

**TERMS OF REFERENCE
(TOR)**

**SUPPLY, DELIVERY, INSTALLATION, TESTING, AND COMMISSIONING OF
HYDROMETEOROLOGICAL SENSORS AND HYDROMETEOROLOGICAL
MONITORING AND RISK ANALYSIS SYSTEM**

I. RATIONALE AND BRIEF BACKGROUND

The Republic Act No. 10121 known as the Philippine Disaster Risk Reduction and Management Act of 2010 defines Early Warning System as the set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

A people-centered early warning system necessarily comprises four (4) key elements: knowledge of the risks; monitoring, analysis and forecasting of the hazards; communication or dissemination of alerts and warnings; and local capabilities to respond to the warnings received. The expression "end-to-end warning system" is also used to emphasize that warning systems need to span all steps from hazard detection to community response.

Flooding occurs most commonly from heavy rainfall when natural watercourses lack the capacity to convey excess water. Various climatic and non-climatic processes can result in different types of floods: riverine floods, flash floods, urban floods and other factors. Given that Quezon City is highly susceptible to evolving disaster risks due to multiple hazards, it is therefore a must to continuously improve on this matter and invest on modern technologies that will promote knowledge building, awareness raising, and disaster preparedness not just for the CDRRMO but to the citizens of Quezon City.

By installing hydrometeorological (rain gauge and water level) sensors to monitor and analyze the impact of both rain amount and water level on flood-prone areas at Quezon City, it will enhance the current system which in turn will further capacitate disaster preparedness of the city along with faster decision making.

II. PROJECT DESCRIPTION

The concept of the project is to enhance the capabilities of CDRRMO by increasing the number of hydrometeorological (rain and water level) sensors

installed in the city and combining it with a science-based data driven analysis system to improve decision making and early warning to the public. The additional sensors will be used to monitor both rain amount and street flooding which has a more direct impact on citizens specially on cancellation of school and work.

Since these are critical systems for disaster preparedness, the CDRRMO recommends a system that is already existing and proven working by other Local Government Units in Metro Manila. The CDRRMO is aiming to have a system aligned with SMART CITY models or solutions that are automated, faster to implement, easy to manage, and more cost effective.

III. **PROJECT SCOPE OF WORK**

The CDRRMO plans to install eight (8) hydrometeorological (rain and water level) sensors within the City identified by CDRRMO. The datasets will then be integrated into the existing display and storage system of CDRRMO along with the previously procured sensors.

System Output

- Operational Hydrometeorological Sensors (8)
- Hydrometeorological Monitoring and Risk Analysis System
 - Data Storage and Processing
 - Graphs & Tables
 - Historical data
 - Alerts
 - Integration to existing Flood Risk Analysis System

Technical Specifications

1 Lot	Description	Delivery Time
1 Lot	1. Eight (8) Hydrometeorological Sensors ● Rain Gauge ○ Power supply through solar ○ Plug and play ○ No programming and complex wiring ○ Real-time access to data from any web browser ○ Enables to monitor data 24/7 via web browser or	30 Calendar Days

	- smartphone ○ Alarm capabilities via text/email ○ LCD display for easy field deployment ○ Cloud-based data access option ○ Smart Sensor Connectors: 10 inputs ○ Logging Rate: Configurable for as low as one (1) second ○ Accuracy: 0-250mm/hr: +/- 2% ○ Accuracy: 250-500mm/hr: +/-3% ● Water Level Sensor ○ Cost effective climate monitoring solution ○ Power supply through solar ○ Plug and play ○ No programming and complex wiring ○ Data Logger (Onset) ○ Real-time access to data from any web browser ○ Enables to monitor data 24/7 via web browser or smartphone. ○ Alarm capabilities via text/email ○ LCD display for easy field deployment ○ Cloud-based data access ○ Smart Sensor Connectors: 10 inputs. ○ Logging Rate: Configurable for as low as one (1) second. ○ Optimum Range: 33 ft. (10 m) ○ Case Material: 316 stainless steel or PVC ○ Max Range: 50 ft. (15.2 m) - Resolution ○ Digital: 0.0135 in. (0.3438 mm) ○ Analog steps: 4099 (0-10 VDC), 3279 (4-20 mA) ○ Interface: RS485	
	2. Sensor Service Maintenance, Warranty and Data Subscription	30 Calendar Days

	Quarterly checking of station such as: • Rain Gauge • Water Level Sensor • Data logger • Battery • Solar Charge Controller • Solar Panel • 3-yrs coverage Replacement of devices and accessories such as: • Rain Gauge • Water Level Sensor • Data logger • Battery • Solar Panel • Solar Charge Controller • 3-yrs coverage Data Connectivity Subscription • 3 years coverage	
	3. Hydrometeorological Monitoring and Risk Analysis System Data • Rain Gauge Data • Water Level Data • Flood Risk Index Data Model • Provision of new API endpoint containing all collected and modeled data at https://api.iriseup.ph/endpoint API endpoint system Data Display • GIS, Table, Graph and Threat Matrix display of real-time and historical of both rain and water level sensor data • GIS, Table, Graph and Threat Matrix display of Flood Risk Index Model with at least 12 hours forecast timeline • GIS analysis overlaying data of both rain and water level sensor	30 Calendar Days

	and flood risk index • Menu & Settings to display clustered view, barangay view, per sensor view • Consolidation of existing and new hydrometeorological sensors into one seamless and unified hydrometeorological monitoring and risk analysis system. Report • Report Facility to assign automated email reports per barangay and its recipients • Email (HTML) Format Alerts • Alert Facility to provide flood monitoring and early warning alerts • SMS alerts for individual alerts with at least 500,000 credits • Integrated to existing Telegram alerts for group alerts Integration • Integration to existing flood risk analysis system Software License • Perpetual Software License with 3year technical support and maintenance	
	4. Sensor Installation • Eight (8) Locations • Site Survey • Installation and Calibration • Engineering works	30 Calendar Days
	5. Training • 1 Day Sensor Maintenance Training • 2 Days End User Training • All training will have eight (8) hours	3 calendar days

	per day with five (5) attendees.	
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IV. AREA OF COVERAGE

The sensor installation will cover eight (8) locations within Quezon City and will be identified by the Emergency Operations Center (EOC) during the start of implementation. All identified locations below are still subject to change depending on the decision of CDRRMO.

HYDROMETEOROLOGICAL SENSOR	DISTRICT	BARANGAY
1	1	Bahay Toro
2	1	West Triangle
3	2	Commonwealth
4	3	Pansol
5	4	Valencia
6	5	Nagkaisang Nayon
7	6	Apolonio Samson
8	6	Talipapa

V. PROJECT STANDARDS AND REQUIREMENTS

Bidders should have completed, a single contract that is similar to this Project or related to Supply, Installation and Maintenance of meteorological devices and data processing systems, equivalent to at least fifty percent (50%) of the ABC five (5) years from the date of submission and receipt of bids, a contract similar to the Project.

Bidders should have at least three (3) field staff for the installation and three (3) years on-going support and maintenance of eight (8) sensors. Bidders should have demonstrated experience and capacity to manage community based early warning systems in a highly urbanized city (HUC) in Metro Manila.

Bidders should have at least one (1) Meteorologist and one (1) IT-Data Science resources for Training and continuous consultation within the project as this is a science-based data driven project.

VI. PROJECT DURATION

The delivery period of the Project shall be within **thirty (30) calendar days** after the issuance of the Notice to Proceed.

VII. APPROVED BUDGET FOR THE CONTRACT

The approved budget for the contract amounts to **Twenty-Five million pesos (P25,000,000.00)**.

ITEM	BUDGET (PHP)
1. EIGHT (8) HYDROMETEOROLOGICAL SENSORS	10,400,000
2. SENSOR SERVICE MAINTENANCE, WARRANTY AND DATA SUBSCRIPTION	3,600,000
3. HYDROMETEOROLOGICAL MONITORING AND RISK ANALYSIS SYSTEM	6,100,000
4. SENSOR INSTALLATION	4,800,000
5. TRAINING	100,000
TOTAL	25,000,000

VIII. BASIS OF PAYMENT

Below are the deliverables that will be used as the basis for full payment.

Item	Deliverables	Payment Percentage
Delivery & Installation of Eight (8) Hydrometeorological Sensors set with Data Logger, Solar Panel and Data Connectivity	Project Acceptance Document: Receipt, Inventory, Installation Completion and Maintenance & Warranty Certificate	15%
Delivery of Hydrometeorological Monitoring and Risk Analysis System	Project Acceptance Document: Fully delivered system and documentation	75%
Training	Training Certificate	10%

IX. PENALTIES FOR BREACH OF CONTRACT

Incomplete and delayed delivery will result in penalties based on standard Government implementing rules and regulations.

X. **CANCELLATION FOR OR TERMINATION OF CONTRACT**

Incomplete and delayed delivery and non-performance of services will result in penalties and termination of contract based on standard Government implementing rules and regulations.

Prepared and recommended by:



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