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CARIBBEAN DEVELOPMENT BANK



**TECHNICAL ASSISTANCE - UPGRADED FLOOD EARLY WARNING SYSTEM FOR
THE RIO COBRE WATERSHED - JAMAICA**

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Considered at the Two Hundred and Seventy-Seventh Meeting
of the Board of Directors held in Barbados July 20, 2017

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JULY 2017

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CARIBBEAN DEVELOPMENT BANK

TWO HUNDRED AND SEVENTY-SEVENTH MEETING OF THE BOARD OF DIRECTORS

TO BE HELD IN BARBADOS

JULY 20, 2017

PAPER 91/17

**TECHNICAL ASSISTANCE - UPGRADED FLOOD EARLY WARNING SYSTEM FOR
THE RIO COBRE WATERSHED - JAMAICA**

1. BACKGROUND

1.01 Hydro-meteorological and hydro-climatic events including hurricanes, tropical storms, heavy rainfalls and associated floods represent the most frequently occurring hazards in Jamaica. These events regularly impact livelihoods, destroy infrastructure and disrupt the provision of essential services. The average annual loss due to hurricanes and floods is approximately USD120 million (mn) and USD62 mn¹, respectively. Among the 827 communities in Jamaica, 32% are located in flood-prone areas, and flooding has significantly affected major infrastructures located on coastal areas and floodplains. Jamaica's location, geology, hilly topography, narrow coastal plains and dense river network have contributed to the island's vulnerability to flooding: ponding, tidal flooding, flash flooding and riverine flooding. Floods are often linked with severe weather systems, frontal systems and troughs and less often with hurricanes and tropical storms. Appendix 1 shows riverine flood hazard potential in Jamaica.

1.02 The Water Resources Authority (WRA), a statutory body, established by the Water Resources Act, 1995, is responsible for the management, protection, and controlled allocation and use of Jamaica's water. WRA is headed by an Executive Director who reports to a Board of Directors and currently operates under the portfolio of the Ministry of Economic Growth and Job Creation. WRA has three functional technical units: Resources Monitoring and Data Collection Unit (RMDU), Resources Planning and Investigation Unit, and Allocation and Regulation Unit. The Technical Services staff includes 19 experienced hydrologists/hydrogeologists supported by 12 technicians. The organisational structure of WRA is shown at Appendix 2. WRA has maintained a robust hydrological database since 1955 and provides data, information, and technical assistance (TA) to government and non-government institutions.

1.03 WRA's RMDU is responsible for routine monitoring of surface and groundwater and the maintenance of stations and equipment. It routinely monitors streamflow at 133 river gauging stations (100 fully automatic and 33 manual) and groundwater levels at 320 well sites throughout Jamaica. Records are also kept of water abstractions. An important element of WRA's work programme is the coordination, preparation and implementation of the island's Floodwater Control Master Plan in collaboration with the Office of Disaster Preparedness and Emergency Management (ODPEM) and other institutions. The outputs include the preparation of flood plain maps, declaration of floodwater control areas and the provision of technical advice for approval of implementing structures to mitigate flood impacts in the environmental impact assessment approval process.

¹ World Bank (2016). Disaster Vulnerability Reduction Project - Jamaica. Report No: PAD1233.

1.04 Given the frequency of flash floods there have been efforts to promote the establishment of community Flood Early Warning Systems (FEWS), to reduce damage to property and livelihoods and save lives in the most vulnerable communities. Manually operated community FEWS have been installed on seven rivers, and an automated FEWS was installed on the Rio Cobre. The Rio Cobre has the third largest watershed management unit (WMU) in Jamaica, covering an estimated drainage area of 646 square kilometres (km)². It can be divided into a northern and a southern section interlinked by a narrow gorge. The gorge length is approximately 6.9 km, from Sligoville, Bog Walk T-Junction in the North and Dam Head, Spanish Town in the South. The gorge discharges into Kingston Harbour. The lower floodplain of the WMU includes large sections of Spanish Town and the fast growing municipality of Portmore. There is a road through the Bog Walk gorge that serves as the main transit route (Appendix 3) between the north and south coast of Jamaica until 2016, when the North-South link of Highway 2000 toll road was completed. It still remains the main road link to Spanish Town and Kingston for the communities of Bog Walk, Dam Head, Ackee Walk, Kent Village, and Angels which are bypassed by the new toll road. Recently, the National Works Agency (NWA) estimated annual average daily traffic in the road through the gorge at 19,670 vehicles.

1.05 An automatic real-time FEWS was installed on the Rio Cobre to prevent usage of the road in the Bog Walk Gorge and to alert the communities at risk. It consists of three intensity rain gauges, one river gauge, and two radio repeaters. One of the major advantages of this system is that changes in water level at different points of interest can be closely watched.

1.06 Data is transmitted via the repeaters to base stations at WRA where the information is decoded and passed to a computer. A trained team from ODPEM, National Meteorological Services (NMS) and WRA determines if a flood event is imminent. When flooding is likely to occur, WRA relays messages to ODPEM, who in turn would advise the Media of the situation, the Jamaica Fire Brigade, and the Jamaica Constabulary Force (JCF) for taking relevant actions such as traffic management and closing of the roadway; the NWA, which has responsibility for all major roads repairs and clearing of blockage; and the St. Catherine Parish Disaster Coordinator (PDC). The police operate the manual gates across the roadway at both ends of the gorge. A schematic of the Rio Cobre FEWS system is shown at Appendix 4.

1.07 The Rio Cobre flood monitoring and data transmission networks have however been inoperable since 2015, because of lightning strikes. The hilly terrain requires the configuration of the system to include several antennas being placed at varying heights, resulting in exposure to windy conditions, lightning strikes and vandalism. Functionality of the rain gauge network is also less than desirable and this has occasionally led to inaccurate flood prediction in the gorge. Given the issues of lightning impact on the repeater antenna and the inadequate rain gauge density of the WMU, the WRA would like to use Global System Mobile (GSM) communications for data transmission and to increase the density of stations in the rainfall and stream gauging network at six and five, respectively. The need for greater monitoring equipment density takes on more urgent proportions given climate change projections for Jamaica which suggest more extreme events and an increase in flood risks of deaths and damage by 11% and 9% respectively to 4.4 persons per annum and USD105.2 mn (2010 dollar value)². The existing stations also need to be rehabilitated and upgraded to take advantage of advancements in renewable energy, data transfer methodologies, and real time communication with stakeholders.

2. **PROPOSAL**

2.01 It is proposed that the Caribbean Development Bank (CDB) provides a grant to the Government of

² Mandal, A (2016). Flooding and Development in Low-Lying Areas in Jamaica: Impact of Climate Change. Session: Managing Ecosystems for more Resilient Cities in India, Bolivia, and Jamaica. Bonn, Germany 2016. http://resilientcities2016.iclei.org/fileadmin/sites/resilient-cities/files/Resilient_Cities_2016/PPTs/A2_Mandal.pdf

Jamaica (GOJ) in an amount not exceeding the equivalent of two hundred and eighteen thousand, seven hundred and fifty-one euros (EUR218,751) from its Special Funds Resources (SFR) allocated from resources provided under the ACP-EU-CDB NDRM in the CARIFORUM Countries Programme, to replace, upgrade and expand the existing flood monitoring system at the Rio Cobre. The grant will provide resources to:

- (a) increase the monitoring equipment density (procurement of four new stream gauging stations and six new rainfall intensity stations³) to recalibrate the flood discharge rate of the WMU, which is critical to improve the flood management system at the Rio Cobre;
- (b) retrofit all stream gauging stations and rainfall intensity stations within the project area; and
- (c) install solar-powered back-up system/servers.

2.02 The Duties and Responsibilities of the Project Coordinator (PC) are presented at Appendix 5.

3. OUTCOME

3.01 The expected outcome is increased capacity of WRA to provide real-time data for flood early warnings for the Rio Cobre watershed. The Design and Monitoring Framework of the proposal is provided at Appendix 6.

4. JUSTIFICATION AND BENEFITS

4.01 Several challenges can hamper the development and maintenance of FEWS in developing countries like Jamaica. There is a lack of detailed and good quality datasets of watersheds, population and critical infrastructure, which is essential for assessing and determining flood predictions. Further, it is often difficult for those countries to implement legislative and regulatory requirements for constraining development of land in flood zones, maintain public awareness of the risk and ensure that effectiveness of mechanisms and processes to facilitate and mount effective emergency management operations.

4.02 The Rio Cobre Watershed was given priority for an automated FEWS due to the significant number of lives lost due to flooding in the gorge and surrounding communities. Although the North-South highway has been completed, the gorge remains the preferred alternative route and is widely used by the residents of the surrounding communities (Bog Walk, Dam Head, Ackee Walk, and Kent Village). More importantly flood risk remains for the communities surrounding the Bog Walk gorge and the municipality of Portmore.

4.03 While the overall management and coordination of the Rio Cobre FEWS by ODPEM is still functional, the system is currently less effective due to the inoperability of its automated monitoring network. Furthermore its limited rainfall and stream gauge coverage of the WMU reduces the effectiveness of flood forecasting. It is a common occurrence that there are power outages during extreme weather events, which hinder data transmission from WRA to ODPEM on the imminence of flooding because WRA's server room has no power. A solar back-up supply and batteries will facilitate the operation of the server room and, consequently, allow for timely transmission of early warnings. The proposed project will also provide resources to improve the density of the stream monitoring and data collection network, improve the reliability of real time data collection, and transmission using GSM communication. All stations will

³ The three rainfall intensity stations presently in-use are obsolete and will be removed and replaced with three new stations plus three additional ones.

be retrofitted and secured to minimise the risk of vandalism. The Project will therefore support the delivery of accurate and early notification to communities at risk and key stakeholder groups including motorists, the police, fire brigade and emergency response personnel. It is expected that the enhanced system will contribute to reducing the loss of lives and casualties, and flood damage. In addition, improved data collection will facilitate sustained and wider disaster risk reduction (DRR) and environmental management objectives for the WMU.

4.04 WRA plays a pivotal role in hydrological data collection, processing, analysis and dissemination to OPDEM and other key stakeholders in the occurrence of flooding from the Rio Cobre. It will use its expertise and resources to conduct a comprehensive assessment of historical impacts and data collection, identify data gaps, revise the flood prediction tables for the WMU and determine the placement of additional rainfall and stream gauges. The WRA will undertake the installation, calibration and maintenance of the monitoring equipment in the Rio Cobre watershed. The GOJ has approved USD114,400 for the 2017-2018 operational plans of the RMDU including the proposed work on upgrading the Rio Cobre FEWS. WRA is committed to continuing to sustain the Rio Cobre flood monitoring network as a routine part of its work programme.

4.05 Based on CDB Performance Rating System, the proposed project has been assessed as highly satisfactory with an overall score of 3.75. A summary of the project performance score is shown in Table 1, and Appendix 7 shows the details of the rating system.

TABLE 1: PROJECT PERFORMANCE SCORE SUMMARY

Criteria	Relevance	Effectiveness	Efficiency	Sustainability	Overall Score
Score	4	3	4	4	3.75

4.06 Based on CDB Gender Marker, the proposed TA is assessed as having no contribution to gender equality (NO) with an overall score of 1. Nonetheless, the project contributes to delivering reliable data for timely decisions in the event of flooding, which will help to save lives, particularly of the most vulnerable groups. The gender marker summary is shown in Table 2, and the details are reported at Appendix 8.

TABLE 2: GENDER MARKER SUMMARY

Gender Marker	Analysis	Design	Score	Code
	1	0	1	NO

4.07 The proposed project is consistent with the Regional Comprehensive Disaster Management Strategy and Programming Framework 2014-2024 and the African Caribbean Pacific–European Union (ACP-EU)–CDB Result Areas (RA) 2: Improved local, national and regional resilience through strengthened early warning, national risk profiling and community-based DRR and climate change adaptation (CCA). This project is also consistent with:

- (a) CDB’s Corporate Priority of supporting environmental sustainability and DRR;
- (b) CDB’s TA Policy and Operational Strategy; and
- (c) CDB’s Climate Resilience Strategy.

5. EXECUTION

5.01 The Project will be executed by the GOJ through WRA. WRA has already assigned a senior staff member as PC who contributed to the preparation of the Project and who will be responsible for coordinating the execution of all project activities, ensuring project technical supervision and quality of deliverables. Duties and Responsibilities of the PC are presented at Appendix 5. The qualifications and experience of the assigned PC are acceptable to CDB. The qualifications and experience of any person subsequently assigned to the position of PC shall also be acceptable to CDB.

5.02 WRA will conduct a comprehensive assessment of historical impacts and data collection to identify gaps, revise the flood prediction table, determine flood warning thresholds, maintain and operate the monitoring equipment, receive and process the data and relay the information to ODPEM and NMS. A senior hydrologist and three technicians have been assigned to work on the Project. The 12 month Work Implementation Schedule is shown at Appendix 9.

6. RISK ASSESSMENT AND MITIGATION

6.01 Some potential risks associated with project implementation and operation as well as potential mitigation measures are summarised in Table 3 below.

TABLE 3: RISK ASSESSMENT AND MITIGATION

Risk Type	Description of Risk	Mitigation Measures
Implementation	Delays in procurement and installation of FEWS equipment to make the system operable will contribute to maintaining vulnerability of the population at risk to Rio Cobre flood hazard.	WRA will commence equipment procurement as soon as the project is approved by CDB's Loan Committee.
Operation	Lack of maintenance of the Rio Cobre FEWS.	WRA has assigned human and financial resources for regular maintenance/repair and calibration of monitoring instrument.

7. COST AND FINANCING

7.01 The total cost of the project is estimated at EUR305,596. The summary of the Financing Plan is shown in Table 4 with a detailed budget shown at Appendix 10.

TABLE 4: SUMMARY OF FINANCING PLAN

CONTRIBUTORS	EUR	%
CDB	218,751	72
GOJ (in-kind)	86,845	28
TOTAL	305,596	100

8. FUNDING SOURCE

8.01 CDB grant to GOJ of an amount in the equivalent of EUR218,751 is eligible for financing from CDB SFR allocated from resources provided under the ACP-EU-CDB Natural Disaster Risk Management (NDRM) in the CARIFORUM Countries Programme. Funds are available within existing resources.

9. PROCUREMENT

9.01 Procurement shall be in accordance with the CDB Guidelines for Procurement (January 2006), for goods, works and non-consultancy services, and the CDB Guidelines for the Selection and Engagement of Consultants (October 2011) for consultancy services. Financing shall be provided under the ACP-EU-CDB NDRM in CARIFORUM Countries agreement and thus, in accordance with that agreement, eligibility shall be extended to countries which are eligible for procurement under EU-funded projects, which are not CDB member countries, in accordance with the EU Eligibility Rules set out in Appendix 11.

9.02 WRA oversees an existing monitoring network of stream gauging stations and intensity rainfall gauges, supplied and supported by Steven Water Monitoring System (SWMS), a company from the United States of America (USA). The stream gauging stations and the intensity rainfall gauges equipment to be provided under the Project will expand and enhance the existing network. Given the need for the standardisation of the new equipment with that which is already in place in the wider monitoring network, it is proposed that the equipment shall be procured under the direct contracting procurement method, as allowed for under paragraph 3.07 (b) of the above-mentioned Guidelines for Procurement (January 2006), from the American company.

9.03 The source and origin of a significant proportion of the equipment to be supplied by SWMS is expected to be USA. Therefore, given this and the aforementioned nationality of SWMS, a waiver of CDB's Guidelines for Procurement (2006) is sought to further extend eligibility for the supplier and the source and origin of the stream gauging stations and the intensity rainfall gauges equipment, to additionally include USA as a country of source and origin for this project. The EU has confirmed in writing that the required extension of eligibility can be undertaken in accordance with CDB's procedures. The value of the waiver is estimated to be EUR52,477.

9.04 CDB's usual practice is to allow for the allocation of up to a maximum of 30% of the resources provided for in TA for the procurement of goods such as equipment and related items. In this Project the equipment required to be purchased is critical to facilitate data collection and operationalise the flood EWS at Rio Cobre. Thus, it is proposed that 77% of the financing provided by CDB be utilised for equipment procurement to replace and expand the monitoring system at the Rio Cobre.

9.05 The Procurement Plan is shown at Appendix 12. Any revisions to the Procurement Plan would require CDB's prior approval in writing.

10. REPORTING REQUIRMENTS

10.01 WRA will be required to submit to CDB, in form and substance acceptable to CDB, the reports described at Appendix 5.

11. RECOMMENDATION

11.01 It is recommended that CDB make a grant to GOJ of an amount not exceeding the equivalent of two hundred and eighteen thousand, seven hundred and fifty-one euros (EUR218,751) (the Grant), from CDB's SFR to assist GOJ in upgrading the flood EWS for Rio Cobre Watershed (the Project) through the

replacement and expansion of the flood monitoring network, on CDB's standard terms and conditions, and on the following terms and conditions:

(1) **Disbursement:**

Except as CDB may otherwise agree, and subject to paragraph (b) below, payment of the Grant shall be made as follows:

- (a) an amount not exceeding the equivalent of twenty-two thousand, six hundred and fifty-two euros (EUR22,652) of the Grant shall be paid as an advance (the Advance) on account of expenditures in respect of the Grant, following receipt by CDB of:
 - (i) a request in writing from GOJ for such funds; and
 - (ii) evidence acceptable to CDB, that the condition precedent to first disbursement of the Grant set out in sub-paragraph (3) below has been satisfied.
- (b) the balance of the Grant shall be paid periodically, by way of further advances (each, a subsequent advance), on account of expenditure in respect of the Project, following receipt by CDB of an account and documentation satisfactory to CDB with respect to each preceding advance, provided however, that CDB shall not be under any obligation to make:
 - (i) the first such subsequent advance until CDB shall have received an account and documentation satisfactory to CDB, in support of expenditures incurred by GOJ with respect to the Advance;
 - (ii) any subsequent advance until CDB shall have received the requisite number of copies of the reports, in form and substance acceptable to CDB, to be furnished for the time being by WRA and the PC, in accordance with the duties and responsibilities set out at Appendix 5; and
 - (iii) payments exceeding one hundred and ninety-six thousand, eight hundred and seventy-six euros (EUR196,876), representing ninety percent (90%) of the Grant until CDB shall have received the requisite number of copies of the final report in form and substance acceptable to CDB, required to be furnished by GOJ and the PC in accordance with the duties and responsibilities set out at Appendix 5 and a certified statement of the expenditures incurred in respect of, and in connection with, the Project.

(2) **Period of Disbursement:**

The first payment of the Grant shall be made by July 25, 2017, and the Grant shall be fully disbursed by June 29, 2018, or such later dates as CDB may specify in writing.

(3) **Condition Precedent to First Disbursement of the Grant:**

The PC referred to in sub-paragraph (5)(a)(i) below shall have been assigned.

(4) **Procurement:**

- (a) Except as provided in sub-paragraph (b) and (c) below, procurement shall be in accordance with the procedures set out and/or referred to in the Grant Agreement between CDB and GOJ or such other procedures as CDB may from time to time specify in writing. The Procurement Plan approved by CDB is set out at Appendix 12. Any revisions to the Procurement Plan shall require CDB prior approval in writing.
- (b) In order to comply with the requirements of the ACP-EU-CDB NDRM in CARIFORUM Countries Contribution Agreement, country eligibility shall be extended to countries which are eligible for procurement under EU-funded projects, which are not CDB member countries.
- (c) With respect to the procurement of the stream gauging stations and the intensity rainfall gauges equipment required for the Project, country eligibility shall be extended to include USA.

(5) **Other Conditions:**

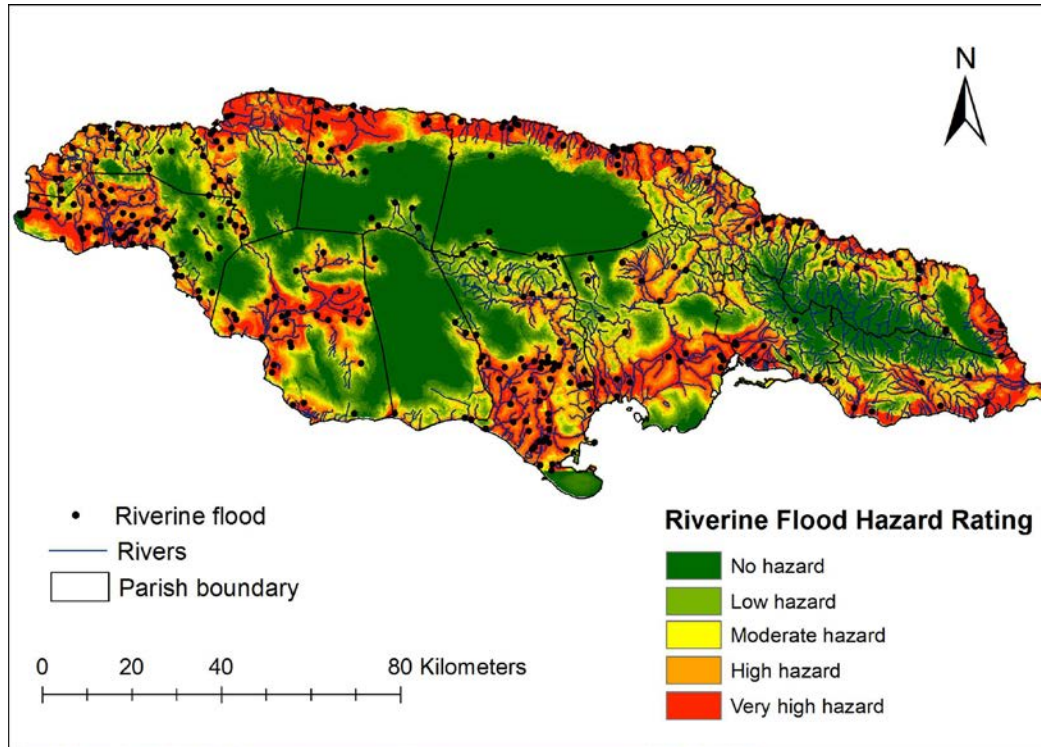
- (a) Except as CDB may otherwise agree, the Grant shall be implemented through the WRA.
- (b) WRA shall assign a senior member of its staff as PC who shall be responsible for coordinating the implementation of the Project, including the carrying out of the functions described in the duties and responsibilities set out at Appendix 5. The qualifications and experience of any person subsequently appointed as PC shall be acceptable to CDB.
- (c) GOJ shall:
 - (i) assign a member of its staff as PC who shall be responsible for coordinating the implementation of the Project, including the carrying out of the functions described in the duties and responsibilities set out at Appendix 5. The qualifications and experience of any person subsequently appointed as PC shall be acceptable to CDB;
 - (ii) in all relevant workshops, publications, correspondence, advertisements and promotions associated with the Grant, openly acknowledge the financial support from the EU in the framework of the ACP-EU-CDB NDRM in CARIFORUM Countries and CDB's contribution to the project, and display the EU, ACP and CDB's logos;
 - (iii) permit CDB to retain copies, and make use, of all digital media, including text, audio, video, and graphics compiled or prepared in carrying out the Project; and
 - (iv) submit to CDB, in form and substance acceptable to CDB, the reports set out in Appendix 5 to this Paper within the periods stipulated therein.

- (d) Except as CDB may otherwise agree, GOJ shall:
 - (i) meet, or cause to be met:
 - (aa) the cost of the items designated for financing by GOJ in the Budget;
 - (bb) any amount by which the cost of the Grant exceeds the estimated costs set out in the Budget; and
 - (cc) the cost of any other items needed for the purpose of, or in connection with, the Grant; and
 - (ii) provide all other inputs required for the punctual and efficient carrying out of the Grant not being financed by CDB.
- (e) CDB shall be entitled to suspend, cancel or require a refund of the Grant, or any part thereof, if there shall have been a failure by the donors, to provide the whole or any part of their contribution, except that GOJ shall not be required to refund any amount of the Grant already expended by GOJ in connection with the Grant and not recoverable by it.

SUPPORTING DOCUMENTATION

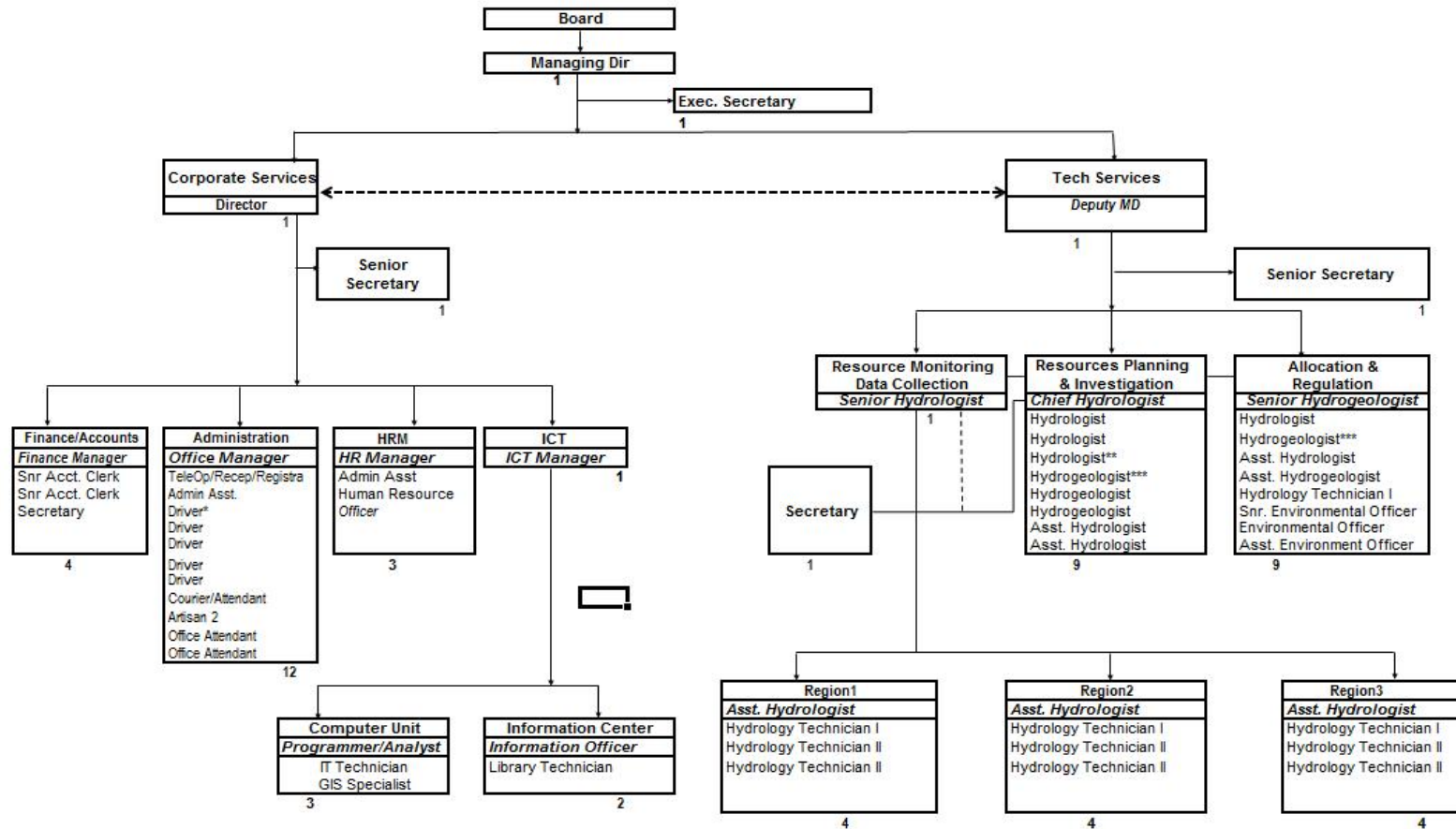
Appendix 1	Maps of Riverine Flood Potential and Parish Boundary in Jamaica
Appendix 2	Organisational Structure of Water Resources Authority of Jamaica
Appendix 3	Flat Bridge over Rio Cobre Connecting Vehicular Traffic between Bog Walk and Angels
Appendix 4	Schematic Diagram of the FEWS for the Rio Cobre Watershed
Appendix 5	Duties and Responsibilities of the Project Coordinator
Appendix 6	Design and Monitoring Framework
Appendix 7	Performance Rating System
Appendix 8	Gender Marker Analysis
Appendix 9	Work Implementation Schedule
Appendix 10	Budget
Appendix 11	EU Eligibility Rules
Appendix 12	Procurement Plan

MAPS OF RIVERINE FLOOD POTENTIAL¹ AND PARISH BOUNDARY INCLUDING RIVERS AND RIVERS AND ROAD NETWORKS IN JAMAICA



¹ Nandi, A., Mandal, A., Wilson, M. and Smith, D., 2016. Flood hazard mapping in Jamaica using principal component analysis and logistic regression. *Environmental Earth Sciences*, 75(6), pp.1-16.

ORGANISATIONAL STRUCTURE WATER RESOURCES AUTHORITY-JAMAICA



*previously Mechanic/HMU Operator

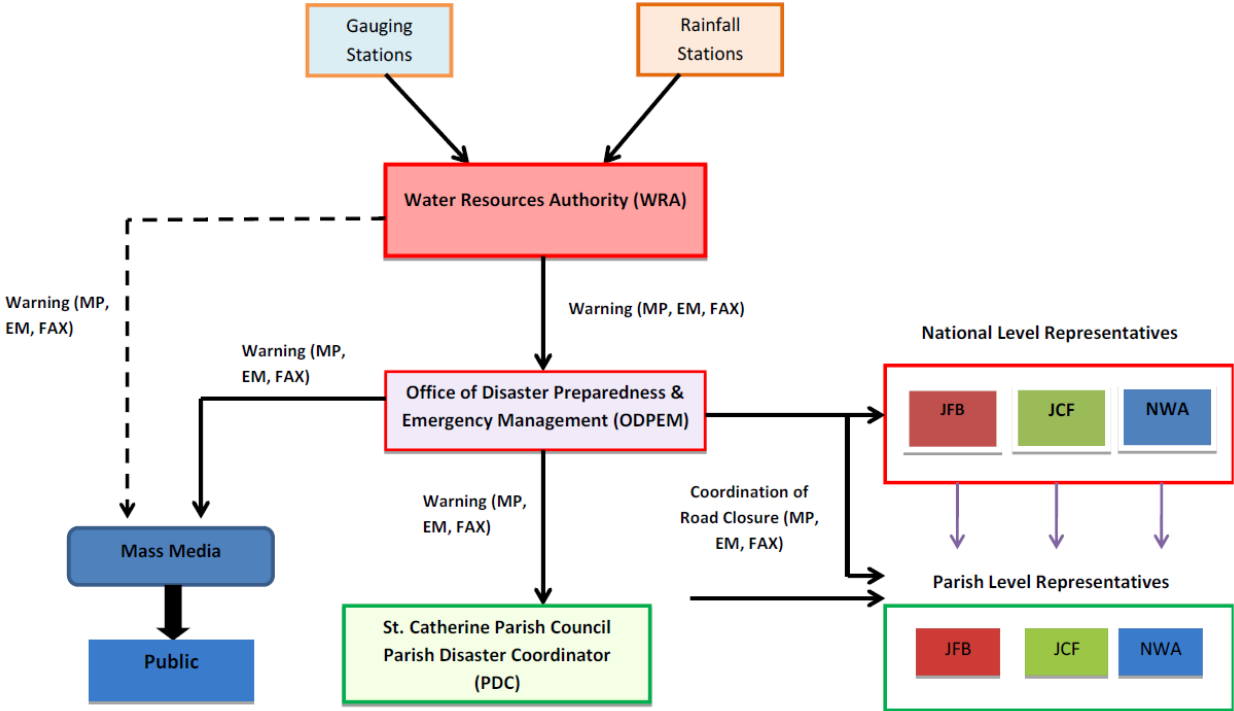
**previously Snr. Asst. Hydrologist
***previously Snr. Asst. Hydrologist

Hydrology Technician I previously Technical Assistant I
Hydrology Technician II previously Technical Assistant II

**FLAT BRIDGE OVER RIO COBRE CONNECTING
VEHICULAR TRAFFIC BETWEEN BOG WALK AND ANGELS**



SCHEMATIC DIAGRAM OF THE FLOOD EARLY WARNING SYSTEM FOR THE RIO COBRE WATERSHED



UPGRADED FLOOD EARLY WARNING SYSTEM FOR RIO COBRE WATERSHED

DUTIES AND RESPONSIBILITIES OF THE PROJECT COORDINATOR

1. The primary responsibility of the Project Coordinator (PC) is to give technical and administrative oversight for the project, coordinate the execution of all project activities to ensure quality of deliverables and that project objectives are achieved.
2. The duties and responsibilities of the PC will also include, but not limited to:
 - (a) preparing project implementation reports and reviewing other technical documents related to the project;
 - (b) managing the procurement of goods and services;
 - (c) updating the Procurement Plan as necessary and at least annually;
 - (d) supervising monitoring equipment installation;
 - (e) leading the comprehensive assessment of historical impacts and data collection, the update of the prediction table and the determination of flood warning threshold;
 - (f) liaising with the Caribbean Development Bank (CDB) Project Management Unit on all technical, administrative and financial aspects of the project;
 - (g) coordinating production of various communication and visibility materials, as required;
 - (h) preparing and submitting progress reports to CDB; and
 - (i) executing any other tasks as assigned by Water Resources Authority to facilitate the successful completion of the project.
3. The PC must have recognised credentials (Bachelor's degree) in Hydrology or related field, and at least five years demonstrated experience in managing hydrological projects including supervising the installation of flood monitoring instrument, data collection and processing. The PC shall also possess: project management certification or demonstrated experience in project management; a good understanding of flood early warning systems; and strong communication skills.
4. The PC will be required to provide the following reports and deliverables to CDB:
 - (a) An Inception Report within two weeks of the signing of the Grant Agreement and a revised implementation schedule, including a detailed plan for the procurement and installation of the flood monitoring equipment, the assessment of flood historical impacts and data collection, the update of flood prediction table and the determination of flood warning threshold; and
 - (b) Monthly progress reports following the Inception Report until the end of the assignment.

DESIGN AND MONITORING FRAMEWORK

DESIGN SUMMARY	PERFORMANCE TARGETS/ INDICATORS	DATA SOURCES/ MEANS OF VERIFICATION	ASSUMPTION
Impact: Increased commuter and resident safety to flood impacts at the Rio Cobre Watershed.			
Outcome: Increased capacity of WRA to provide real-time data for flood early warnings for the Rio Cobre Watershed.	WRA reports reliable flood prediction to ODPEM and key stakeholders to by June 2018.	Project progress and final report.	Residents follow the warnings.
Outputs: Flood EWS for the Rio Cobre watershed upgraded and operational. Coverage density of FEWS monitoring equipment for the Rio Cobre watershed increased.	Flood prediction table updated and threshold for flood warning determined by September 2017. Reliable and real-time data on rainfalls and water level in the Rio Cobre river collected, transmitted to, and processed by WRA by May 2018. Six new rainfall intensity stations and four new stream gauging stations installed in the Rio Cobre watershed by April 2018.	Project progress report.	Equipment procurement and installation takes place as scheduled.
Items/ Activities/Inputs		COST (EUR)	
Equipment and Shipping		52,477	
Back-up Solar Power		115,089	
Fabrication		15,248	
Installation		16,923	
Web Set-up		2,404	
Visibility Actions		5,000	
Miscellaneous (Annual Fee, Equipment Installation and Fabrication)		902	
Assessment Historical Data/Update Flood Prediction Table/Determination Flood Threshold		14,423	
Project Coordinator and Technicians		43,269	
Total Direct Cost		265,735	
Contingency		39,861	
Total Project Cost		305,596	

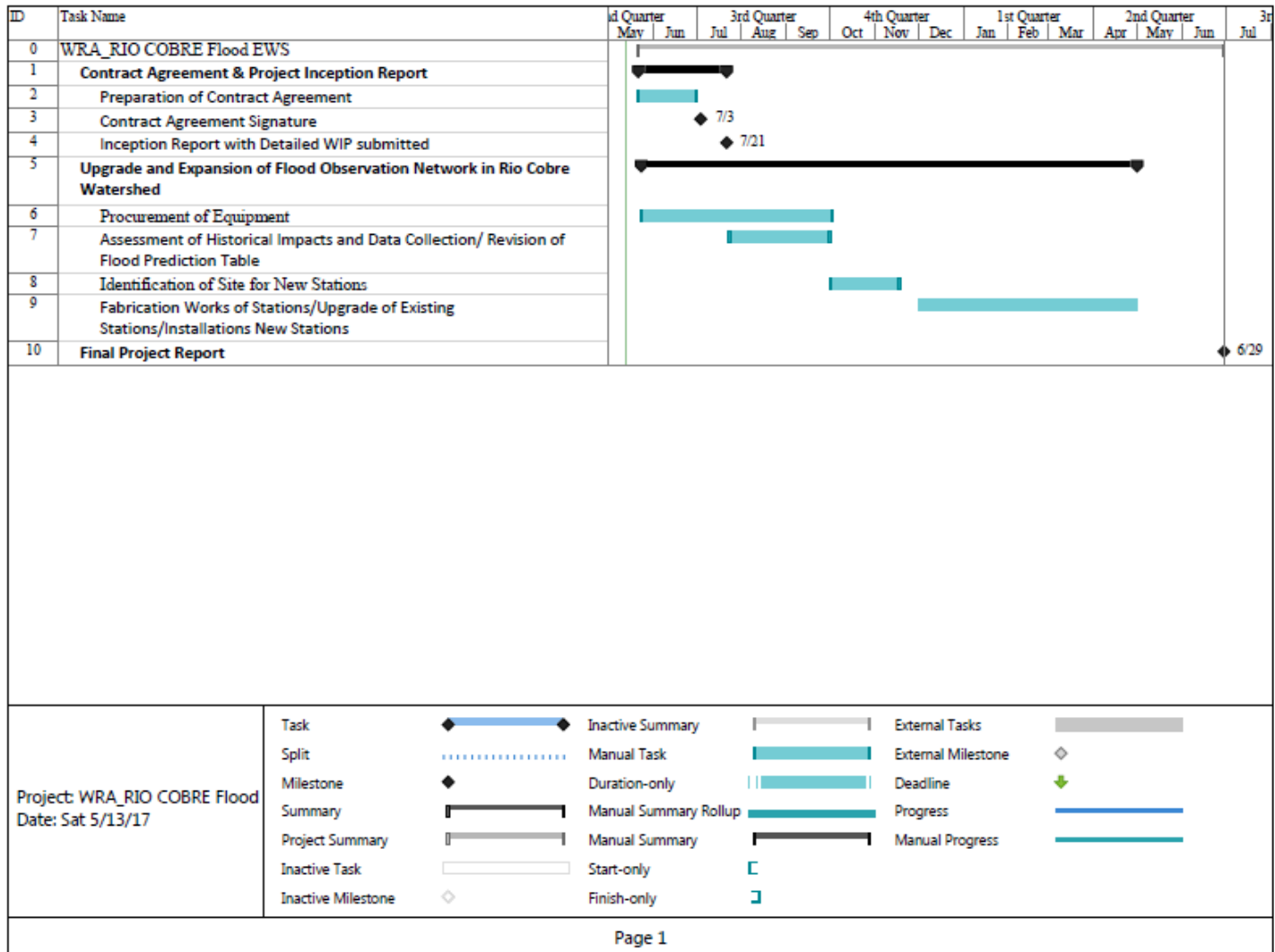
PERFORMANCE RATING SYSTEM

Criteria	Score	Justification
Relevance	4	The proposed TA is consistent with the Regional Comprehensive Disaster Management Strategy and Programming Framework 2014-2024 and the ACP-EU-CDB RA 2: Improved local, national and regional resilience through strengthened early warning, national risk profiling and community-based DRR and CCA. This TA is also consistent with CDB's Corporate Priority of supporting environmental sustainability and DRR; CDB's TA Policy and Operational Strategy; and CDB's Climate Resilience Strategy.
Effectiveness	3	The project will contribute to a more robust flood EWS for the Rio Cobre. The system will provide reliable data for timely decisions to save lives and minimise damage to property in the event of flooding. Therefore, the project is expected to contribute to the achievements of the ACP-EU-CDB RA 2.
Efficiency	4	WRA will provide its expertise to conduct a gap analysis of the existing system, update the flood prediction table and determine flood warning threshold. Thus, the expected cost of this Project is considered reasonable. The activities and deliverables are expected to be achieved within time and budget.
Sustainability	4	WRA has demonstrated its commitment having already assigning staff for preparation and implementation of the project and, the budgeting of sufficient resources to maintain the monitoring stations, receive and process the data. WRA is committed to sustaining data acquisition and delivery to ODPEM and other key stakeholders of the flood EWS at the Rio Cobre.
Overall Score	3.75	Highly Satisfactory

GENDER MARKER ANALYSIS

Project Cycle Stage	Criteria	Score
Analysis: Background	Sex-disaggregated data included in the background analysis, and/or baselines and indicators, or collection of sex-disaggregated data required in TOR.	0
	Socioeconomic analysis considers socioeconomic conditions or traditional role models that lead to disadvantages for males and females in participation in project activities or in the distribution of benefits.	1
Design: Project Proposal/Definition/Objective	TA interventions are designed, or will be identified as part of the project, that address gender disparities or enhance gender capacities.	0
	Project objective/outcome includes the enhancement of gender capacities, gender data collection, gender equality or the design of gender-responsive policies or guidelines	0
Score:		1
Scoring Code		
Gender Specific (GS) or Gender Mainstreamed (GM): 3-4 points Marginally Mainstreamed (MM): if 2 points. NO: if projects score 0-1, if NO give justification why or indicate Not Applicable		

WORK IMPLEMENTATION SCHEDULE



**TECHNICAL ASSISTANCE - UPGRADED FLOOD EARLY WARNING SYSTEM FOR
THE RIO COBRE WATERSHED – JAMAICA**

BUDGET

PROJECT COMPONENT	COST (EUR)
Budget Item	
E-Trackers including GSM Cellular Module	10,524
Battery 12VDC, 17AH Lead-Acid Rechargeable	1,534
Fabrication of Intensity Rain Gauges	2,729
Enclosure NEMA-4X	4,125
Fabrication of Stream Gauging Station	12,519
Installation	16,923
Radar Level Sensor	14,904
Tipping Buckets	7,413
Solar Panels	4,615
Charge Controller JL2	1,534
RLS signal Transfer Cable	720
Data Management Service	2,404
Miscellaneous: Annual Fee and Equipment Installation	902
Miscellaneous such as Wires, Estimated Shipping and Insurance	7,108
Back-Up Solar Power for RCFWS Servers	115,089
Assessment Historical Data/Update Flood Prediction Table/Determination Flood Threshold	14,423
Project Coordinator and Technicians	43,269
Visibility Action	5,000
Sub-Total	265,735
Contingency	39,861
TOTAL	305,596

Equipment Description

DESCRIPTION	COST (EUR)
E-Trackers including GSM Cellular module	10,524
Battery 12VDC, 17AH lead-acid rechargeable	1,534
Enclosure NEMA-4X	4,125
Radar Level Sensor	14,904
Tipping Buckets	7,413
Solar Panels	4,615
Charge Controller JL2	1,534
500 metre - RLS Signal Transfer Cable	720
Back up Solar power for RCFWS servers	115,089
TOTAL	160,458

EUROPEAN UNION ELIGIBILITY RULES
AFRICAN CARIBBEAN PACIFIC – EUROPEAN UNION
NATURAL DISASTER RISK MANAGEMENT

PARTICIPATION IN PROCEDURES FOR THE AWARDING OF
PROCUREMENT CONTRACTS OR GRANT CONTRACTS

1. Participation in procedures for the award of procurement contracts financed under the EU Contribution Agreement for the Implementation for the Action entitled: “Africa Caribbean Pacific – European – Caribbean Development Bank (ACP-EU-CDB) Natural Disaster Risk Management in CARIFORUM Countries” (ACP – EU NDRM Resources)”, is open to international organisations and all natural persons who are nationals of, or legal persons who are established in, an eligible country.

2. Eligible countries¹ are deemed to be:

(a) Caribbean Development Bank member countries:

Anguilla, Antigua and Barbuda, Barbados, Belize, Brazil, British Virgin Islands, Canada, Cayman Islands, China, Columbia, Dominica, Germany, Grenada, Guyana, Haiti, Jamaica, Italy, Mexico, Montserrat, St Kitts and Nevis, Saint Lucia, St Vincent and the Grenadines, Suriname, The Bahamas, Trinidad and Tobago, Turks and Caicos Islands, the United Kingdom and Venezuela.

(b) Members of the “African, Caribbean and Pacific (ACP) Group of States”²:

Africa:

South Africa³, Angola, Benin, Botswana, Burkina Faso, Burundi, Central African Republic, Cameroon, Cape Verde, Chad, Comoros Islands, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Equatorial Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritius, Mauritania, Mozambique, Namibia, Niger, Nigeria, Uganda, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, Sudan, Swaziland, Tanzania, Togo, Zambia and Zimbabwe.

¹ Note some countries may be eligible by virtue of more than one category

² Cotonou Partnership Agreement of 23 June 2000 (as amended by the provisional application of Decision No 1/2000 of the ACP-EC Council of Ministers of 27 July 2000, Decision No 1/2000 of the ACP-EC customs cooperation committee of 18 October 2000, Decision No 1/2001 of the ACP-EC customs cooperation committee of 20 April 2001, Decision No 2/2001 of the ACP-EC customs cooperation committee of 20 April 2001, Decision No 3/2001 of the ACP-EC customs cooperation committee of 10 May 2001, Decision No 4/2001 of the ACP-EC customs cooperation committee of 27 June 2001, Decision No 5/2001 of the ACP-EC customs cooperation committee of 7 December 2001, Decision No 2/2002 of the ACP-EC customs cooperation committee of 28 October 2002, Decision No 1/2003 of the ACP-EC Council of Ministers of 16 May 2003, Council Decision (EC) of 19 December 2002, Decision No 1/2004 of the ACP-EC Council of Ministers of 6 May 2004, Decision No 2/2004 of the ACP - EC customs cooperation committee of 30 June 2004 and Decision No 4/2005 of the ACP-EC customs cooperation committee of 13 April 2005).

³ Natural and legal South African persons are eligible to participate in contracts financed by the 10th/11th EDF. However, the 10th/11th EDF does not finance contracts in South Africa.

Caribbean:

Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago.

Pacific:

Cook Islands, East Timor, Fiji, Kiribati, Marshall Islands, Micronesia, Nauru, Niue, Palau, Papua New Guinea, the Solomon Islands, Western Samoa, Tonga, Tuvalu, Vanuatu.

Overseas Countries and Territories:

Anguilla, Antarctic, Netherlands Antilles, Aruba, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Falkland Islands (Malvinas), French Polynesia, French Southern Territories, Greenland, Mayotte, Montserrat, New Caledonia, Pitcairn, Saint Helena, Saint Pierre and Miquelon, South Georgia and South Sandwich Islands, Turks and Caicos, Wallis and Futuna Islands.

(c) **A Member State of the European Union:**

Austria, Belgium, Bulgaria, Croatia, Czech republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

An official candidate country of the European Union:

The Former Yugoslav Republic of Macedonia, Turkey, Iceland, Montenegro.

A Member State of the European Economic Area: Iceland, Lichtenstein, Norway.

(d) **All natural persons who are nationals of, or legal persons who are established in, a Least Developed Country as defined by the United Nations:**

Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Dem. Rep. Congo, Equatorial Guinea, Eritrea, Ethiopia, Guinea, Guinea-Bissau, Haiti, Kiribati, Lao PDR, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Djibouti, Solomon Islands, Somalia, South Sudan, Sudan, Tanzania, The Gambia, Timor-Leste, Togo, Tuvalu, Uganda, Vanuatu, Yemen, Rep. and Zambia.

(e) **Participation in procedures for the award of procurement contracts or grants financed from the Facility shall be open to all natural persons who are nationals of, or legal persons established in, any country other than those referred to in paragraph 1, where reciprocal access to external assistance has been established. Reciprocal access in the Least Developed Countries as defined by the United Nations (UN) shall be automatically granted to the OECD/DAC members: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Korea, Luxembourg,**

Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

3. Services under a contract financed from the Facility may be provided by experts of any nationality, without prejudice to the qualitative and financial requirements set out in the Bank's procurement rules.
4. Supplies and materials purchased under a contract financed from the Facility must originate in a State that is eligible under paragraph 1. In this context, the definition of the concept of 'originating products' shall be assessed by reference to the Bank's prevailing procurement guidelines/procedures, and supplies originating in the EU shall include supplies originating in the Overseas Countries and Territories.
5. Whenever the Facility finances an operation implemented through an international organisation, participation in procedures for the award of procurement contracts or grants shall be open to all natural and legal persons who are eligible under paragraphs 1, care being taken to ensure equal treatment of all donors. The same rules apply for supplies and materials.
6. Whenever the Facility finances an operation implemented as part of a regional initiative, participation in procedures for the award of procurement contracts or grants shall be open to all natural and legal persons who are eligible under paragraph 1, and to all natural and legal persons from a country participating in the relevant initiative. The same rules apply for supplies and materials.
7. Whenever the Facility finances an operation co-financed with a third entity, participation in procedures for the award of procurement contracts or grants shall be open to all natural and legal persons eligible under paragraph 1, and to all persons eligible under the rules of the third entity. The same rules shall apply to supplies and materials.

Caveat: The Bank and EU eligibility requirements are subject to change by the Bank and the EU. The applicant is responsible for checking whether there have been any updates on the eligibility requirements, as well as the UN's list of Least Developed Countries.

PROCUREMENT PLAN

I. General

1. Project Information:

Country: Jamaica

Grant Recipient: Water Resources Authority (WRA)

Project Name: Upgraded Flood Early Warning System for the Rio Cobre Watershed

Project Executing Agency: WRA

2. Bank's Approval Date of the Procurement Plan: July 20, 2017

3. Period Covered By This Procurement Plan: July 2017–June 2018

II. Goods and Works and Non-Consulting Services

1. Prior Review Threshold: Procurement decision subject to prior review by the Bank as stated in Appendix 2 to the Guidelines for Procurement.

	Procurement Method	Prior Review Threshold (EUR)	Comments
1.	DC Goods/Non-Consulting Services	<input type="text"/>	
2.	Shopping/Non-Consulting Services	<input type="text"/>	

2. Prequalification: N/A

3. Reference to (if any) Project Operational/Procurement Manual: Guidelines for Procurement (2006)

4. Any Other Special Procurement Arrangements: To comply with the requirements of the ACP-EU Finance Agreement the following is required:

(a) Financing shall be provided under ACP-EU-CDB NDRM in CARIFORUM Countries and thus eligibility shall be extended to CARIFORUM member countries and countries which are eligible for procurement under EU-funded projects, which are not CDB member countries, in accordance with the EU Eligibility Rules.

(b) The source and origin of a significant proportion of the equipment to be supplied by SWMS is expected to be USA. Therefore, given this and the aforementioned nationality of SWMS, a waiver of CDB's Guidelines for Procurement (2006) is sought to further extend eligibility for the supplier and the source and origin of the stream gauging stations and the intensity rainfall gauges equipment, beyond that allowed for under (a), as previously approved by CDB's Board of Directors, to additionally include USA for this project. The EU has

confirmed in writing that the required extension of eligibility can be undertaken in accordance with CDB's procedures. The value of the waiver is estimated to be EUR52,477.

5. Procurement Packages with Methods and Time Schedule:

1	2	3	4	5	6	7	8
No.	Contract (Description)	Estimated Cost (EUR)	Procurement Method	Prequal. (Yes/No)	Review by Bank (Prior/Post)	Expected Bid-Opening Date	Comments
	Equipment and Shipping	██████	DC	No	Prior	October 2017	Standardisation of the new equipment with that which is already in place in the wider monitoring network.
	Back up Solar Power	██████	NCB	No	Prior	October 2017	
	Fabrication	██████	Shopping	No	Post	November 2017	Many items to be procured separately.
	Web Set-up	██████	Shopping	No	Post	October 2017	
	Visibility Actions	██████	Shopping	No	Post	September 2017	

III Consulting Services

N/A.

IV. Implementing Agency Procurement Capacity Building Activities with Time Schedule

1. In this section the agreed Capacity Building Activities are listed with time schedule.

No.	Expected Outcome/ Activity Description	Estimated Cost	Estimated Duration	Start Date	Comments
1.	Project launch virtual meeting with CDB and Implementing Agency to increase the capacity of Implementing Agency to follow CDB's procurement procedures	0	2	July 2017	
2	Increased capacity of Implementing Agency to undertake procurement in accordance with CDB's Procurement Procedures through CDB's Online Procurement Training.	0	2	July 2017	

This information is withheld in accordance with one or more of the exceptions to disclosure under the Bank's Information Disclosure Policy.

V. Summary of Proposed Procurement Arrangements

Project Component	ACP-EU-CDB (EUR)									NBF (EUR) Country	Total Cost (EUR)
	Primary	Secondary			Other						
	ICB	NCB	RCB	LIB	Shopping	DC	FA	QCBS	ICS		
Equipment and Shipping											
Back up Solar Power											
Fabrication											
Web Set-up											
Visibility Action											
Sub-Total											
Contingency											
Total											

CQS - Consultant Quality Selection

LIB - Limited International Bidding

DC - Direct Contracting

NCB - National Competitive Bidding

FA - Force Account

NBF - Non-Bank Financed

FBS - Fixed Budget Selection

QCBS - Quality and Cost-Based Selection

ICB - International Competitive Bidding

RCB - Regional Competitive Bidding

ICS - Individual Consultant Selection

This information is withheld in accordance with one or more of the exceptions to disclosure under the Bank's Information Disclosure Policy.