assessed for environmental impact, but the specific actions are not yet known. EMF has been prepared
- ▶ Any aboveground fuel storage in excess of 880 gallons or underground storage in excess of 1,100 gallons that may be associated with standby power generation, will need a license
- ▶ Regulatory requirements of the Government of Jamaica must be met.

Legislative Imperatives for 2014

- ▶ Recent review of policy, plans, legislation and regulations for climate resilience in Jamaica - commissioned by the PIOJ
- ▶ Current policy and legislative framework is not adequate to respond to the ongoing requirements of climate change
- ▶ Water Resources (Amendment) Act
- ▶ Disaster Management Act
- ▶ Town and Country Planning Act
- ▶ Meteorological Act
- ▶ National Building Act and promulgation of the Building Code
- ▶ Renewable Energy Act

World Bank Safeguard Policies

- ▶ *Seek to prevent and mitigate undue harm to people and their environment in the development process.*
- ▶ Provide guidelines for Bank and borrower staff in the identification, preparation, and implementation of programs and projects.
- ▶ EMF document providing the guidelines
- ▶ Described as a cornerstone of the Bank's support to sustainable poverty reduction

World Bank Safeguards

- ▶ Environmental assessments - integrated with the project cycle such that environmental screening occurs at the project identification stage – identify issues early in project cycle.
- ▶ Magnitude and sensitivity of the project and the attendant issues determine whether a full assessment is required.
- ▶ Design environmental improvements into projects, avoid, mitigate, or compensate for adverse impacts.
- ▶ Objective - avoid costs and delays in implementation due to unanticipated problems.
- ▶ Attention to Stakeholder/Beneficiary engagement

Project classification

Category A	A full EIA is required, as the project may have diverse and significant environmental impacts
Category B	Although a full EA is not required, environmental analysis is appropriate, as the project may have specific environmental impacts
Category C	Environmental analysis is normally unnecessary, as the project is unlikely to have any environmental impacts

...Safeguards

- ▶ WB Safeguard policies that could be triggered by actions are as follows:
- ▶ *Environmental Assessment*
- ▶ *Natural Habitats*
- ▶ *Physical and cultural resources*
- ▶ *Involuntary resettlement*

Stakeholder Consultations

- ▶ SPCR Consultations
- ▶ Data Generators and Users
- ▶ Data Beneficiaries
- ▶ EMF Disclosure

Project Beneficiaries and Engagement

- ▶ Hydromet data - Public good – entire population – reduce dislocation and loss – build resilience
- ▶ Increase awareness and knowledge –influence behaviour
- ▶ KAP Survey - Major knowledge gap - strong demand for increased awareness and improved climate literacy.
- ▶ Climate Communication Plan Phase 1 – PPCR - Messages developed
- ▶ 3 Broad Groups Stakeholders
 - ▶ Generators of Data and Providers of Information
 - ▶ Users of Information
 - ▶ Beneficiaries of Information

Public Sector Agencies

- ▶ MWLECC - Met Services, WRA and CCD
- ▶ MoAF - RADA
- ▶ MoLGCD - ODPEM
- ▶ MOH

MWELCC - Met Services, WRA and CCD - responsible for implementing approx. 62 % in value of Project sub-components

Project Beneficiaries and engagement

List of Stakeholders - based on Sector/Function

Financing and Executing Agencies	Water resources	Met & climate data	Agriculture	Communication	Infrastructure and Utilities	Disaster Risk Management	Private Enterprise	Political representatives	Civil society	Monitoring and evaluation
Planning Institute of Jamaica (PIOJ)	Water Resources Authority	Met Services	Ministry of Agriculture and Fisheries	Caribbean Institute of Mass Communication (CARIMAC)	National Water Commission	Office of Disaster Preparedness and Emergency Management (ODPEM)	Private sector agricultural enterprise	Members of Parliament	Community-Based Organisations (CBOs)	National Environment and Planning Agency
World Bank	Ministry of Land, Water, Environment and Climate Change	University of the West Indies – Climate Studies	Rural Agricultural Development Agency (RADA)	Jamaica Information Service (JIS)	Jamaica Public Service Co (JPSCo)	Emergency Responders	Environment and Development Professionals (including engineers, architects, planners, etc.)	Councillors	NGOs- Red Cross, ADRA, Salvation Army etc. NGOs	Met Services
Ministry of Finance and Planning	National Irrigation Commission	Climate Change Division		PANOS Caribbean	Ministry of Transport, Works and Housing (MTWH)	Ministry of Health	General Insurance sector			Water Resources Authority
	National Water Commission					General Insurance sector				Planning Institute of Jamaica (PIOJ)
						Mines and Geology Division				World Bank

Application of Outputs



OUTPUT	APPLICATION
Climate and hydrological data and models - Water sector □ Climate data, modeling and scenario building- Agriculture sector and farmers □ Climate data and modeling - Fisheries sector	<ul style="list-style-type: none">• water availability and quality•• promote micro-scale water harvesting technologies.•• use of climate smart cropping methods • use of drought tolerant crops • pest management mechanisms • importance of protecting mangroves to increase fish stock • respecting closed seasons • fish farming as a livelihood alternative • Effect of water supply and quality on sanitation • likely increase of vector borne illnesses such as malaria and dengue

OUTPUT	APPLICATION
	<ul style="list-style-type: none"> • the need for tourism structures to withstand certain wind speeds • the availability of financial products that can support financial risk management • retrofitting and building adaptation • water recycling • water conservation measures • identify vulnerability • respect marine zones • consider product diversification to reduce dependence on climate sensitive resources.
<p>Climate data and scenarios – Vulnerability and risk assessments</p>	<ul style="list-style-type: none"> • importance of following building codes • need for identifying “no build” zones • the linking of disaster risk management and physical planning
<p>Climate and hydrological models and scenarios - Insurance sector</p>	<ul style="list-style-type: none"> • increase in risk to properties and persons • the various insurance options that exist
<p>Climate and hydrological data and scenarios – Energy sector</p>	<ul style="list-style-type: none"> • risk threatening the sustainability of hydropower energy supply in the future
<p>Improved data to be provided and the data sharing platform</p>	<ul style="list-style-type: none"> • communities involvement in watershed management and conservation activities • sector policies and programmes

...screening

- ▶ Project activities mainly positive environmental and social impacts
- ▶ improving weather and climate information and forecasting
- ▶ contribute to strengthening disaster risk management, reduction of vulnerability and loss, and increased productivity.

Regulatory Requirements

- ▶ NEPA Permit and License system
- ▶ No ICDIMP activities within prescribed categories for environmental permit
- ▶ Screening of activities under the Met Services and the WRA- civil works .
- ▶ Replacement of the Doppler Radar entailed some small civil works and other activities with some environmental consideration

Exclusion Screening

- ▶ List elements necessary for screening of each of the subprojects and activities in the future – applied once specifics are known about a particular location or action.
- ▶ Responsibility of the Implementing Agency (MSJ, WRA, or others) to review each proposed activity based on the specifics of each proposed location -as details become available during project implementation.
- ▶ Evaluation of whether a particular activity would potentially affect natural habitat or physical cultural resources, or involve any land acquisition, use or access.
- ▶ In such cases the associated World Bank Safeguard Policy would be triggered and the project activity would be ineligible and excluded from consideration.
- ▶ This screening function applicable to all proposed activities.

Project Screening & Exclusion Criteria

CRITERIA	YES / NO	
➤ Does the proposed project require the major construction or upgrading of new roads or opening new access routes?		
➤ Does the proposed project require the acquisition of any land, either temporarily or permanently; the removal of crops or destruction of any personal property; or, create any new restrictions to access of any sites, locations or roadways?		
➤ Would the works require leveling and clearing of lands with natural habitat (those water or land areas where most of the original plant and animal species are still present)?		
➤ Would the works affect cultural property, including any archeological or historical sites?		
➤ Is the project in a natural protected area, or could the project impact or affect the habitat of endangered species of plants or animals?		
➤ Could the project adversely affect natural resources (water intakes) or waterways (streams, rivers, or wetlands) by sedimentation, pollution, flooding, draining, or filling?		
➤ Will the project modify any coastal zone feature, reef or marine features?		



Indicative Impacts and Mitigating Measures

- ▶ intended to serve as a guide for the WRA and MSJ during the scoping of particular locations, actions, and plans.
- ▶ These screening/scoping and mitigation measures can be inserted in the contractual agreement with selected contractors.
- ▶ Each location or action must be screened by WRA and/or MSJ to ensure that all the pertinent environmental factors are being taken into account

Indicative Impacts and Mitigating Measures

Issues/Impact	Mitigation Consideration	Subcomponent
Site assessment for new and existing installations	Hazard vulnerability- flood and seismic risk, slope failure, etc.	All sites, especially AWS and stream gauges
Property ownership, use or access	Prohibit any land acquisition (temporary or permanent), change in land use (such as	All sites
Ease of Access	Minimal vegetation clearance and earthwork – minimize vegetation clearance and habitat destruction	All sites
	Prohibit expansion of roads or acquisition of lands for access	All sites
Waste management	Proper disposal of packaging for material - off site Avoid any burning	All sites
Installation of cables or trenches	Minimize earthworks and slope instability	All sites

Work in stream beds	Maintain riparian rights and do not affect water use	Stream gages
	Control sediment generation and discharge	Stream gages
	Prohibit heavy equipment in streams or on banks; use	Stream gages
Refurbish old buildings	Appropriate disposal of debris generated, packaging, paint containers, chemical residue, etc.	Radar site Stream gauge sites AWS
	Use licensed waste disposal contractors to ensure	
New structures	disposal at licensed sites. Minimise earthworks, consider site vulnerability to hazards	Stream gauge sites AWS
Materials Supply (Gravel, Concrete, Asphalt, etc.)	Environmental compliance of suppliers re dust control, and material spillage/loss during transport, delivery and storage	Stream gauge AWS Radar site
Noise	Close to residential area so consider time of day for installation. Ensure muffler systems attached for	Radar site
Dust	operating equipment Regular wetting	All sites where necessary

Chance Find of Cultural Artifacts	Contact relevant authorities – Jamaica National Heritage Trust	All sites – weather and hydrological installations
Management of Solid Wastes	Collection, transport, and disposal of any debris	All sites
Management of toxic substances	Enforce use of safety gear for workers. Package empty containers for disposal by contractor.	All sites
Management of Hazardous waste	Contain waste and Contact NEPA	All sites
Emissions from Construction Equipment/vehicles	Keep equipment/vehicles in good running order	All sites
Management of spills from equipment	Appropriate clean up	All sites
Worker Health and safety	Sensitize workers and adhere to safety standards – protective gear as appropriate.	All sites
Management of wastewater from refurbishing and maintenance	Avoid runoff	Radar site

Standard Contract Language for Mitigation Measures



ACTIVITY	PARAMETER	MITIGATION MEASURES CHECKLIST
1. General Conditions	Notification and Worker Safety	<p>(a) The Parish Council and respective communities have been notified of upcoming activities</p> <p>(b) The public has been notified of the works through appropriate notification in the media and/or at publicly accessible sites e.g. Library, post office, parish council office, site of the works, etc.</p> <p>(c) All legally required permits have been acquired for construction and/or rehabilitation</p> <p>(d) The Contractor formally agrees that all work will be carried out in a safe and disciplined manner designed to minimize impacts on neighboring residents and environment.</p> <p>(e) On site construction workers will comply with international good practice (always hardhats, as needed masks and safety glasses, harnesses and safety boots)</p> <p>(f) Appropriate signposting of the radar site will</p>

A. General Rehabilitation and /or Construction Activities

Air Quality

- (a) During interior refurbishing old carpeting, windows, doors etc. will be carefully removed and debris transported to temporary storage area on site
- (b) Debris shall be kept in controlled area and covered with tarpaulin
- (c) The surrounding environment (sidewalks, roads) shall be kept free of debris to minimize dust
- (d) There will be no open burning of construction / waste material at the site
- (e) There will be no excessive idling of construction vehicles at sites

Noise

- (a) Construction noise will be limited to day time.
- (b) During operations the engine covers of generators, air compressors and other powered mechanical equipment shall be closed. Equipment should be in good working order to further minimize noise



Water Quality	<p>(a) The site will establish appropriate erosion and sediment control measures such as e.g. silt fences to prevent sediment from moving off site and causing excessive turbidity in nearby streams and rivers. No equipment should be used in or near channel bed and sides</p>
Waste management	<p>(a) Waste collection and disposal pathways and sites will be identified for all major waste types expected from demolition and construction activities.</p> <p>(b) Construction waste will be collected and transported to landfill by licensed collectors</p>

B. Wastewater treatment	Water Quality	<p>Existing system for handling sanitary wastes and wastewater from radar site to be inspected and upgraded if deemed necessary.</p> <p>(a) Construction vehicles and machinery will be washed only in designated areas where runoff will not pollute natural surface water bodies.</p>
C. Historic building(s)	Cultural Heritage	<p>(a) If installations of any new equipment are close to a designated historic structure, or located in a designated historic district, notification shall be made and approvals/permits obtained from Jamaica National Heritage Trust, Parish Councils</p> <p>(b) Provisions must be made for artifacts or other possible “chance finds” encountered in excavation or construction to be noted and registered, responsible officials at JNHT contacted.</p>
D. Acquisition of land	Land Use or Access	<p>(a) If acquisition or temporary use of land was not expected but is required, or if loss of access to income of legal or illegal users of land was not expected but may occur, then the Bank’s Task Team Leader shall be immediately consulted.</p>

<p>E. Toxic Materials</p>	<p>Asbestos management</p>	<ul style="list-style-type: none"> (a) If asbestos is located on the project site, it shall be treated as hazardous material. (b) Asbestos should be handled and disposed by skilled & experienced professionals (c) If asbestos material is be stored temporarily, the wastes should be securely enclosed inside closed containments and marked appropriately. (d) Security measures will be taken against unauthorized removal from the site.
	<p>Toxic / hazardous waste management</p>	<ul style="list-style-type: none"> (a) Temporary storage on site of all hazardous or toxic substances will be in safe containers labeled with details of composition, properties and handling information (b) The containers of hazardous substances shall be placed in a leak-proof container to prevent spillage and leaching (c) As far as practicable paints with toxic ingredients or solvents or lead-based paints should not be used (d) Any use of pesticides must be made by licensed and trained companies.

<p>F. Affected forests, wetlands and/or protected areas</p>	<p>Protection</p>	<p>(a) All recognized natural habitats, wetlands and protected areas in the immediate vicinity of the activity will not be damaged or exploited, all staff will be strictly prohibited from hunting, foraging, logging or other damaging activities.</p> <p>(b) A survey and an inventory shall be made of large trees in the vicinity of the construction activity, large trees shall be marked and cordoned off with fencing, their root system protected, and any damage to the trees avoided</p> <p>(c) Adjacent wetlands and streams shall be protected from construction site run-off with appropriate erosion and sediment control features - e.g. silt fences</p> <p>(d) No work is allowed in any Protected Area or Natural Habitats.</p>
<p>G Traffic and Pedestrian Safety</p>	<p>Direct or indirect hazards to public traffic and pedestrians by construction activities</p>	<p>(a) In compliance with national regulations the contractor will ensure that the construction site is properly secured and construction related traffic regulated. This includes but is not limited to</p> <ul style="list-style-type: none"> • Signposting, warning signs, barriers and traffic diversions: site will be clearly visible and the public warned of all potential hazards • Traffic management system and staff training, especially for site access and transportation of radar from port to installation site. – • Adjustment of working hours to local traffic patterns

Environmental Management Plan

- ▶ Defined by the Implementing Agencies (WRA and MSJ) using the methods described in Part II of this EMF.
- ▶ Includes procedures for :
 - ▶ definition of mitigation measures
 - ▶ enforcement of contract provisions,
 - ▶ record keeping of screening and inspections
 - ▶ reporting to PIOJ and the World Bank.

EMP

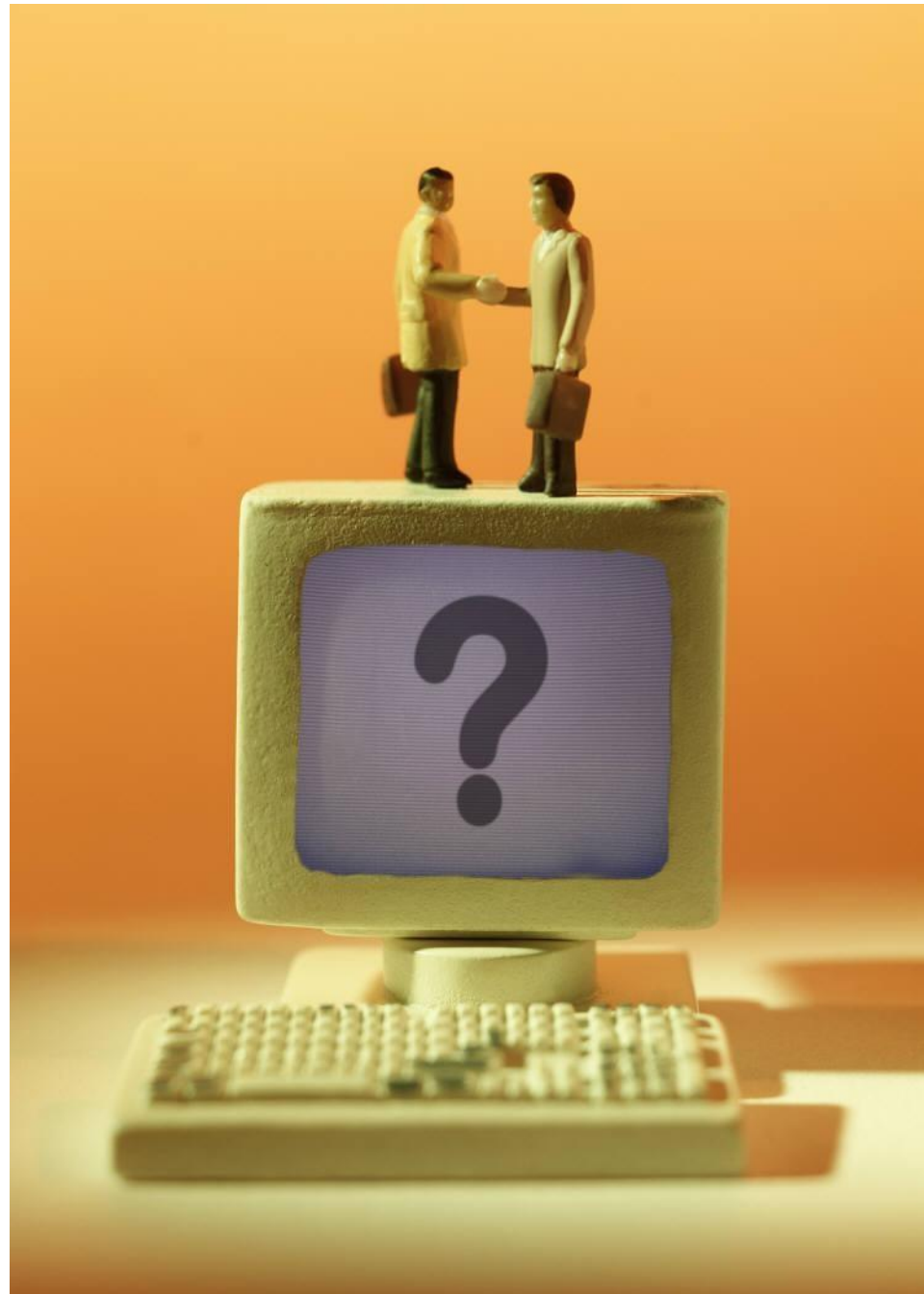
- ▶ WRA and MSJ will supervise their contractors in the field to ensure that the mitigation measures are indeed carried out according to monitoring program
- ▶ A simple monitoring program would entail:
 - ▶ Project start-up. site selection, equipment transport and installation, installation of data systems, installation of tide gauge, refurbishing of Coopers Hill site offices for Radar installation
 - ▶ Three month intervals for the first year - monitor on-going site selection and installation - AWS, stream gauges
 - ▶ Twice per year after Year 1 to the end of the project for the longer duration subcomponents.

EMP

- ▶ Monitoring activities and EMP will be periodically reviewed by the world bank
- ▶ Will form the criteria for safeguards compliance in future evaluations.
- ▶ Final evaluation will be guided by the indicators for environmental quality objectives

In Summary

- ▶ Engagement of stakeholders pivotal to the successful implementation of the Investment Project
- ▶ Project beneficiaries have been identified, categorized and consulted.
- ▶ Sub-components of ICDIMP to be screened according to the Environmental Management Framework of the World Bank.
- ▶ Mitigation measures have been identified as appropriate
- ▶ Compiled in an Environmental Management Plan.
- ▶ **Conditions to be included in Contracts for small works**



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