

ALLEVIATING THE QUALITY AND QUANTITY OF LIFE ON THE FRESHWATER ECOSYSTEM

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Abstract

This research proposal revolves around the assessment and restoration of Sapang Balen, Mabalacat City, Pampanga with the implications targeted on SDG Nos: 2 (Zero Hunger), 6 (Clean Water and Sanitation), 14 (Life Below Water), and 17 (Partnerships for the Goals). This local water system of Mabalacat City is vulnerable to the persistent pollution generated by the surrounding residential and business areas. 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.

Keywords: Sapang Balen, Sustainable Development Goals (SDGs), restoration

1. 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 dependent 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 is the *Sapang Balen* of Mabalacat City, Pampanga. Also known as the Mabalacat River, it flows through multiple barangays in Mabalacat City, Pampanga, including. It is situated between the Sacobia River and Quitangil River, covering around 485.20 hectares of the city's land area. This river is a part of the Pampanga River Basin which is one of the eight major river basins originating from Mt. Pinatubo (Pearson and Eriksen, 1994; Orejas, 2016).

According to the 2018 report by the DOTr as cited by Nuguid (2021), the water quality assessment for Sapang Balen revealed out of sixteen parameters there were five that did not meet the specified guidelines of DENR Class C guidelines for Fresh Surface Waters. These include temperature at 31.70°C, biochemical oxygen demand at BOD, 10 mg/L, fecal coliform levels at 350 MPN/100 ml, total coliform levels at 920 MPN/100 ml, phosphate-phosphorus at PO4-P, 0.516 mg/L, and copper (Cu, 0.0343 mg/L).

Being one of the significant waterways of Mabalacat city, it is important that continuous assessment and interventions be performed to address the challenges of Sapang Balen, including the minimal information in terms of the species diversity, water quality, and physicochemical status. 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.

2. Materials and Method

Study Area

The project will be conducted in Sapang Balen, Mabalacat City, Pampanga. The stream traverses the Clark Area, and the barangays of Poblacion, Sta. Ines, and Mamatitang. 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

Water samples will be collected from different stations of *Sapang Balen* in Mabalacat City. All water samples will be kept on their ideal condition prior and during the conduction. All flora and fauna will also be collected on the study areas will be authenticated by the animal and plant experts.

Preliminary Assessment of the Physical, Chemical, and Biological Status

The following are the preliminary assessments to be conducted on collected water samples.

- **Physical-** Watershed mapping will be done in the waterway using the guide of Bell and Cook (2011). The features of the study areas will be described 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 and preserved based on the protocols of the National Museum and University of the Philippines Los Banos and maintained in ideal condition for authentication.

Potability Tests

All water samples obtained from head stream, middle stream, and downstream of *Sapang Balen* will be analyzed in terms of total coliform and fecal coliform (CFU/100ml). In addition, water samples obtained 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 Dicuango (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 *Sapang Balen*.

Application of Bio flocculants

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

3. Results and Discussion (On-going Phase 1)

Last June 26, 2023 the IAS faculty has conducted the pre-launching program for the restoration. Sample collection for the flora, fauna, and water was conducted. Biological specimens were preserved according to protocols, and water samples were sent for testing in the CRL Environmental Corporation, Department of Science and Technology.

4. Conclusion

Overall, this proposal revolves around the alleviation of water quality in *Sapang Balen*, Mabalacat City, Pampanga. Specifically, the conduction involves the preliminary assessment of the physical, chemical and biological status of the study area, authentication of the flora and fauna, *in-situ* tests of physicochemical parameter, total and fecal coliform test, microplastic and heavy metal assessment. The study also aims the eventual 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, and the formulation and application of plant-based flocculant.

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