



DOST Form 2 (for Basic/Applied Research)
DETAILED RESEARCH & DEVELOPMENT PROJECT PROPOSAL

(1) PROJECT PROFILE

Program Title: Grant-in-Aid
 Project Title: Automatic Flood Monitoring System for Boac River
 Project Leader/Sex: Edgardo R. Laririt / Male
 lariritedgardo@gmail.com
 Project Duration (number of months): 36 months / 3 years
 Project Start Date: June 2023
 Project End Date: June 2026
 Implementing Agency: Marinduque State College
 Address/Telephone/Fax/Email: Tanza, Boac, Marinduque
 president@mscmarinduque.edu.ph

(2) COOPERATING AGENCY/IES (Name/s and Address/es)

Marinduque State College – Tanza, Boac, Marinduque
 DOST-MIMAROPA – PSTO Marinduque – Bangbangalon, Boac, Marinduque
 LGU Boac – Isok 1, Boac, Marinduque

(3) SITE(S) OF IMPLEMENTATION

IMPLEMENTATION SITES NO.	COUNTRY	REGION	PROVINCE	DISTRICT	MUNICIPALITY	BARANGAY
1.	Philippines	MIMAROPA	MARINDUQUE		BOAC	Tanza
2.	Philippines	MIMAROPA	MARINDUQUE		BOAC	
3.	Philippines	MIMAROPA	MARINDUQUE		BOAC	

(4) TYPE OF RESEARCH

☐ Basic
☒ Applied

(5) R&D PRIORITY AREA & PROGRAM (based on HNRDA 2017-2022)

☐ Agriculture, Aquatic and Natural Resources
 Commodity: _____
☐ Health
 Priority Topic: _____
☐ Industry, Energy and Emerging Technology
 Sector: _____
☒ Disaster Risk Reduction and Climate Change Adaptation
☐ Basic Research
 Sector: _____

Sustainable Development Goal (SDG) Addressed

Strengthen Social Protection

(6) EXECUTIVE SUMMARY (not to exceed 200 words)

This project aims to install Automatic Flood Monitoring System designed by Marinduque State College and will be infused with Lorawan Technology to avoid the frequent problem on data transmission when using GSM based communication.

The technology will help in reducing vulnerabilities and mitigate the impact and adverse effect of climate change related to hazard. It will also introduce climate-adaptive technologies and intensify and develop livelihood capacity of local communities.

The developed system will be installed along the Boac-River stretch and be used to monitor and evaluate the condition of the Boac river and coordinate with the concerned agencies in the event of adversity.

(7) INTRODUCTION

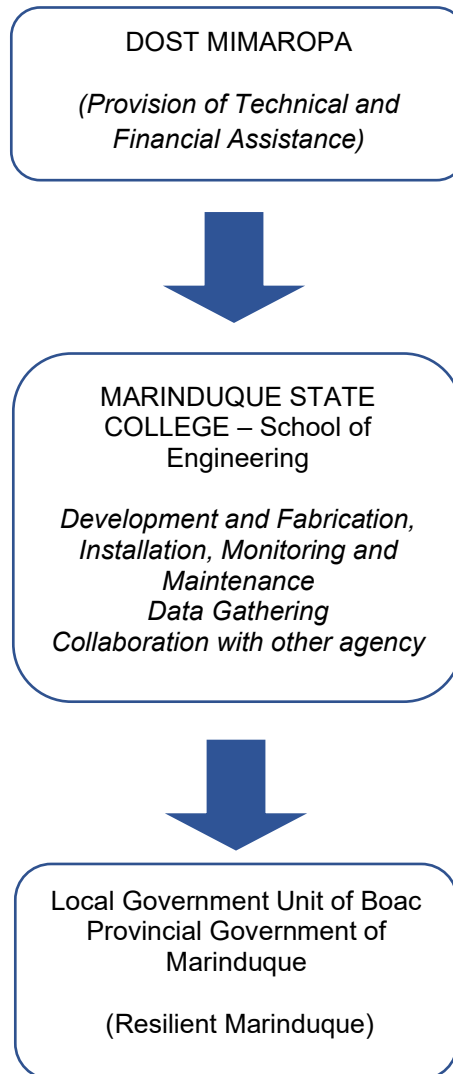
(7.1) RATIONALE/SIGNIFICANCE (not to exceed 300 words)

Flood Monitoring is a highly important adaptive measure wherein the protection to the public is alerted in advance and undertakes immediate responses to minimize the impact of the event. Based on R.A. 10121, Section 12. No. 5 "LDRRMO shall perform the following functions: operate a multi-hazard early warning system linked to disaster risk reduction to provide accurate and timely advice to national or local emergency response organizations and to the public, through diverse mass media, particularly radio, landline communications, and technologies for communication within rural communities." This is particularly important to the residents, for farmers, agricultural workers and other stakeholders who live in the flood prone areas so that concerned agencies can provide appropriate actions before the harmful effects.

Marcopper Tragedy was considered the country's biggest mining disaster. It was more than two decades when this misfortune happened in the province of Marinduque but still, it is a threat to Marinduqueños. The liquid waste materials called mine tailings still find their way into Makulapnit-Boac River causing pollution to the province. The retaining wall of several dams of Marcopper after 20 years gradually weakened and might collapse that millions of cubic meter of liquid and hazardous wastes and other debris might escape through the dam that will surely cause damage along the way. This man-made disaster creates negative impacts to the whole province.

Reduction of vulnerabilities and mitigation of the impact and adverse effect of climate change related to hazard are the intentions of this project. With this risk reduction undertaking, it will also introduce climate-adaptive technologies and intensification of livelihood and capacity development for local communities.

(7.2) SCIENTIFIC BASIS/THEORETICAL FRAMEWORK



(7.3) OBJECTIVES

General: To establish a Disaster Risk Reduction Team and office in Marinduque State College.

Specific:

1. To develop an Automatic Flood Monitoring System that is simple, easy to install, maintain, and troubleshoot.
2. To install the developed system along the Boac-River stretch.
3. To monitor and evaluate the condition of the Boac river and coordinate with the concerned agencies in the event of adversity.

(8) REVIEW OF LITERATURE

- Installation and development of Wireless Sensor Network (WSN) on numerous applications areas such as transportation, logistics, environmental and habitat monitoring, security and surveillance, industrial automation, military, precision agriculture and healthcare, has been reported.
- The Advanced Remote Data- Acquisition Unit (ARQ) is an automated data transmission device that is used to send the measured value in the website [http://fmon.asti.dost.gov.ph/ weather/predict](http://fmon.asti.dost.gov.ph/weather/predict) and is automatically connected to Philippine Atmospheric Geophysical and Astronomical Service Administration (PAGASA). ARQ is the instrument used in Project NOAH that is used to detect the water level.
- Dr. D. Basha of Bonsalove, India design an Early Warning Flood Detection System for developing countries in 2007.
- Dr. C. Yuwat designed a disaster and alert system using WSN to send weather information and disaster alerts by a Zigbee module. This weather information was analyzed using decision tree techniques to announce the alerts.
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- R. Morias implemented a wireless data acquisition network to collect climate data and soil moisture for a smart irrigation system in Portugal to enhance efficiency of irrigation.
- J. Windarto of Semarang, India proposed flood early warning system using SMS and web to record rainfall and water level data and SMS on flood status to attendants and stakeholders.

(9) METHODOLOGY

Marinduque State College-School of Engineering (MSC-SEng) shall lead the project as the technical agency that will handle the development, overall installation and maintenance of the Automatic Flood Monitoring System and coordinate with other concerned agencies for the implementation of the project

As Research and Development part of the proposed project, MSC-SEng will develop a system. Control circuit will be installed by Electrical Engineering (EE) group, electronics and programming will be handled by Electronics and Communication Engineering (ECE), Computer Engineering (ComE) and the EE group including installation of Fame IoT Platform system for water level sensor data transmission and messaging. Mechanical parts such as assembly of poles and other steel works will be assigned to the Mechanical Engineering (ME) group. GIS mapping of flood and other parameters will be handled by the Civil Engineering (CE) group. Installation and testing of the system to the site will be a group effort in partnership with DOST-PSTO Marinduque.

The project was planned to construct along Boac River Stretch to monitor and evaluate the condition of the said river and the danger of abandoned Marcopper Dam that may cause flash flood once the retaining wall collapsed. The areas possibly affected of those hazards are those communities along or near the said river. We stationed 5 monitoring system located on Barangay Hinapuln, Sitio Pinagsangahan, Barangay Tampus and 2 in between the mentioned barangay

which are considered as strategic locations for the project.

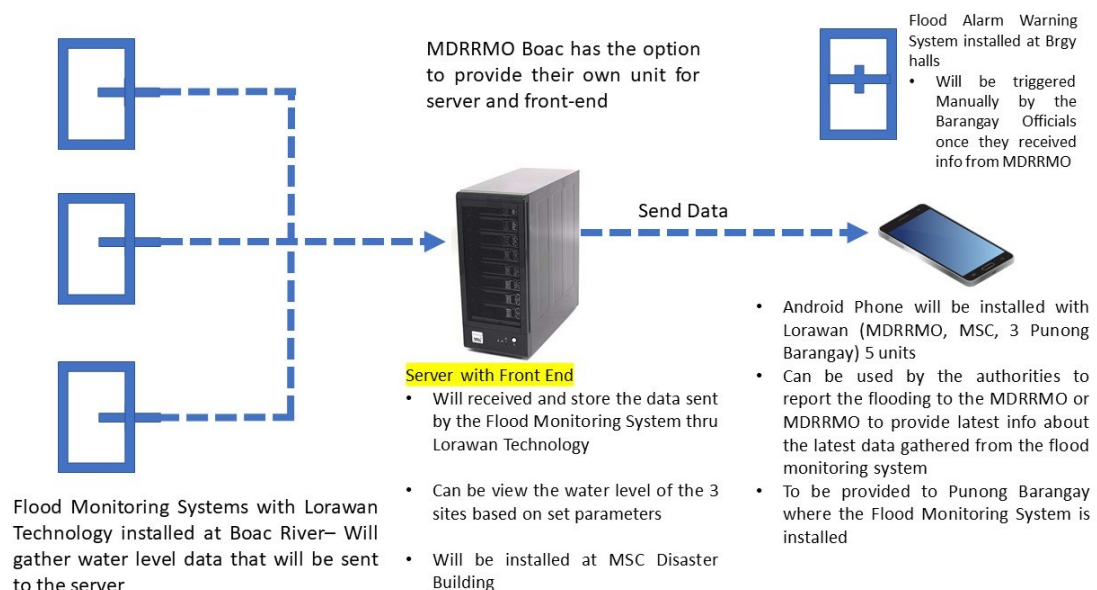
Based on the Marinduque Disaster Risk Reduction and Management Plan (2018), most of the community affected by flood are those barangays located near or along the Boac River and consider as High Flood Susceptible, they are the barangays of Malusak(Pob), Mercado (Pob.), Murallon(Pob.), Isok I (Pob.), Isok II(Pob.), San Miguel (Pob.), Tampus(Pob.), Amoingon, Balagasan, Balaring, Balimbing, Balogo, Bamban, Bangbangalon, Bantay, Binunga Boi, Boton, Buliasnin, Bunganay, Caganhao, Catubugan, Cawit, Daig, Ihatub, Laylay, Lupac, Maiinit, Maligaya, Ogbac, Pili, Poctoy, Poras, Puyog, Santol, Sawi, Tabi, Tabigue, Tagwac, Tambunan and Tanza. The said barangays will also consider as the target beneficiaries of the project.

DOST MIMAROPA will provide technical assistance to Marinduque State College that includes the acquisition of technology for data transmission and messaging needed for the said project.

DOST-PSTO Marinduque together with MSC-SEng will be coordinating with concerned agencies regarding the project and implementation. Focal person from MSC SEng and DRR Officer will be assigned to monitor the system and coordinate with the corresponding agency in time of calamity.

We look forward to adopt these strategies in mitigating the adverse effect of nature by different LGUs, and if the fund permits, there are no hesitations to install it also in the municipality of Mogpog and to those low lying areas around the province.

Schematic Diagram



(10) TECHNOLOGY ROADMAP (if applicable) (use the attached sheet)**(11) EXPECTED OUTPUTS (6Ps)**

Publications	Apply for IPOPHL registration
Patents/IP	Apply for IPOPHL registration
Products	Developed and deployed three (3) units Automatic Flood Monitoring System
People Services	This is particularly important to the residents, for farmers, agricultural workers and other stakeholders who live in the flood prone areas so that concerned agencies can provide appropriate actions before the harmful effects.
Places and Partnerships	1 MOA between DOST-MIMAROPA and Marinduque State College
Policy	N/A

(12) POTENTIAL OUTCOMES

Reduction of vulnerabilities and mitigation of the impact and adverse effect of climate change related to hazard are the intentions of this project. With this risk reduction undertaking, it will also introduce climate-adaptive technologies and intensification of livelihood and capacity development for local communities.

(13) POTENTIAL IMPACTS (2Is)**Social Impact:**

The output of the project may lead other government agencies and SUCs to adopt the project for their provincial and regional offices.

Economic Impact:

The project would benefit the community's economic sustainability considering that the project focuses on flood monitoring which aims to mitigate the impact of disaster.

(14) TARGET BENEFICIARIES

The following barangays under the municipality of Boac listed below are the target beneficiaries of the project.

Malusak(Pob)	Balogo	Cawit	Puyog
Mercado (Pob.)	Bamban	Daig	Santol
Murallon(Pob.)	Bangbangalon	Ihatub	Sawi
Isok I (Pob.)	Bantay	Laylay	Tabi
Isok II(Pob.)	Binunga	Lupac	Tabigue
San Miguel (Pob.)	Boi	Maiinit	Tagwac
Tampus(Pob.)	Boton	Maligaya	Tambunan

Amoingon	Buliasnin	Ogbac	Tanza.
Balagasan	Bunganay	Pili	
Balaring	Caganhao	Poctoy	
Balimbing	Catubugan	Poras	
<p>(15) SUSTAINABILITY PLAN (if applicable)</p> <p>DOST-MIMAROPA will provide technical assistance to Marinduque State College for the development of the Automatic Flood Monitoring System.</p> <p>MSC will procure the supplies and materials needed for the fabrication of the system.</p> <p>MSC-School of Engineering will ensure the proper implementation of the above-mentioned project from manufacturing up to installation to the site following the submitted workplan.</p> <p>PSTO-Marinduque to monitor the progress of the project.</p>			
<p>(16) GENDER AND DEVELOPMENT (GAD) SCORE (refer to the attached GAD checklist)</p> <p>8.48 – Proposed proposal is gender-sensitive (proposal passes the GAD test).</p>			
<p>(17) LIMITATIONS OF THE PROJECT</p> <ul style="list-style-type: none"> ➤ The water level status can be visualized and heard using indicator lamps and sirens. ➤ Great volume of water rushing from the mountain such as flashflood together with debris limits the capability of the system. Increasing the number of larger motor pumps and controls are also recommended to catch-up the huge volume of water. ➤ The system will be installed along Boac river stretch. 			
<p>(18) LIST OF RISKS AND ASSUMPTIONS RISK MANAGEMENT PLAN (List possible risks and assumptions in attaining target outputs or objectives.)</p>			
<p>(19) LITERATURE CITED</p> <p>Zoysa, K.D., Keppitiyagama, C., Seneviratne, G.P., & Shihan, W. W. A. T. (2007). A public transport system based sensor network for road surface condition monitoring,” in NSDR '07: <i>ACM SIGCOMM Workshop on Networked Systems for Developing Regions</i>.</p> <p>Juang, P., Oki, H., Wang, Y., Martonosi, M., Peh, L.S., & Rubenstein, D. (2002). Energy-efficient computing for wildlife tracking: design tradeoffs and early experiences with ZebraNet,” in ASPLOS '02: Proceedings of the 10th International Conference on Architectural Support for Programming Languages and Operating Systems. <i>ACM Press</i>, 96–107.</p> <p>Zhang, P., Sadler, C.M., Lyon, S. A. & Martonosi, M. (2004). Hardware design experiences in ZebraNet,” in SenSys '04: Proceedings of the 2nd International Conference on Embedded Networked Sensor Systems. <i>ACM Press</i>, 227–238.</p> <p>Udo, E. N., & Isong, E. B., (2013) Flood Monitoring and Detection System using Wireless Sensor Network. <i>Asian Journal of Computer and Information Systems</i>,</p>			

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Wemer-Allen, G., Johnson, J., Ruize, M., Less, J. & Welsh, M. (2005) Monitoring Volcanic Eruptions with a Wireless sensor Network. *Proceedings of 2nd European Workshop on Wireless Sensor Network*.

Basha, D., & Rus, D. (2007) Design of Early Warning Flood Detection System for developing countries. *Proceeding of the conference on Information and Communication Technologies and Development, Bonsalove, India*, 1-10.

Wirawam, S., Pratoma, I., & Mita, N. (2008) Design of Low Cost Wireless Sensor Network-Based Environmental Monitoring System for Developing Country. *Proceedings of APCC*, 33-40.

Yuwat, C. & Kilaso, S. (2011) A Wireless Sensor Network for Weather and Disaster Alarm System. *Proceedings of International Conference on Information and Electronics Engineering, IPCSIT*, 6, 1 – 5.

Morias, R., Valente, A., & Serodo, C. (2005) A Wireless Sensor Network for Smart Irrigation and Environmental Monitoring. *EFTA/WCCA Joint Congress on IT in Agriculture*, 845 – 850.

Windarto, J. (2010) Flood Early Warning System Develop at Garang River Semarang Using Information Technology base on SMS and Web. *International Journal of Geomatics and Geosciences*, 1. 1-5.

(20) PERSONNEL REQUIREMENT

Position	Percent Time Devoted to the Project	Responsibilities
Project Leader	60%	To oversee all the components
Civil Engineer	30%	Civil works
Civil Engineer	30%	Civil work / Mapping
Electrical Engineer	30%	Electrical works / documentation
Electrical Engineer	30%	Electrical works / documentation
Electronics Engineer	30%	Electronics and Communication
Electronics Engineer	30%	Electronics and Communication
Mechanical Engineer	30%	Mechanical and Fabrication
Electrician	30%	Mechanical and Fabrication
Computer Engineer	30%	Computer programing

(21) BUDGET BY IMPLEMENTING AGENCY


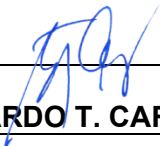
IMPLEMENTING AGENCY	PS	MOOE	EO	Total
Year 1				
Year 2				
Year n				
TOTAL				

(22) OTHER ONGOING PROJECTS BEING HANDLED BY THE PROJECT LEADER: _____
(number)

Title of the Project	Funding Agency	Involvement in the Project

(23) OTHER SUPPORTING DOCUMENTS (Please refer to page 2 for the additional necessary documents.)

I hereby certify the truth of the foregoing and have no pending financial and/or technical obligations from the DOST and its attached Agencies. I further certify that the programs/projects being handled is within the prescribed number as stipulated in the DOST-GIA Guidelines. Any willful omission/false statement shall be a basis of disapproval and cancellation of the project.

	SUBMITTED BY (Project Leader)	ENDORSED BY (Head of the Agency)
Signature		
Printed Name	EDGARDO LARIRIT	BERNARDO T. CARINGAL
Designation/ Title	College DEAN CEIIT	Provincial S&T Director
Date		