

TERMS OF REFERENCE

INSTALLATION OF AN AUTOMATED EARLY WARNING SYSTEM FOR ANNOTTO BAY

*A Community Disaster Risk Reduction Project funded
through the Building Disaster Resilient Communities Project (ODPEM)*

Background

Jamaica experiences frequent flash flooding, usually with insufficient lead time to effect adequate mitigative response. On average, there is at least one disastrous flood every four (4) years in Jamaica. Between 1800 to 2003, fifty-four (54) major floods have occurred in Jamaica causing 273 fatalities and economic losses totaling over 2 billion US Dollars.

As flooding continues to affect a greater portion of the growing population in Jamaica, communities with persistent flood problems or with risk of great losses when flooding does occur, are continually seeking methods to mitigate flood losses including the loss of lives. Technological advancements have made Flood Early Warning Systems (EWS) more affordable, effective and sustainable. An automated EWS provides even greater opportunity for forecasting floods with greater accuracy and more effective lead time or advance warning. For these reasons EWS is an attractive solution where other engineering solutions may prove to be very expensive. The EWS can also be used to provide reliable data for flood modeling which can be used to guide the type of mitigative actions that can be taken by the community and to inform urban planning and development within the community. Flood warning systems are an attractive solution either because of their low cost of operation and ability to enhance the operation of other flood mitigation methods as when using community operated flood warning systems or because of the provision of reliable data for modeling flooding to guide the type of mitigative actions that should be taken when using automated (real-time) flood warning systems and equipment.

Incorporating a flood warning system into community preparedness activities in Jamaica have strengthened local capabilities in making timely and accurate decisions for the protection of lives and property. The ultimate goal is to protect life and property by achieving and maintaining a high level of community preparedness. This can be achieved, to a large extent, by utilizing community flood warning systems to support local disaster and emergency services, while working in close collaboration with the Office of Disaster Preparedness and Emergency Management (ODPEM).

ODPEM is currently advocating for greater improvement in measuring disaster risk, mitigating related effects, and utilizing technology to support human, corporate and governance functions for preparedness, response and mitigation against disasters and emergencies. To this end, ODPEM is inviting submissions from suitably qualified providers for the installation of an automated flood warning system for the community of Annotto Bay that will support the work of the existing Flood Alert Team while providing real-time data for alert, response and mitigation planning.

The automated early warning system is to provide stream flow and rainfall data that is transmitted in real time and which integrates rainfall data. The system must enable a warning mechanism (i.e. a forecast table and communications for transmitting warnings) for when flooding is likely to occur based on the rainfall or a flood model for areas forecasted as likely to be inundated.

The EWS that is developed must incorporate the features of the flooding particular to Annotto Bay. Flooding in Annotto Bay is caused by two factors – as the town is located below sea-level, when sea-levels rise due to storm surge that can occur during even minor weather events, this causes storm waters to flow upwards in the drainage systems and ‘backs-up’ into the town drains, eventually spilling over and flooding roadways and community infrastructure. This is further compounded by the fact that Annotto Bay has both a major and minor river flowing through the town, and is a part of the natural drainage system for the Osbourne Mountain located south of the town. It must be noted that there are sections of the town that will flood before the river is in spate, due to spillover from the drains cause by rising sea levels and increased surface water levels directly within the town. The areas that are particularly prone to such flooding are sections of Cane Lane and Fort George Road. The problem of flooding in the town is further exacerbated by riverine flooding, which over the last 3-5 years has been traditionally monitored by a stream gauge in the Pencar River. However, the existing EWS infrastructure in Annotto Bay has been compromised resulting in the stream flow no longer being measured by the existing stream and community gauges for the Pencar River. This stream gauge was a significant part of the data collection network that would inform the forecasting of floods likely to impact the community.

The rain gauge that has been installed in the upper watershed of the Pencar River by the Meteorological Office of Jamaica is also to be considered in expanding and improving the existing EWS for Annotto Bay. Data from the rain gauge is to be incorporated in the automated EWS for the town, so that ODPEM and the Project Partners are able to receive and integrate stream and rainfall data in forecast table and flood modelling to be managed by the Water Resource Authority and to provide early warning to the community. It is expected that over a period of time the data gathered will ultimately provide discharge measurements required to develop a rating curve and to facilitate flood modelling. It may also be necessary to transmit storm surge, sea level measurements or water flow in select drains, on a real time basis, to be incorporated in the forecast table and flood models.

Based on the parameters to be considered for monitoring flood levels and providing warning the community, the Annotto Bay Flood Alert Team, in collaboration with ODPEM and the project stakeholders, has identified 4 areas for which community flood gauges are required, based on the frequency, depth, extent, starting point and lead time of the flooding. In addition to the community flood gauges, ODPEM and the project stakeholders also require stream flow data on the Pencar River. The areas for the installation of gauges are currently Cane Lane, Fort George Road and in the Pencar and Crooked Rivers.

Community DRR Project - Upgrading the Existing EWS for Annotto Bay

The Annotto Bay Flood Alert Team (which is a sub-set of the Annotto Bay Health and Environment Association and Community Disaster Management Team) has requested, informed by discussions and assessments conducted by the Water Resources Authority (WRA), the installation of two new community flood gauges, repainting of three existing community flood gauges and the installation of a river gauge in the Pencar River. ODPEM will place priority on measuring water levels of the Pencar River and providing the community with the land-based community flood gauges.

The project has four main components:

1. To provide and install early warning system infrastructure for flooding in the community of Annotto Bay, St. Mary that transmits data on a real time basis, with built in communication and power supply redundancy, and which allows for the integration of rainfall and stream flow data, in phase one of the project.
2. Data collection and calibration of stream flow and rainfall data by ODPEM and the project partners to develop a forecast table and ultimately a rating curve and to facilitate flood modelling for Annotto Bay, St. Mary.
3. Use of communication technology to transmit alerts and updates to the Flood Alert Team, as well as the general community and commuting public for dangers associated with flooding in the community.
4. Training the community in use of the forecast tool and strengthening linkages between relevant agencies/stakeholders and the community for communication of community flood data and alerts.

The collection and calibration of data is to be achieved through arrangements between ODPEM and the project stakeholders, including the Water Resources Authority, Meteorological Office of Jamaica and the St. Mary Parish Council. This includes the development, monitoring and sharing of the forecast table for rainfall and stream flow measurements; flood modelling based on the forecast table and rating curve; communication of alerts and public advisories using traditional methodologies as well as advanced or existing communication technologies (e.g. mobile phones and electronic notice boards).

A consultant is to be engaged to provide and install the early warning system infrastructure, inclusive of the communications infrastructure for the requisite alerts and advisories/updates on a real time basis and redundancies for power supply and communications.

Purpose of the Consultancy

To install automated early warning system infrastructure in the Pencar River, Annotto Bay, St. Mary, with communication capabilities and built-in redundancies for communication and power supply and to provide data on an ongoing basis for flood modelling and early warning to technical agencies and the community.

Consultancy Requirements

The Consultant is required to provide technical and cost proposals for the provision of :

1. Construction and installation of two additional staff gauges in Cane Land and Fort George Road.
2. Repainting two existing staff gauges in Cane Land and Fort George Road.
3. Installation of equipment that can provide real-time data on water levels, temperature and humidity on the Pencar River. The recommended solution must be accessible via the web through standard means of access or using smart phones. The system should also provide real-time alerts to cell phones, computers or any smart device that can facilitate the notification process. These alerts will be provided to the Annotto Bay Community / Flood Alert Team, the ODPEM and its' key partners accordingly to pre-determined parameters that will be defined in the preparation of the systems requirements for the project.
4. Rain gauges in upper watershed must be integrated into EWS such that rainfall data is provided in real time to the Annotto bay flood alert team
5. Evaluate rain gauge requirements in the Pencar River Watershed for the provision of effective EWS and whether or not the existing rain gauge will provide adequate coverage.

Conditions for Implementation

The implementation of the Early Warning System for Annotto Bay is to support both community preparedness and alert and to provide ODPEM (and by extension the WRA) with data on water levels and to, over time, establish trends that will be correlated with rainfall and other data to forecast flood levels and inform mitigation solutions. As such the following conditions are to be met in the design and implementation of the early warning system.

1. The system must be low maintenance and capable of handling the harsh weather conditions expected in Jamaica's climate, which are expected to become more intense and prolonged due to climate change.
2. The rain gauge in the upper watershed must be integrated into the system
3. The system (inclusive of rain and stream gauges) should inform the Flood Alert Team and the wider community of the rain fall intensities and water levels for the appropriate alert and response.
4. The data is to be provided on a real-time basis and must be able to be integrated in other technologies for alert and data-logging purposes.
5. The technologies used must be easily integrated with existing data platforms operated by ODPEM (GIS, internet based).
6. The risk of theft or damage is to be minimized in the design of the system.
7. Should be designed to consume minimum power in the transmission of data.
8. The data provided becomes the property of ODPEM.
9. The service provider is to provide a minimum guarantee of 3 years on the EWS provided.

Duration

The consultancy is a three (3) month consultancy being offered for the period January 1, 2012 to March 30, 2012.

Contract value

(not be included, but FYI - \$1.8 million has been earmarked for this project)

Payment

50% of the contract value will be payable within ten (10) days of the signing the contract and the balance will become due on the acceptance of the system by ODPEM.

Deliverables

The Consultant is expected to:

1. Assess the site and provide the technical specifications for the system within five working days of signing the contract.
2. Establish the workplan for the project at 8:00a.m. of the 8th working day of the signing of the contract.
3. Procure, construct and install the early warning system in accordance with the agreed specifications, and within the resources and timelines outlined in the contract and workplan, as accepted by ODPEM.
4. Facilitate knowledge transfer for ODPEM in the use and management of the system and the relevant data and technological outputs. The community / Flood Alert Team is also to be sensitized on the use (where necessary and agreed upon with ODPEM) and outputs of the system.
5. Inform ODPEM at least two weeks beforehand of the installation date so that video coverage of the installation of the system may be scheduled. The consultant is to make a suitable representative available to participate in the filming of the footage.

ODPEM commits to:

1. Providing documentation on the existing early warning system.
2. Arrange a meeting of the project stakeholders with the Consultant which is to be held within two working days of signing the contract for the Consultant to meet with the project stakeholders to determine the technical specifications of the flood warning system.
3. ODPEM is to provide feedback on the technical specifications within two working days of the Consultants submission of the technical specifications.
4. ODPEM is to provide feedback and indicate acceptance of the workplan within 24 hours of submission by the Consultant.