



DETAILED RESEARCH & DEVELOPMENT PROJECT PROPOSAL



(To be accomplished by the participants)

(1) Title/Leader/Gender/Agency/Address/Telephone/Fax/Email	
Program Title:	River Restoration
Project Title:	Alleviating the Quality and Quantity of Life on the Freshwater Ecosystem
Leader/Gender:	Marilyn S. Arcilla, MAN, RN, LPT
Agency/Address:	Institute of Arts and Sciences
Telephone/Fax/Email	N/A
(2) Cooperating Agencies	(3) MCC - Internalization Office
(4) Site of Implementation/Municipality/District/Province/Region	
Tarlac - Pampanga	
(5) Classification	(6) Mode of Implementation
Research: <ul style="list-style-type: none"> <input type="checkbox"/> Biotechnology <input type="checkbox"/> Alternative Energy <input type="checkbox"/> ICT <input checked="" type="checkbox"/> Environment <input type="checkbox"/> Health Products/Pharmaceutical <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Basic Research 	Development: <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Single Agency <input type="checkbox"/> Multi Agency
(7) Sector/Commodity	

**Mabalacat City College
Mabalacat City, Pampanga**

BASIC INFORMATION

- I. Project Title: **River Restoration: Alleviating the Quality and Quantity of Life on Freshwater Ecosystems**
- II. Project Leaders: **Marilyn S. Arcilla, MAN, RN and Representative of Tan Trao University**
IAS - Dean
- Proj. Assistant: **Glen S. Nolasco, MSc.**
Project Staff: **Representative of Tan Trao University: Specialized Fields**
All Instructors under Institute of Arts and Sciences
- BS-Biology
 - AB-History
 - Mathematics and Natural Sciences
 - Language and Literature
 - Physical Education
 - Social Sciences
- III. IMPLEMENTING AGENCY:
- Mabalacat City College and Tan Trao University
Mabalacat City, Pampanga
- IV. FUNDING AGENCY:
- C/O: OVPGROW**
- V. Duration: **5 Year Project**
- VI. TOTAL BUDGET COST: **Unknown**

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(3) Introduction

Nowadays, accessibility of potable water is one of the major problems that the world is encountering. In fact, the available freshwater on the earth has approximately 2.58%, and about 1.97% of this value was confined in glaciers. The remaining freshwater are distributed to different reservoir such as lake, ground water, atmosphere, organisms, and rivers considered as scarce reservoirs having 0.001% (Carpenter *et al.*, 1992). Moreover, This reservoir has major impacts to the community as numerous people are dependant to the services of this river. With this relationship, anthropogenic impacts to rivers have severely elevated which include introduced species, flow alteration, global climate change, and pollution. Hence, conservation and restoration are some of the ways to protect the freshwater ecosystem which can promote sustainability (Aylward *et al.*, 2005; Dodds *et al.*, 2013; Vigerstol *et al.*, 2011; Sandin and Solimini, 2009)

In relation to this, targeted areas of this project are the Abacan and Sacobia-Bamban Rivers. These waterways are part of the eight major river basins originating from Mt. Pinatubo. Along with O'Donnell, Gumain-Porac, Pasig-Potrero, Maloma, Bucao, and Santo Tomas-Marella rivers, the Abacan and Sacobia-Bamban waterways are noted to have radial drainage that end in the east of Pampanga River (Pearson and Eriksen, 1994; Orejas, 2016).

Abacan River is known as one of the largest waterways in Pampanga. It is composed of two headwater tributaries, namely the Sapangbato and Taug (Sapangbayo) Rivers, both of which originated from a mid-slope of Mt. Pinatubo. It has a latitude of 15.1524° (15° 9' 9" north) and longitude of 120.64986° (120° 38' 60" east), with an elevation of 46 metres (151 feet). The river is situated near the localities of Cutud, Dolores, Cauayan, Lupalo, and Sapalibutad (*Abacan River*, n.d.). The river traverses the eastward part of Angeles City, where it slowly moves southeastwards in the alluvial plain area. It is continuously channeled southernly until it reaches the town of Mexico, then into Pampanga River (Pearson and Eriksen, 1994).

On the other hand, Sacobia-Bamban traverses the east-northern areas of Mt. Pinatubo. It is situated near the localities of San Pedro, Acirea, La Paz, Culubasa, Lourdes, and Paculcal. The river is specifically located at 15.27367° (15° 16' 25" north) latitude, and 120.58916° (120° 35' 21" east) longitude, with an elevation of 65 metres (213 feet) (*Bamban River*, n.d.). The river is known to have four tributaries namely: Marimla, Sapang Balen, Sapang Cauayan, and Sacobia River. After the eruption of the volcano in 1991, Sacobia River has fused with Bamban River. In the alluvial plains, the Sacobia-Bamban River traverses the town of Concepcion, Tarlac. It splits into smaller waterway systems that drain into the San Antonio Swap in the east. This swamp then empties into to Rio Chico River, which is one of Pampanga River's tributaries (Pearson and Eriksen, 1994).

These rivers are some of the main tributaries of Pinatubo's watershed, in spite of thus, there is still a lack of minimal information in terms of the species diversity, water quality, and physicochemical status of the Abacan and Sacobia-Bamban river. Interestingly, this project will generate substantial information with regards to the inadequate data that would save and restore the river. Hence, the main goal of this project is to alleviate the quality and quantity of life of fauna

and flora on freshwater ecosystems.

(4) Program/Project Title:

River Restoration: Alleviating the Quality and Quantity of Life on Freshwater Ecosystems

(5) Program/project leaders

Project Leaders

Name: Marilyn S. Arcilla, MAN, RN
Field of Specialization: MAN
Designation/Position: Assistant Professor I
Contact Address: MCC, Mabalacat City, Pampaga

Name: _____
Field of Specialization: _____
Designation/Position: _____
Contact Address: Tan Trao University

Percentage Time for Research: 20%

(6) Implementing agency

Mabalacat City College, Mabalacat City, Pampanga and Tan Trao University, Vietnam

(7) Cooperating agency

(8) Significance of the proposal

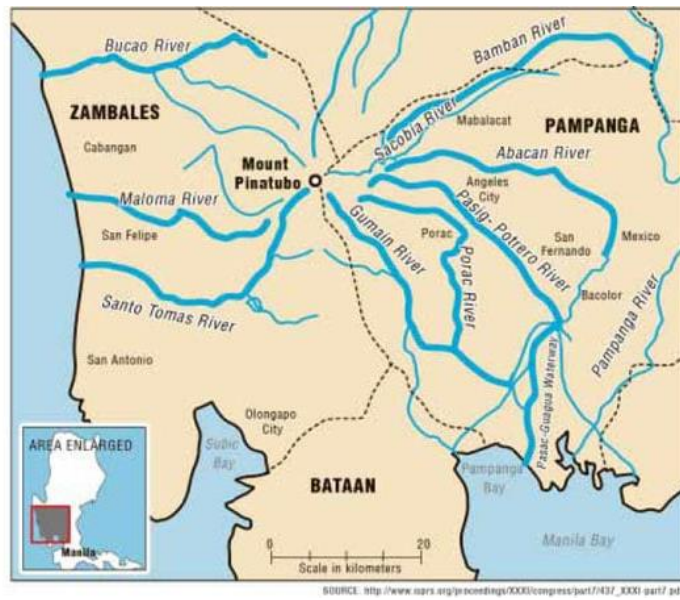
This research proposal targets to address four SDG goals for the restoration, conservation, and promotion of sustainability for all inhabitants of two chosen river systems. Specifically, these are SDG Nos: 2 (Zero Hunger), 6 (Clean Water and Sanitation), 14 (Life Below Water), and 17 (Partnerships for the Goals).

The significance of this study revolves around the assessment and restoration of the Abacan River in Angeles City, Pampanga, and the Bambang River in Bambang, Tarlac. Both waterway systems are vulnerable to the persistent pollution generated by the surrounding residential and business areas. The wasting of the river systems significantly impacts potable water security, the fishery industries, and the local flora and fauna of the several areas through which the rivers traverse.

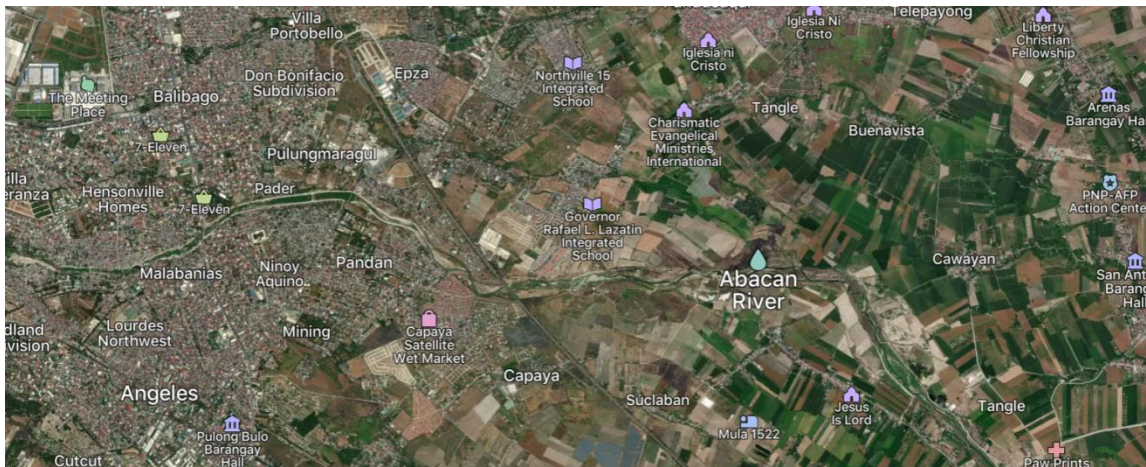
A series of strategies are to be applied for the health assessment and restoration of the rivers. Specifically, the physical, chemical, and biological tests are crucial in identifying the specific problems of the rivers. The data from these assessments will be utilized to formulate the next procedures for addressing the identified issues. The subsequent strategies will then be tested and utilized as interventions for the promotion of sustainability, and for policy-making.

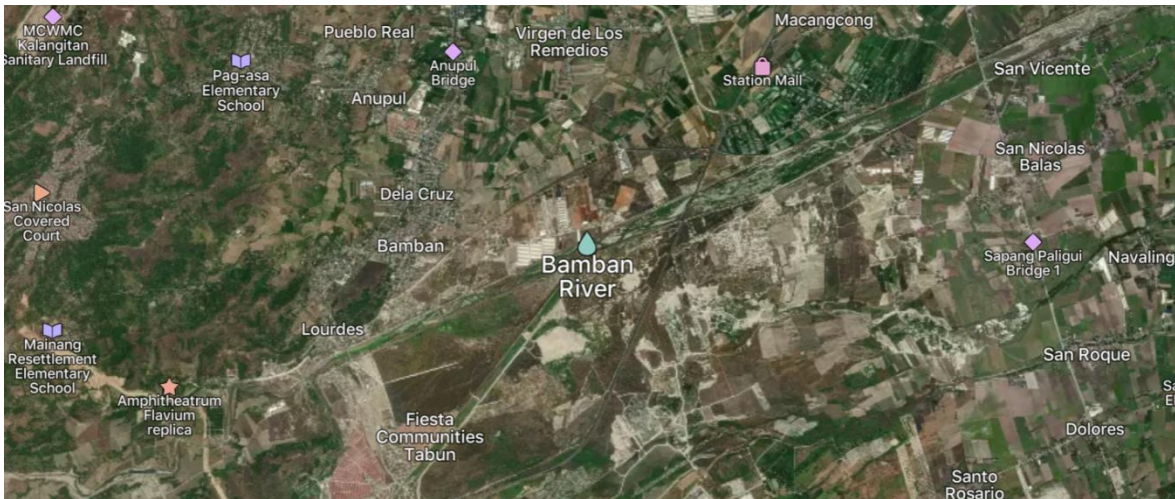


(9) Study Area



The eight major rivers surrounding Mt. Pinatubo (Orejas, 2016)





Abacan River (Mapcarta, n.d.)

Bamban River (Mapcarta, n.d.)

(10) Objectives

This project targets the restoration of Abacan and Bamban River, in terms of the quality and quantity of the flora and fauna.

Specifically this project will meet the following objectives :

1. What are the current status of Abacan River and Bamban River in terms of;
 - A. Physical;
 - B. Chemical; and
 - C. Biological?
2. What are the identified species of flora and fauna in Abacan River and Bamban River?
3. Are there significant differences in the results of assays/tests conducted in the freshwater ecosystems namely;
 - A. Physicochemical parameters;
 - B. Potability;
 - C. Trace of Microplastic; and
 - D. Trace of Heavy metals?
4. What are the intervention strategies to be applied in the Abacan River and Bamban River to alleviate the quality and quantity of the freshwater ecosystems?
 - A. Phytoremediation using Aquatic Macrophytes;
 - B. Application of Activated Carbon generated from Balakat Tree;
 - C. Charcoal briquettes derived from Water Hyacinth;

- D. Installation of Modified filter revetment; and
E. Application of Plant-based flocculants.

5. What are strategic policies to be implemented relative to the betterment of flora and fauna of Abacan and Bamban River?

(11) Expected Output (s): 6 Ps metrics

Publications	<ul style="list-style-type: none"> • At least 1 published journals • At least 1 IEC materials on the river restoration • Fact sheet or Infograph about river restoration
Patents	<ul style="list-style-type: none"> • 1 Patent/Utility model on briquettes or activated carbon derived from balakat tree
Products	<ul style="list-style-type: none"> • 1 non-food product from balakat tree
People Services	<ul style="list-style-type: none"> • at least 1 training to capacitate at least 100 participants • 2 BS Biology/DVM; as thesis participant of the study • Participation of IAS organization
Places and Partnerships	<ul style="list-style-type: none"> • MOU/MOA with SUCs/LUCs, LGUs and allied organizations
Policy	<ul style="list-style-type: none"> • Policy making and policy briefs
Socio-economic importance	<ul style="list-style-type: none"> • Production of safe, effective and cost-effective derived products

(12) End-users/target beneficiaries

The community residents of Bamban, Tarlac and Angeles City, Pampanga concerning restoration of Bamban River and Abacan River will benefit in terms of the quality of water, quality and quantity of freshwater fauna and flora. In addition, renewable resources like plant-based briquettes and activated carbon are also encapsulated in this project to be utilized by the community residents.

(13) Program/project duration

This project will be conducted for a period of 5 years.

(14) Methodology

This section presents the outline of the methodology.

Study Area

The project will be undertaken at the Abacan and Bamban river. All necessary tests will be initiated by CRL Environmental Corporation, Department of Science and Technology and Science

Laboratory of Mabalacat City College.

The Specimens/Samples

The mature leaves of *Z. talanai* (Blanco) Merrill., will be obtained at Xevera, Tabun, Mabalacat City, Pampang. Water samples will be collected from Abacan and Bamban River. All water samples will be kept on their ideal condition prior and during the conduction. All flora and fauna that will be collected on the study areas will be authenticated by the animal and plant experts.

Preliminary Assessment of the Physical, Chemical, and Biological Status

Physical - Watershed mapping will be done in both rivers using the guide of Bell and Cook (2011). The features of the study areas will be describe and illustrated.

Chemical - All the physicochemical parameters will be considered in both rivers, such as temperature, pH level, dissolved oxygen, suspended particles, and salt content.

Biological - All species of flora and fauna will be collected in the study areas. All samples will be kept on ideal condition for authentication.

Potability Tests

All water samples obtained from head stream, middle stream, and down stream of both rivers will be analyzed in terms of total coliform and fecal coliform (CFU/100ml).

In addition, water samples obtained from the rivers will be subjected to heavy metal analysis.

Moreover, water samples from both rivers will be analyzed for the presence of microplastics.

Phytoremediation using Aquatic Macrophytes

Freshwater macrophytes will be propagated in different areas of the rivers following the protocol of Akhtar, Yasar, and Irfan (2017).

Application of Activated Carbon

The procedure on the generation and application of plant-based activated carbon will be adopted from the paper of Dicuangco (2023).

Charcoal Briquettes Derived from Water Hyacinth

The protocol for charcoal briquettes derived from water hyacinth will be adopted from Carnaje, Talagon, Peralta, and Shah (2018); Rezania, Din, Kamaruddin, and Taib (2016). Samples of this plant will be air dry and processed in the laboratory of Tan Trao University. All samples will be stored in the ideal condition prior to calorimeter test.

Calorimetry Test

Equipment that will be utilized in this study will be conducted from Tan Trao University to verify the energy transfer of the samples.

Installation of Alternative Revetment

Installation and creation of modified filter revetment will be guided by the paper of Pilarczyk (2010). Simulation of river and installation of revetment will be conducted in the laboratory of Tan Trao prior to installation of alternative revetment on Abacan and Bamban river.

Application of Bioflocculants

Plant-based flocculants will be administered following the guide of Das, Ojha, and Mandal (2021).

(15) Work plan schedule

Below is the chronological order of each activity to be undertaken throughout the course of the project:

Activities/Conduction	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Inception Meeting and MOA Signing	█																			
Search for sponsorship/funds	█																			
Occular visit of the study area	█																			
Preliminary assessment of the physical, chemical and biological status of the study area		█	█																	
Authentication of the flora and fauna.				█																
<i>In-situ</i> tests of physicochemical parameters						█														
Total and fecal coliform test							█	█												
Microplastic assessment							█	█												
Assessment of Heavy metals in the water samples								█												
Deployment of aquatic macrophytes in the designated areas of the rivers									█	█	█	█	█	█	█	█	█	█	█	█
Formulation and application of activated carbon in the river system									█	█	█	█	█	█	█	█	█	█	█	█
Procurement and production of water hyacinth briquettes									█	█										
Physical and chemical tests of the briquettes											█	█								
Installation of filter revetment in selected area of the rivers.									█	█	█	█	█	█	█	█	█	█	█	█
Formulation and application of plant-based flocculant									█	█	█	█	█	█	█	█	█	█	█	█

(16) Ethical/biosafety clearance

Ethical/biosafety clearances will be secured from concerned agencies as deemed before the start of any experiment.

(17) Research utilization

Research results will be disseminated to concerned agencies as well as researchers and health workers, academe involved in the similar project, and to policy makers to ensure that the results of the project would be of assistance in solving some environmental problems and in addressing biodiversity conservation, sustainability of water and clean energy. Information dissemination can also be done through presentation of the results in fora and publications of outputs. The results of the study will be incorporated and organized in a sourcebook for publication when additional funding assistance will be granted as next phase of the study.

(18) Estimated budgetary requirements

Please see attached sheet

Line Item Budget (LIB)

Estimated budgetary requirements		
Funding Requirement		
Particulars	Source of Fund (PhP)	
	(Unknown)	MCC
I. Honoraria		
Project Leader		
Project Staff		
Laboratory Aide		
Sub-Total		
II. Maintenance and Other Operating Expenses		
Supplies and Materials (Office and Lab supplies)		
Travelling, Transportation/Gasoline Expenses		
Representation/Training Expenses		
Communication Expenses		
Printing and binding expenses for draft book and report		
Other Professional Expenses & Services (Statistician, Consult Methodologist, Photography services, Taxonomist, etc.		
Rental expenses (Lab services)		
Sub-Total		
PS + MOOE		
III. Administrative Cost (7.5%PS + MOOE)		
TOTAL		

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