KOREA INTERNATIONAL COOPERATION AGENCY (KOICA)

REQUEST FOR PROJECT AID

1. Project Outline

1.1 Title : **Automation of Flood Early Warning System for Disaster Mitigation in Greater Metro Manila (EWS3)**

1.2 Duration:

Starting Date : June 2014
Completion Date : December 2016

1.3 Total Cost (inclusive of local contribution) : **Php 294,480,044.80** *(USD 6,611,629.00)*

Total Cost (exclusive of local contribution) : **Php 228,480,044.80** *(USD 5,100,001.00)*

(Exchange rate: 1USD = PhP44.80)

1.4 Target Location:

- Pasig-Marikina River Basin
- Tullahan River Basin (Quezon City, Valenzuela, Malabon and Navotas)

1.5 Beneficiaries:

12 Million population of Greater Metro Manila Area (GMMA)

1.6 Objectives:

To provide advance warning of an imminent flood in flood prone communities in Greater Metro Manila

1.7 Activities

- To provide scientific and automated method for gauging the flood in the Pasig-Marikina rivers and its tributaries as well as the allied rivers in Greater Metro Manila and its environs;
- To provide an early warning system to the residents living along the Pasig Marikina River and in allied rivers;
- To establish real-time data monitoring system in concerned government offices and local government units;
- To establish an integrated flood information control system (IFICS) for the PAGASA and the flood information monitoring system for Disaster Risk Reduction (DRR) offices;

- To enhance community response capability through the development of alarm systems as well as public information campaigns, awareness raising, training and learning; and
- To conduct a feasibility study for design and implementation of the project.

1.8 Point of Contact:

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Department of Science and Technology (DOST)

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2. Background

2.1 Current situation

Metro Manila and its environs continue to suffer from recurrent flooding that threatens to affect the lives and livelihood of the communities and its people. These hazards pose serious threat not only to the economic and social development of Metro Manila but for the whole country as well. A major river like the Pasig-Marikina river basin running through the heart of Metro Manila, a highly populated residential, commercial, and industrial area should have an automated early warning system to enable affected residents to evacuate in flood-prone areas of the river basin during periods of flooding.

The Pasig-Marikina River is the main river basin in Eastern Metro-Manila, stretching from Rodriguez, Rizal up to Pasig, passing through San Mateo, Marikina City, and Quezon City. The 40 kilometer river flows in the center of Marikina Valley between the mountain range of Sierra Madre in the east and Quezon City in the west. Its depth ranges from 3 to 21 meters and spans from 70 to 120 meters. It is one of the main tributaries of the Pasig-Marikina-Laguna de Bay Basin with a drainage area of 535 square kilometers. A portion of its flow is controlled and diverted by the Manggahan Floodway to Laguna Lake. The remaining water is drained to Manila Bay through Pasig River.

Marikina River runs in the heartland of Marikina Valley passing through heavily populated residential areas throughout its length and through important commercial and industrial areas at its middle and downstream portions. The river regularly overflows its banks and floods the surrounding basin during periods of heavy rains. **Tropical Storm Ondoy** which passed Metro Manila last 26 September 2009 caused the highest level of Marikina River (on record) resulting in a heavy loss of lives and properties. **TS Ondoy (Ketsana)** dumped 455 millimeters of rain in Metro Manila and its environs in just a span of 9 hours - the highest recorded in 42 years. A month's worth of rainfall in a single day washed

away homes and flooded large areas, stranding thousands on rooftops in the city and elsewhere. There were 464 casualties and damage was estimated to have reached $100 million.

The allied rivers in Metro Manila were also flooded as well as the province of Bulacan. These areas are also affected by repetitive floods. Hence, the establishment of an early warning system in these areas is also considered urgent.

This project is the extension of the early warning system for the mitigation of disaster to the repetitive flood zones of Greater Metro Manila and its environs.

With the expansion of the **NCR-PAGASA Integrated Flood Information Control System (NCR-PIFICS)** to monitor actual situation near the river banks, Greater Metro Manila and vicinity will have the early warning system for mitigation of the disaster that redounds to the mitigation of the damages in human and economic loses.

2.2 Problem or opportunity analysis

Early warning system has been recognized as a cost-effective way to deal with potential disasters which could save lives, reduce economic losses and aid in the process and prospects for sustainable development. The disaster caused by **TS Ondoy (Ketsana)** cost an estimated damage of **PhP10.4 Billion** broken down into: Infrastructure - **PhP3.684 Billion** and Agriculture – **PhP6.766 Billion.** The establishment of an early warning system brought about by these extreme climate events will reduce and mitigate damages. This early warning system can help to identify and lessen if not totally remove hydro-meteorological hazard-related obstacles to sustainable development.

3. Government of partner country's priorities and plans

The proposed project, which is basically an early warning system, is among the most economical non-structural measure of mitigating loss of lives and damage to properties and the environment due to extreme climate events. Early warning system has been recognized as indispensable component in total disaster risk management.

(1) Title of the socio-economic development plan

Medium -Term Philippine Development Plan (MTPIP)

(2) Priority of the proposed project in the development plan

Thrusts No. 5 - Mitigate the occurrence of natural disasters to prevent loss of lives and properties

4. Project (one option) Description

4.1 Goal and Outcomes

Output No. 1: Support from the local government units to operate, manage and maintain the Flood Early Warning and Monitoring Systems (FEWMS) are obtained.

Output No. 2: An Automated Flood Early Warning and Monitoring System is established and operational by the end of project.

4.2 Strategies (Basic direction)

The Philippines ranks third in the list of countries most vulnerable to climate change (2011 Global Risk Index report), next to Vanuatu (1st) and Tonga (2nd) based on a World Bank Index Report (2011). In the past couple of years, the country had experienced record-breaking extreme climate events that results to catastrophic flooding. The magnitude of flooding has been aggravated by anthropogenic activities which include land-use change, infrastructure development, increase in population, among others. As stated by the FAR of IPCC, more extremes are expected which are manifested by either flood, drought or sea level rise. Hence, the enactment of the **Climate Change Act of 2009** (**Republic Act 9729**) and the **Philippine Disaster Risk Reduction and Management Act of 2010** (**Republic Act 10121**) put into focus and priority all activities on disaster risk reduction (DRR) and climate change adaptation (CCA).

The **Climate Change Act** mainstreams climate change into government policy formulations and establishes the framework strategy and program on climate change.

The **DRRM Act** strengthens the Philippine DRR management (DRRM) system by providing for the national DRRM framework and institutionalizing the DRRM Plan and appropriating funds. The core functions in DRR are: 1) disaster mitigation and prevention, 2) disaster preparedness, 3) disaster response and 4) disaster rehabilitation and recovery. The proposed project covers the salient points in disaster preparedness which includes: a) capacity building through training, orientation, drills and exercises, b) establish and operate an end-to-end early warning system, and the c) conduct of IEC/advocacy campaign.

Early warning system is among the climate change adaptation measures identified and promoted by the government to address extreme climate events.

4.3 Activities

4.3.1 Summary

Activities	Input	Output	Outcome
Activity1 **Establish an Automated Flood Early Warning and Monitoring System**	**KOICA:** - Technical Experts; - Procurement, installation of monitoring facilities; - **PAGASA:** - Counterpart funds for VAT, duties & taxes; - Technical staff to ensure ROW of sites; - Supplies and materials;	- No of experts; - Progress reports - No of monitoring equipment installed; - Flood forecasting management center;	An Automated Flood Early Warning and Monitoring Systems (FEWMS) is established and operational
Activity 2 **Operate, manage and maintain the Flood Early Warning and Monitoring Systems (FEWMS)**	KOICA: - Training of PAGASA technical staff in hydrology and O&M; - Workshop and Training of LGUs		PAGASA and LGUs are able to operate, manage and maintain the Automated Flood Early Warning and Monitoring System by the end of project.

4.3.2 Details on activities

a) Observation and Early Warning System
   - Provision of Equipment and Construction of Facilities

Contents	Quantity		Estimated Cost PhP (₱)
	Tullahan	Pasig-Markina	
1. Water Level Station	3	1	7,871,404.80
2. Rainfall Station	5	10	20,097,190.40
3. Warning Post	14	-	25,791,404.80
4. CCTV(PTZ)	7	-	4,982,432.00
5. CCTV Server 1 Unit	1	-	4,186,918.40
6. VHF Relay Station	1	-	10,467,296.00
7. Current meter & Crane	4		502,432.00
8. Control Room(Renovation, Interior and Furnishing)	1		4,186,918.40
9. Transport Fee(KOICA)	1		418,700.80
10. Maintenance car(SUV)	1		2,093,459.20
11. Automatic Recovery Earth Leakage Breaker	-	2	167,462.40
12. Spare Parts	4		1,172,326.40
Total Cost PhP (₱)			**81,937,945.60**

b) Investigation
   - **Data Gathering and Hydrographic Survey**

Contents	Quantity		Estimated Cost PhP (₱)
	Tullahan	Pasig-Markina	
1. River Survey	1		3,140,166.40
2. Discharge Measurement	1	10	23,028,051.20
Total Cost PhP (₱)			**26,168,217.60**

c) Development of the Flood Forecasting and Warning System

Contents	Quantity		Estimated Cost PhP (₱)
	Tullahan	Pasig-Markina	
1. PMC	1		24,702,809.60
2. Basic Design	1		23,865,408.00
3. Invitation Training	2		5,024,320.00
4. Workshop for LGU's (80 People, 5 Days, 3 Times)	3		7,117,779.20
5. PAO (C-5, 15 months)	1		4,186,918.40
6. Project Management	1		5,233,625.60
Total Cost PhP (₱)			**70,130,860.80**

d) Development of Flood Forecasting Model

Contents	Quantity		Total Cost PhP (₱)
	Tullahan	Pasig-Markina	
1. Development and Modification of System	1		20,934,592.00
2. Development of Data Sharing System	1		6,280,377.60
3. Development of CCTV Video Control System	1		4,186,918.40
Total Cost PhP (₱)			**31,401,888.00**

e) Others

➢ Dispatch of Korean Experts, Workshop and Project Management

Contents	Quantity		Estimated Cost PhP (₱)
	Tullahan	Pasig-Markina	
1. Evaluation and Calibration of System	1		6,280,377.60
2. Establishment of Hydraulic Model	1		12,560,755.20
Total Cost PhP (₱)			**18,841,132.80**

f) Mobilization of Personnel by the host country

Priority order	Name of Personnel	Duration of Service	Major Activities
1	Overall Project Leader	2	Oversee the implementation of the project.
1	Assistant Project Leaders	2	Coordinate with concerned agencies the activities for the smooth implementation of the Project.
2	Senior Staff	2	Coordinate the technical aspect of the project.
1	Technical Expert/ Consultant	2	Provide assistance and expertise in the assessment & evaluation of the system.
2	Administrative Support Staff	2	To oversee budget preparation and expenditure.

g) Allocation of counterpart funds by the host country (to cover VAT, duties and taxes and other maintenance and other operating expenses (MOOE))

Priority order	Description	Purpose of Use	Costs PhP(₱)
1	Duties and Taxes	Payment of VAT, duties and taxes of imported equipment and facilities	61,000,000.00
	Project Management (MOOE)	Travel, supplies and materials, Petroleum, oil and Lubricants (POL)	5,000,000.00
ESTIMATED COST PhP (₱)			**66,000,000.00**

5. Timeframe and Budget

5.1 Proposed Schedule

Activities	TIME FRAME											
	1st Year				2nd Year				3rd Year			
	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4	1/4	2/4	3/4	4/4
Dispatch of Korean Experts (Basic Design Team)					*	*	*	*	*	*	*	*
Conduct of planning meetings, site surveys and climatological and hydrological studies					*	*						
Conduct of scoping sessions in the target river basin/focused group discussions					*	*	*					
Formulation of MOA with the stakeholders						*	*					
Installation of Instruments, testing and commissioning						*	*	*	*	*	*	*
Conduct of training of community personnel							*					
Enhance, sustain and institutionalize the flood early warning system								*	*	*	*	*
Preparation of final report, turn over and inauguration	Project Final report shall be prepared in Q9 and Q10 and to be provided to PAGASA, KOICA and relevant institutions in December 2016/2017											

5.2 Budget Estimate (Cost by input components and cost sharing)

Contents		Total (PhP)	1st Year
Foreign Contribution	Observation & Early Warning System - Provision of Equipment and Construction of Facilities	81,937,945.60	81,937,945.60
	Investigation - Hydrographic Survey	26,168,217.60	26,168,217.60
	Development System - Establishment of NCR PAGASA Flood Information Command Control Center Display and Archiving System	31,401,888.00	31,401,888.00
	Flood Forecasting Model - Evaluation and Calibration of System - Establishment of Hydraulic Model	18,841,132.80	18,841,132.80
	Others - Dispatch of Korean Experts (Basic Design Team, PAO) - Workshop, Invitation Training, Project Management	70,130,860.80	70,130,860.80
Local Contribution		**66,000,000.00**	**60,000,000.00**
Total (exclusive of local contribution)		**228,480,044.80**	**228,480,044.80**
Total (inclusive of local contribution)		**294,480,044.80**	**294,480,044.80**

6. Feasibility Analysis

6.1 Analysis on stakeholder

6.1.1 Beneficiaries

- The direct beneficiaries of the project are the 12 million residents of Metro Manila which will be timely and properly warned to take action against an impending natural disaster.

6.1.2 Project Implementing Organization of Partner's country

Name of organization:

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Department of Science and Technology (DOST)

Nature and type of organization: **Service Agency**

Major functions:

a. Maintain a nationwide network pertaining to observation and forecasting of weather and other climatological conditions affecting national safety, welfare and economy;

b. Undertake activities relative to observation, collection, assessment and processing of atmospheric and allied data for the benefit of agriculture, commerce and industry;

c. Engage in studies of geophysical and astronomical phenomena essential to the safety and welfare of the people;

d. Undertake researches on the structure, development and motion of typhoons and formulate measures for their moderation; and

e. Maintain effective linkages with scientific organizations here and abroad, and promote exchange of scientific information and cooperation among personnel engaged in atmospheric, geophysical and astronomical studies.

Annual budget:

Year	Personal Services (PhP)	MOOE (PhP)	Capital Outlay (PhP)	Total (PhP)
2013	355,167	463,367	643,671	1,462,205
2014	352,021	507,579	396,504	1,256,104

Note: MOOE – Maintenance and Other Operating Expenses

Manpower:

As of September 2013, there are 860 warm bodies of the 1034 plantilla positions. From the pool of personnel, there are 11 PhDs and 56 MScc.

Priorities (on-going) and future plan:

The PAGASA-DOST plans to implement the following:

a) Enhance monitoring facilities through the installation of Doppler radars, automatic weather stations and automatic raingauges and water level gauging stations, etc.
b) Establishment of Flood Forecasting and Warning Centers in 13 major river basins and selected principal river basins
c) Enhancement of the 5 PAGASA Regional Service Divisions

d) Derivation of higher resolution climate change projections for 2020 and 2050
e) Improve the understanding and readability of forecasts and warnings
f) Recruitment and training of young technical engineers and support staffs
g) Enhancement of the PAGASA meteorological and hydrological telecommunication system

6.1.3 Other Stakeholders that may involved

There are quite a number of government agencies, non-government organizations (NGOs), private institution and foreign donors working on similar projects. The PAGASA is tasked to integrate all initiatives on early warning systems to ensure the quality of information and maximize the use of such monitoring facilities.

6.2 Economic, Social, Cultural feasibility

- Early warning system save lives and alleviate poverty through the mitigation of the impacts of flood disaster.

- Better visibility and international prestige through the provision of Korean technology/equipment for early warning and disaster mitigation.

6.3 Sustainability and Partner Country Responsiveness

- The Philippines experience a wide range of disasters all year round and the PAGASA as the mandated agency to provide advisories occasioned by tropical cyclones and other weather and water-related disasters is at the forefront, among others.

- The agency has proven its expertise in implementing both local and foreign-assisted projects during the past 30 years.

6.4 Others (gender, environmental issue)

None

7. Project Formulation Schedule

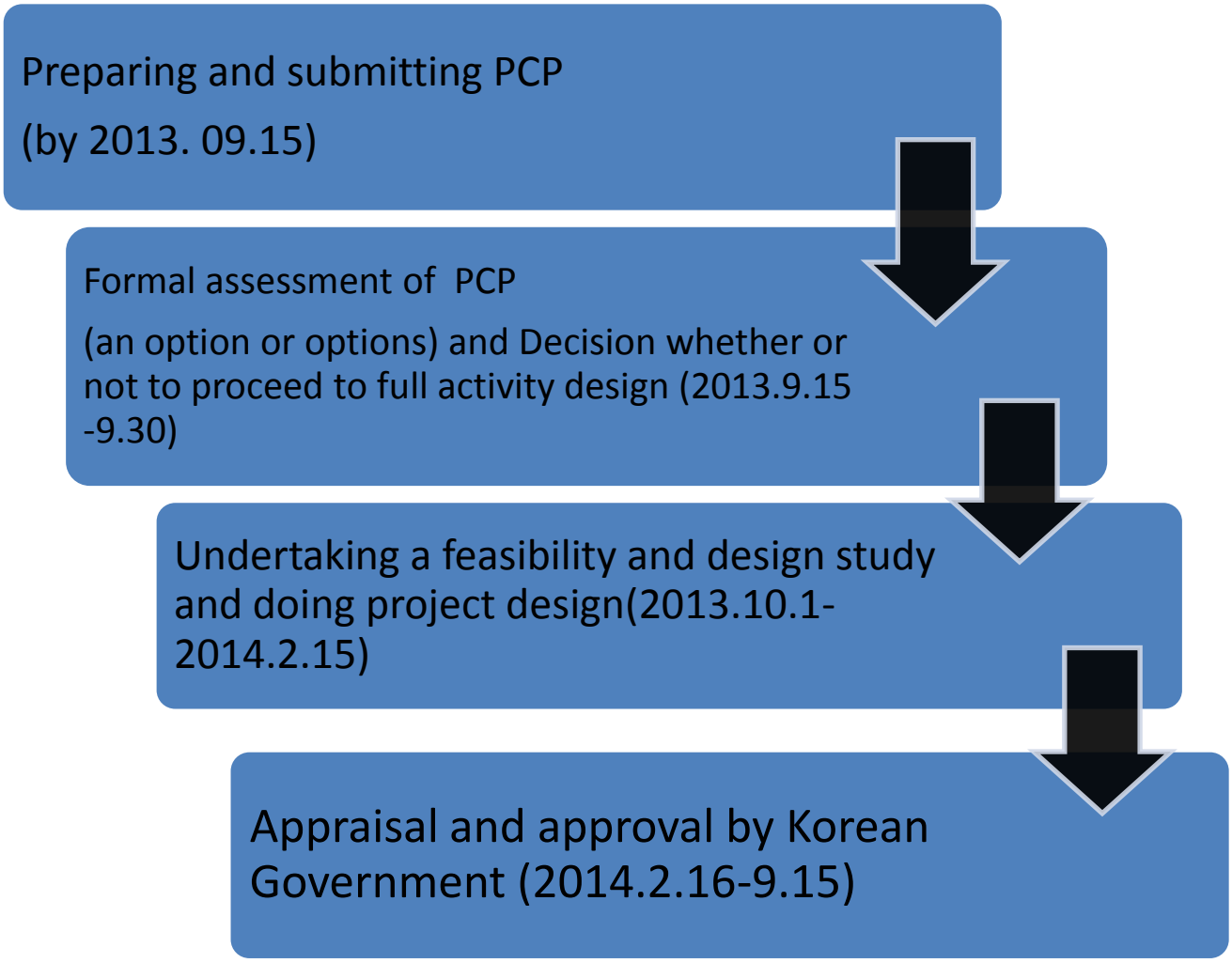

Fig. 1 Location map of Pasig-Marikina, Tullahan and Bulacan river basins

Fig. 2 Proposed Location of Monitoring stations for Flood Early Warning System in the Tullahan River Basin