Benguet State University
College of Arts and Sciences
Extension Unit

CAS RESEARCH AND EXTENSION PROPOSAL

TITLE: THE BALILI RIVER SYSTEM: BIOLOGICAL , CHEMICAL , MATHEMATICAL AND SOCIAL DIMENSIONS FOR ITS REHABILITATION

PROPONENT: College of Arts and Sciences

PROGRAM LEADER: **Dr. Aurea Marie M. Sandoval**
Dean, College of Arts and Sciences

PROJECT LEADERS:

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Names and Designation of Faculty/ Researcher Cooperating/ Collaborative Member:

Research Project/Study Title	Project/Study Leader	Research Members
Project 1: Baseline Data on the Bio-Physical and Biodiversity Status of the Balili River System	Dr. Aurea Marie Sandoval	
Study 1: Determination of the Bio-physical Status of the Balili River	Dr. Aurea Marie Sandoval	Prof. Maricel A. Guron Jones Napaldet Joanna Alafag Elizabeth Dom-ogen Dr.Denisa L. Domondon
Project 2: Waste Audit of Solid Wastes found in the Balili River	Dr.Romeo A. Gomez Jr.	Dr.Aurea Marie M. Sandoval Jones Napaldet Joyce Paing
Project 3: Bioremediation as a Means for River Revitalization	Dr. Sherlyn Tipayno	Prof. Maricel Guron Dr. Aurea Marie Sandoval
Project 4: Analysis of Arsenic and Heavy Metals in the Waters from Identified Sites of the Balili River System	Ms.Yvonne D. Bolayo	Elvira Bolinget Petra C. Cadawan Luisita L. Ely Rhea Contada
Project 5: Implementation of National and Local Environmental Laws among Selected Barangays in La Trinidad, Benguet	Dr.Leonardo Samonte	Prof. Stanley Anongos Gigy Banes Ma. Teresa Dolipas

Project 6: Understanding the Lifestyle and Values of Balili River Constituents	Rachele D. de Guzman	
Study 1: Consumer Behavior and Perception of Balili River Constituents on Environmentally Harmful Products	Rachele D. De Guzman	Aurora S. Cuyan Charlie Dagwasi Flordeliza David
Study 2: Waste management disposal practices of the Balili River Constituents.	Charlie Dagwasi	Aurora Cuyan Rachele de Guzman Flordeliza David
Study 3: Women's Role in Household Management and Environmental Care	Flordeliza David	Aurora S. Cuyan Charlie Dagwasi Rachele de Guzman
Project 7: Understanding Balili River Degradation Through An Urbanization Perspective	Geoffrey Amlos	Tecah Sagandoy Gregorio Taag Noel Parinas
Project 8: Mathematical- Based Analyses of the Environmental Degradation in the Balili River	Phil S. Ocampo	
Study 1: Spatial Distribution of the Water Pollutants in the Balili River	Phil S. Ocampo	Monica S. Alimondo Julie A. Buasen Marilyn B. Toledo Keneth Pakipak Danni Loven Fulwani Serano L. Oryan Florence D. Palasi
Study 2: Odds-Ratio Estimate of Socio-economic Activities Contributory to the Water Pollution of the Balili River	Serano L. Oryan	Monica S. Alimondo Julie A. Buasen Marilyn B. Toledo Keneth Pakipak Danni Loven Fulwani Phil S. Ocampo Florence D. Palasi
Project 9: Trend and Behaviour Analyses of Physico-Chemical and Climate Attributes of the Balili River Ecosystem	Bretel B. Dolipas	
Study 1:Trends and Behaviour Analyses of the Physical and Chemical Attributes of the Balili Ecosystem	Jennifer Lyn S. Ramos	Joel V. Lubrica Jovalson T. Abiasen Bretel B. Dolipas
Study 2: Trends and Behaviour Analyses of the Climate Characteristics Along the Balili River	Bretel B. Dolipas	Joel V. Lubrica Jovalson T. Abiasen Jennifer Lyn S. Ramos
Project 10: Statistical-Based Feasibility Study of a Balili Ecopark Project	Salvacion Z. Beligan	
Study 1: Feasibility Study of a Balili Ecopark Project: A Conjoint Analysis	Salvacion Z. Beligan	Marycel T. Sajise Valerie B. Baniwas Precious Magallanes Maria Azucena Lubrica B.Lubrica
Study 2: A Logistics Regression Analysis on the Willingness of Balili Residents to Adopt an Ecopark Project.	Maria Azucena B. Lubrica	Marycel T. Sajise Valerie B. Baniwas Precious Magallanes Salvacion Z. Beligan

System Revitalization Information Education Campaign		Lily Joy C. Kepes Evangeline Rachel D. Leaño

Executive Summary

Introduction

The Balili River System is an important water resource for residents of Baguio City and La Trinidad, Benguet as it serves various domestic, agricultural and economic purposes. With a total length of approximately 9,760 meters, the Balili River actually starts upstream from Baguio City and has been referred to as part of the Sagudin River. It passes through several creeks along Barangays Furgoson, Manuel Roxas and Magsaysay and empties into La Trinidad, all emptying into the Balili River as it is referred to in the La Trinidad part. The river basin encompasses 74 of 128 barangays in Baguio City and 7 of the 13 barangays in La Trinidad.

The Balili River is a highly degraded river. This has been established by studies from the 1990s to 2010 on the physico-chemical and biological properties of the Balili River, and from regular monitoring and data gathering done by the EMB-DENR, CAR and the Baguio City Environment and Parks Management Office (CEPMO). Over the years, degradation has been caused mainly by anthropogenic activities in both Baguio City and La Trinidad.

Efforts to rehabilitate and protect the Balili River start back to the late 1980s. From 1988 to 1999, several groups initiated activities to this end. In August 2010, stakeholders of the Balili River revisited these efforts and received updates on the river's current condition. However, accordingly, efforts have not been concerted and impacts of some past researches in terms of rehabilitation were not very visible. This eventually led to several multi-sectoral workshops, the main output of which is "to rehabilitate and sustain the Balili River System". On July 2011, representatives from various government agencies, academic institutions, non-government organizations, government line agencies, the private sector and the local government of both Baguio City and La Trinidad met, and building on the results of the earlier data gathered and workshops conducted, the BALILI RIVER SYSTEM REHABILITATION COALITION (BRSRC) was born, with its main objective of carrying out several activities for the eventual rehabilitation of the Balili River System, through synchronized and concerted efforts.

Five Key Result Areas (KRAs) have since been developed by the BRSRC, from which revolve its different activities. These KRAs are: KRA 1 – Research and Development, KRA 2 – Governance; KRA 3 – Information and Education Campaign; KRA 4 – Reduced Dumping of Wastes; and KRA 5 – Infrastructure. BRSRC members have been grouped and work on these areas in accordance to their expertise and/or agency mandate.

Benguet State University has been considered as one of the prime movers in the evolution of the Coalition. Through the College of Arts and Sciences, its Eco-waste Management Program and its Research and Extension units, it has coordinated and participated in various activities of the coalition. It has been playing a major role in KRA 1 and KRA 3.

In line with this, together with the academe from Baguio City (University of the Philippines Baguio, University of the Cordilleras, Saint Louis University and Pines City Colleges), the College of Arts and Sciences of Benguet State University is part of spearheading a more encompassing Balili River Research Program conceptualized by the Coalition, the outputs of which would translate to Extension activities, thus, this Research and Extension Proposal which hopes to be one of the college's contribution in rehabilitation efforts.

Significance

The program uses a framework that is patterned from the PSR Model for Sustainable

population, consumption, lifestyle and human activities in the society that puts pressure on the environment. S stands for the state or condition of the environment such as levels of pollution and degradation. The state, however, will in turn affect the well-being of the society. R stands for responses or actions taken by society to ease or prevent negative environmental impacts. It includes regulatory action, research, public opinion, changes in management strategies and the provision of environmental information. These responses are designed to act on the pressures and will in turn have an impact to the human activities and the state of the Balili River.

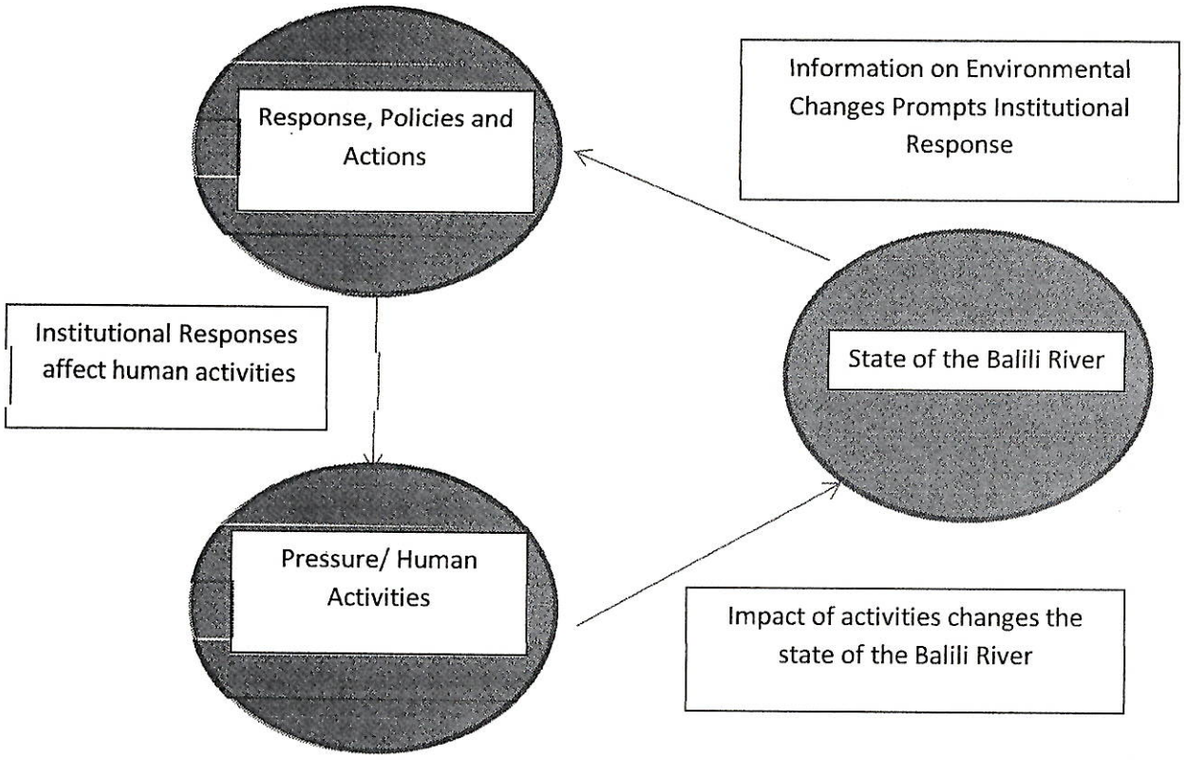

Figure 1.The schematic diagram showing the relationships of the variables of the study. Adopted from the PSR Model for Sustainable Development by Tony Friend and David Rapport

For this program, study components for Pressure include the social dimensions of the Balili River. The biological, chemical, physical and mathematical dimensions will determine the State. The project components of this program will give a holistic picture of the factors that contribute to the state of the Balili River, as well as the effects of these factors, manifested in the present condition of the river. Findings in the project and study components under pressure and state will be used for extension activities (Responses) and these responses will be evaluated in terms of their impact to the Pressure and the State.

Expected Output

The following are expected outputs of the program:

a. The pressure points on the Balili River have been identified; hence, a substantial basis for policy recommendation.
b. The state of the Balili River has been examined; hence, a basis on the extent of intervention needed for its rehabilitation.
c. Findings from the researches of this program will also serve as guide for the feasibility of further projects/ programs of the college, university, barangay, municipality and the BRSRC.

Description of the project components of the program:

Project 1

Title : Baseline Data on the Bio-Physical Status and Biodiversity of Balili River

Researchers: Aurea Marie M. Sandoval (Project Leader)
Maricel A. Guron
Jones Napaldet
Joanna Alafag
Elizabeth Dom-ogen
Denisa L. Domondon

Brief Description of the Study

The suitability of water for aquatic life and for human use depends on its quality. Water quality, on the other hand, is determined by the concentration of biological, chemical and physical contaminants (Schwab, et al, 2008). Similarly, Brooke et al (1998) reported that water quality is measured by physical parameters such as turbidity/presence of sediments, temperature and color; through chemical parameters like dissolved oxygen, pH, biological oxygen demand, and through biological parameters such as planktons, fishes, the number and kind of plants and animals that abound, and microorganisms. Any change in natural water quality beyond the standard implies pollution.

Biodiversity is the foundation of healthy and functioning ecosystems. The complexity of nature and the myriad of species it supports are essential for stable and thriving communities, and leads to the stability of the natural ecosystem. Bio-assessment represents an important scheme to classify water resources and water quality priorities. Pollution though, is one of the threats to the maintenance of biodiversity (Schwab et al, 2008).

It is therefore necessary to obtain baseline data on the physico-chemical and biodiversity status of the Balili River System as an initial step towards rehabilitating, managing and protecting the river from further degradation.

Objectives:

The study aims to assess the water quality of the Balili River Sytem to come up with baseline data. Specifically, the objectives of the study are as follows:

1. To determine the physical characteristics of the Balili River in terms of
   a. Temperature
   b. Total Suspended Solids (TSS)
   c. Depth
   d. Depth and % of light penetration
   e. Turbidity
   f. Substratum

2. To determine the chemical properties of the Balili River such as
   a. pH
   b. dissolved Oxygen (DO)
   c. Biological Oxygen Demand (BOD)

3. To find out the presence of coliforms in the Balili River in terms of
   a. Total coliform
   b. Fecal coliform

4. To identify macroscopic flora and fauna and their
   a. Index of similarity
   b. Population density
   c. Species diversity

5. To correlate the physico-chemical status of the river to its floral and faunal density and diversity

6. To compare the different sampling points/stations according to physico-chemical, floral and faunal characteristics, location and period of collection.

Methodology

A. Establishment of Sampling Stations
Sampling stations will be established along the entire stretch of the Balili River. Each sampling station will have a specific length. The designation of sampling stations will be based on a reconnaissance (walkthrough) which will be undertaken beforehand. Each sampling station will have substations with specific measurements.

B. Collection and Testing of Water Samples
Temperature and pH determination will be done on-site. For the other tests, water samples will be taken directly from each of the stations using the Grab Method. These water samples will be brought to the different laboratories for analysis of Total Suspended Solids, total coliform and fecal coliform, Dissolved Oxygen (DO) and Biological Oxygen Demand. Collection of water samples will be done in the morning at a specific time, and at different designated stations during the months of July/August 2014 (wet season) and February/March2015 (dry season).

C. Determination of Physical Characteristics

1. Temperature
The temperature (^{0}C) of water in the designated sampling stations will be obtained by dripping the mercury fluid thermometer just below the water surface. Air temperature will likewise be taken by suspending the thermometer in the air above the surface of the water for 5 minutes.

2. Total Suspended Solids (TSS)
TSS of the water will be determined by collecting one liter of water samples in each of the substations. There will be 3 trials per substation. The water samples will then be brought to the laboratory. These will be filtered using filter paper and funnel, where the water samples will be poured slowly. Suspended solids will thus be measured through filtration, using the Gravimetric Method. The initial weight of the filter paper will be predetermined. After filtering, the filter papers will be air dried and weighed. The increase in weight will represent the weight of the TSS. TSS will be determined using the equation:

TSS = air dried weight of filter paper with residue – initial weight of the filter paper

3. Velocity of Water
The velocity of water will be obtained using a styrofoam piece floated along a 100 meter length along the river. Rate of flow of water will be determined by timing the styrofoam piece as it flows until it reaches the end of the 100 meter length.

4. Depth of Water
This will be done by measuring the distance from the water surface down to the substratum using a meter stick. The mean depth will be obtained.

5. Depth of Light Penetration and % of Light Penetration

The depth of light penetration will be obtained using a 20 cm white circular plate (Secchi disk). This will be lowered into the water and the depth at which it will disappear will give the extent of visibility/depth of light penetration.

% light penetration will be derived by using the formula:

$$\%\text{light penetration} = \frac{\text{mean light penetration of suspended solids} \times 100}{\text{mean depth of suspended solids}}$$

6. Turbidity
   The water's turbidity will be measured using the Horiba Water Quality Checker. The readings will be recorded in Nephelometric Turbidity Units (NTU). The higher the NTU, the more turbid the water.

7. Substratum
   Substratum will be determined by touch and ocular observation. The substratum is rocky if gravel is present, sandy if gritty and rough, silty if smooth and powdery when rubbed between fingers, and muddy if smooth and sticky.

D. Determination of Chemical Characteristics

1. pH
   The pH of the water will be determined by dripping a pH paper in the water and comparing the resulting color of the ph paper with a pH color chart, or a ph meter can be used.

2. Dissolved Oxygen
   Water samples will be collected early in the morning and will immediately be brought to the laboratory for analysis. The Wrinkler-Azide Method will be used in the analysis of the dissolved oxygen in water.

3. Biological Oxygen Demand
   The D.O. Wrinkler Azide Method or Azide Modification Method will also be employed for the analysis of BOD and this will be done in the laboratory.

E. Determination of Coliforms

Standard bacteriological procedures, particularly the Multiple-tube Fermentation Technique will be adopted in the determination of the presence of coliform bacteria in Balili River water samples. The procedures will consist of the following tests:

a. Presumptive Test
b. Confirmatory Test
c. Completed Test

The results of the examination of the series of test tubes will be expressed in terms of MPN (Most Probable Number). This is an estimate of the amount of microorganisms based on certain probability formulas.

F. Identification of Macroscopic Flora and Fauna

Identification and listing of macroscopic flora and fauna along the sampling stations will be done using the Quadrat Method. A quadrat, 5m x 5m, divided into 20 grids, will be established in each of the sampling stations. Plants that are floating, submerged and found along the river banks will be listed and identified.

Insects belonging to Class Ephemeroptera, Plecoptera andTricoptera (EPT) will be gathered through brush method and consequently identified.

The number of flora and fauna will be estimated by counting the number of organisms contained in the smaller grids of the quadrat. Documentation and field interview will be done to further facilitate

The tabulation and computation of data for floral and faunal assessment will be done using percentage (%), ranking, EPT index, index of similarity (%) and Shannon-Weiner Diversity Index.
For the assessment, analysis and comparison among stations for species diversity, the following indices will be used:

a. Index of Similarity (%); Species Richness and Evenness
b. Shannon-Weiner Diversity Index (H')

Project 2: Title: Waste Audit of Solid Wastes along the Balili River System

Researchers: Romeo a. Gomez Jr. (Project Leader)
Aurea Marie M. Sandoval
Jones Napaldet
Joyce Paing

Brief Description of the Study

A Waste Audit is a formal structural process used to quantify the amount and type of wastes being generated by either an organization or a particular area (www.solidwastedistrict.com). Information from the waste audit could be a very big help in identifying current waste practices and how they can be improved. Waste auditing is likewise important if an area is to have a more efficient and effective organization, have reduced waste management costs and have a better use of limited natural resources.

As part of the rehabilitation initiatives for the Balili River System, it is imperative to determine the possible sources, volume and kinds of wastes being generated.

Objectives

1. To determine the composition and quantity of wastes being generated along the Balili River
2. To find out the effectiveness of the use of existing waste management systems
3. To identify opportunities for improving waste management systems and strategies
4. To collect baseline data for measuring the effectiveness of waste minimization strategies

Methodology

1. Planning
   - determination of the time, number of days, number of staff, number of trained sorters and time to do the sorting of wastes; safety issues
2. Collection of Wastes
3. Sorting of Wastes
4. Analysis of Data
5. Interviews
6. Final clean-up and decontamination

Project 3 : Bioremediation as a Means for River Revitalization

Sherlyn Tipayno (Project leader)
Maricel Guron

Brief description of the study

Bioremediation refers to the use of microbes to clean up contaminated soil and groundwater. It is a process that facilitates the detoxification or removal of contaminants or wastes from an environment through the use of microorganisms (microbial remediation). Plants can likewise b e used as a means of remediation (phytoremediation).

Microbes such as bacteria live naturally in the environment and thus can be used for bioremediation processes. Bioremediation stimulates the growth of certain microbes that use contaminants as a source of food and energy. There are some types of microbes that eat and digest contaminants, usually changing them into small amounts of water and harmless gases like carbon dioxide and ethene. If soil and groundwater do not have enough of the right microbes, they can be added in a process called "bioaugmentation." Amendments range from household items like molasses and vegetable oil, to air and chemicals that produce oxygen.

Contaminants treated using bioremediation include oil and other petroleum products, solvents, and pesticides. Bioremediation is a safer process than the use of chemical agents because of the use of naturally occurring biological organisms as agents which pose no danger to existing populations or ecosystems.

For bioremediation to be effective, the right temperature, nutrients, and food also must be present. Proper conditions allow the right microbes to grow and multiply—and eat more contaminants. If conditions are not right, microbes grow too slowly or die, and contaminants are not cleaned up.

Objectives

1. To determine the microorganism/s that would allow bioremediation of the Balili River
2. To find out the extent of bioremediation the identified microorganisms can do to the pollutants in the river
3. To determine mechanisms by which the identified microorganisms are able to thrive and eat up the pollutants

Project 4 Title : Analysis of Arsenic and heavy metals in the waters from identified sites at the Balili River System

Researchers:

Yvonne D. Bolayo (Project Leader)
Elvira Bolinget
Petra C. Cadawan
Luisita L. Ely
Contada, Rhea

Brief Description of the Study:

In the natural aquatic ecosystem, heavy metals are naturally found in low concentrations. However, anthropogenic activities have significantly increased the levels of these elements and have affected water quality. Exposure to these may pose great risks to human health and aquatic life because of their persistence in the environment and bioaccumulation in food chains.

Objectives:

The study aims to determine the occurrence of Arsenic, Cadmium, Mercury and Lead in the waters of the Balili River System

Specifically to:

1. To identify the collection points in the assigned area
2. To determine the occurrence and concentration of Arsenic, Cadmium, Mercury and Lead in the water samples collected
3. To compare the concentrations of the above elements at different sampling points
4. To identify the heavy metal that has the highest concentration and determine its level of toxicity using the Brine Shrimp Assay
5. To compare concentrations of Arsenic, Cadmium, Mercury and Lead with acceptable / safe levels based on WHO

Methodology:

A. Identification of sampling site
B. Sample collection
   The fraction to be analyzed will be determined which will be the basis whether the sample will be acidified with or without filtration and the type of digestion to be used.
   Sample containers for storage of samples are made of polypropylene or linear polyethylene with polyethylene cap and borosilicate glass containers. These containers should be acid-rinsed.
C. Preparation of water samples for AAS
   Preserving samples after filtration will be immediately done by acidifying with concentrated nitric acid to pH < 2. Acidified samples will be stored in in a refrigerator at approximately 4 ^{0}C. Stability of samples with metal concentrations of several milligrams per liter are stable for up to 6 mos. Except for mercury which is limited to 5 weeks.
   The samples will be digested using the Microwave digester
D. Preparation of Standards
E. Determination of concentration of arsenic and heavy metals using AAS
   The procedure to be used will be based on the Standard Method of Analysis for the examination of water and waste water (2005) and the GBC manual
F. Brine shrimp assay
   Brine shrimp assay method will be performed using the procedure of Saupe (2006).

Review of Related Literature:

In recent years, public concern on the discharge of pollutants through human activities in the aquatic system has increased. Toxic substances such as metal and organic chemicals are released into water system by industrial activities and farming practices(Buell and Girard, (1994). Dumallig (2011) reported that lead content of water samples from Chico River traversing Kalinga and its neighboring provinces was above the threshold lead content for class B rivers. The significant increase in the amount of this heavy metal is a result of improper waste disposal of pesticides, paints, used batteries, hospital wastes, mine tailings and household wastes. Cadawan(2006) revealed that potentially toxic elements such as Lead, Cadmium, Chromium and Arsenic were present in stream sediments of Baguio Mining District.

The Environmental Management Bureau identified the major sources of water pollutants in Balili River such as : solid wastes like plastics and styrofoam , garbage from households, domestic sewage directly discharged , untreated effluents from business establishments such as used oil from motor and machine shops , car wash along the River and from improper containment of excavated materials from construction and widening of the Baguio-La Trinidad-Bontoc Road (http://www.emb.gov.ph/regions/car/pcd/water/balili.htm).

Heavy metals are generally found in the lower right hand corner of the periodic table including toxic metals like lead, cadmium and mercury. As pointed out by Sabo et.al. citing the work of Abowei, and Sikoki (2005), the discharge of metal pollutants into the aquatic environment could damage the quality of the ecosystem which makes it unsuitable for its intended purpose . This is supported by Manahan (1993) when he stated that ions of these toxic metals bind to cell membranes, thus obstructing transport processes through the cell wall. They may also precipitate phosphate biocompounds or increase their rate of decomposition. Arsenic, a metalloid is also considered as significant water pollutant.

Cadmium is used in metal plating is found in water in the +2 oxidation state. Release of this to the water may arise from industrial discharges and mining wastes. Among the effects of acute cadmium poisoning in human are high blood pressure, kidney damage, destruction of testicular tissue and destruction of red blood cells (Manahan, 1993). According to Buell and Girard (1994) cadmium is also used in paints, plastics, nickel- cadmium batteries and as impurity in zinc metal and zinc compounds produced from ores. They also revealed several cases of cadmium poisoning which occurred in the 1950s in Northern Japan where effluents from a zinc mine were discharged into the Zintsu River and has contaminated the water for irrigating rice fields. People developed a skeletal disorder after consuming the rice

Lead, is used as a solder and is a component of many alloys, used in lead-acid storage batteries, ingredient in paints and gasoline, plumbing fixtures. At very low concentration in the blood, it can development and may cause brain damage to young children and in adults, it may cause neurological disorders and pregnancy complication. It can also disrupt metabolic processes (Buell and Girard, 1994).

Mercury as cited by Manahan (1993) is present as pollutant which includes the following sources: discarded laboratory chemicals, batteries, broken thermometers, fungicides, amalgam tooth fillings, pharmaceutical products, plastics and electrical equipment.

Buell and Girard (1994) revealed that In Iraq in 1972, about 500 people died after eating bread made from wheat grain that was treated with methyl mercury fungicide also in 1950 in Japan when a chemical plant released large amounts of mercury compounds in Minimata bay causing neurological symptoms and death to people who consumed the contaminated fish and shellfish.

Arsenic is a gray colored metalloid and its compounds occur in several forms. Compounds of this element are used as wood preservatives, agricultural pesticides, glass and metal processing and bronzing. Exposure to high levels may induce vomiting and diarrhea and blood vessel or cell damage and long term exposure to some arsenic compounds may cause skin and lung cancer(http://apps.sepa.org.uk/spripa/Pages/SubstanceInformation.aspx?pid=99).

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Project 5. TITLE: IMPLEMENTATION OF NATIONAL AND LOCAL ENVIRONMENTAL LAWS AMONG SELECTED BARANGAYS IN LA TRINIDAD, BENGUET

Researchers:

Anongos, Stanley (Project Leader)
Banes, Gigy
Dolipas, Ma. Theresa
Gapasin, Mursha
Kiwang, Ann Heather

Brief Description of the Study:

The Philippine Government has continuously promulgated policies that aim not only to protect but also to manage the state's natural resources. These environmental policies are expected to be adopted by local government units by promulgating ordinances that will guide the local officials and stakeholders in the management of the natural resources in the locality. However, these policies are rarely seen because of problems arising in consonance with its implementation.

The deterioration of the water quality in the Balili River has been caused by a number of obvious factors. This was revealed in a 2012 study conducted by students of University of the Philippines Baguio Professor Vicky Diaz. The study concluded that there is a need for rules and these have to be strictly implemented. It is on this finding that the present study is anchored.

Objectives:

The proposed study will be guided by the following objectives:

1. To identify the existing national and local environmental laws on river management;
2. To assess the awareness of local government officials and stakeholders on existing national and local environmental laws on river management;
3. To identify the mechanisms of the implementation of environmental and local laws on river management;
4. To identify social, economic and political factors that facilitate or hinder the implementation of national and local environmental laws on river management; and
5. To make recommendations for better policy implementation.

Methodology:

A. Interviews using a questionnaire based on the USAID Policy Implementation Assessment Tool will be conducted with local policy implementers and other stakeholders.
B. Incumbent and previous municipal officials will be interviewed. Officials of barangays adjacent to the Balili River will also be included as respondents of the study. These include Barangays Balili, Lubas, Pico, Betag and Buyagan. Other stakeholders in the rehabilitation of the Balili River will also be interviewed. These include the provincial government of Benguet, Benguet State University and nongovernment organizations advocating for the rehabilitation of the river.

Review of Related Literature:

The Preamble of the 1987 Philippine Constitution reflects one of the goals its framers intend to achieve and that is the establishment of a government that shall ensure the conservation and development of the country's patrimony. In this regard, the Philippine Government, through its Bicameral Congress, has continuously promulgated policies that aim not only to protect but also to manage the state's natural resources. These environmental policies are expected to be adopted by local government units by promulgating ordinances that will guide the local officials and stakeholders in the management of the natural resources in the locality. However, although Congress has enacted a number of good environmental policies, the impacts of these policies are rarely seen because of problems arising in consonance with its implementation. These environmental policies are not instigated appropriately and rigorously. Consequently, the Philippines' natural resources suffer from a variety of problems brought about by human activities that are left unchecked by the country's policy

The pollution of the Pasig River, to cite a case, has been a dilemma for the officials of Metro Manila. Metro Manila's industrialization and urbanization converted the River into a "sewage and industrial effluents depot". There have been numerous policies that were promulgated to protect it from the harmful effects of the inflow of people in Metro Manila, but they seem to be ineffective. The pollution of the Balili River in Benguet is not distinct from that of the Pasig River.

In two online news articles about Balili River, Aro (2012, 2013) commented that this biggest river system in Baguio City and La Trinidad was classified as Class A in 1975. However, the quality of the water faded through the years because of pollution, urbanization and human activities. "It used to be a pristine river system with crystal clear waters and was endowed with diverse flora and fauna. People could even swim and drink its water, but its condition has changed a lot from 1950s to present," Aro said in these articles. These statements harmonize with that of University of the Philippines Baguio Chancellor Raymundo Rovillos' assertion, cited in a Sun Star Baguio news article, that the Balili River is now in a bad state, and it would take a lifetime effort to clean up (Catajan, 2012).

The deterioration of the water quality in the Balili River has been caused by a number of obvious factors. This was revealed in a 2012 study conducted by students of University of the Philippines Baguio Professor Vicky Diaz. The Social Science students investigated the waste management of village residents within the river system in Sagudin River in Baguio City and Balili River in La Trinidad. The conclusion of the study affirms the assumption stated earlier that a problem exists in terms of the implementation of environmental policies. The study concluded that there is a need for rules and these have to be strictly implemented. It is on this finding that the present study is anchored.

In January 2013, Secretary Ramon Paje of the Department of Environment and Natural Resources has approved the DENR Order No. 05 pursuant to Republic Act 9275 (Philippine Clean Water Act of 2004). The Department Order specified Balili River as a Water Quality Management Area (WQMA) covering the areas of Baguio City, La Trinidad and Sablan in Benguet.

It is against this background that the researchers deem it essential to assess the implementation of national and local policies on river management in selected barangays in La Trinidad. The persistence of the Balili River pollution problem despite the existence of environmental laws and ordinances presents a need to look into the effectivity of these laws and policies in addressing the concern.

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Project 6: Title: Understanding the Lifestyle and Values of Balili River Constituents

Researchers:

Rachele D. de Guzman (Project Leader)
Aurora S. Cuyan
Charlie Dagwasi
Flordeliza D. David

Brief Description of the Project

The research revolves in the assessment of the lifestyle of Balili residents as reflected in three factors of (1) beliefs and values, (2) consumption patterns of households, businesses and agricultural producers along the Balili River and (3) waste management practices. These factors involve patterns of behavior that are necessary in order to come up with policy recommendations and programs towards building sustainable lifestyle practices of Balili stakeholders.

Objectives:

The study aims to determine the lifestyle of the Balili River Constituents

Specifically it aims:

1. To identify the consumption practices of the people living along the Balili River
2. To identify the waste management practices of the people living along Balili River
3. To determine the held beliefs and values of the residents living along Balili River.

Component Objectives:

Study 1: Consumer Behavior and Perception of Balili River Constituents on Environmentally Harmful Products

Objective: To determine the behavior and perception of Balili River Constituents on environmentally-sensitive products towards responsible purchasing and consumption.

Aurora S. Cuyan
Charlie Dagwasi
Flordeliza D. David
Rachele D. de Guzman (Study Leader)

Study 2: Waste management disposal practices of the Balili River Constituents.

Objective: To identify the waste management practices of the people living along Balili River and to make an output of how to help manage waste disposal.

Aurora S. Cuyan
Charlie Dagwasi (Study Leader)
Flordeliza D. David
Rachele D. de Guzman

Study 3: Women's Role in Household Management and Environmental Care

Objective: To determine the role of women as managers of the household and environmental health care.

Aurora S. Cuyan

Flordeliza D. David (Study Leader)
Rachele D. de Guzman

Methodology:

The main objective of the research is to generate thematic insights using the triangulation method. Triangulation establishes the verity of the researcher's observations. It involves checking what one hears and sees by comparing one's source of information (Fraenkel and Wallen, 2006). The method will be used to analyze and verify or affirm the values and lifestyle experiences of the Balili constituents on the data gathered from Personal Interviews (PI), Direct Observation (DO) and Focus Group Discussion (FGD). This is linked with the lateral thinking of De Bono using the Six Thinking Hats. This method is a simple model for constructive thinking. It comprises of the white, red, black, yellow, green and blue hat. The color of the hat is related to its functions (de Bono, 1985).

Following this, the researchers will give a brief introduction or the rationale of the study to the respondents and shall proceed to the different hats as follows: 1) The first hat is *white* with the question, what is our present status? These are pure, factual generalizations or the facts about the lifestyle and value experiences of the Balili residents. 2) The second hat is *red* with the question, what do we feel? These include sentiments, emotions feelings – the collective feelings of the lifestyle and value experiences of the Balili residents. 3) The third is *yellow* with the question, what is good in us? Here are beautiful and good – positive or affirmative experiences of the lifestyle and value experiences of the Balili residents. 4) The fourth is *black* with the question what is wrong with us? Included here are the negative, failure, and problems of the lifestyle and value experiences of the Balili residents. 5) The fifth is the *green* hat with the question, what then must be done? Here, creativity, suggestions, solutions, improvements or the collective suggestion of the lifestyle and value experiences of the Balili residents. 6) The sixth which is the *blue* hat which involves an action as a practitioner, director, and facilitator. This is where the researcher will be able to direct the discussion where possible corrections/solutions can still be done as to what transpired in the discussions.

Review of Related Literature

The study of Peter Newton and Denny Meyer, entitled, *Exploring the Attitudes: Does "Environmental Lifestyle" Segmentation Align with Consumer Behavior*, defines lifestyle as a distinctive pattern of a person's life that straddles notions of individual identity, on the other hand and community/ sociality on the other, embodying notions of choice and self-actualization alongside opportunities for collectivity and attachment. It is a broad based concept that incorporates everyday facets of individual lives, including their attitudes, opinions, values, feelings, intentions, habits and social contexts. This study suggests that the common contexts of everyday life, such as homes and workplaces help in understanding how observed consumption behavior reflect daily routines, practices and habits.

In the 1995 Journal on Consumer Policy, entitled, *Understanding of Consumer Behavior as a Prerequisite for Environmental Protection* by Folke Olander and John Thogersen, it noted that a number of the environmental problems threatening our habitat are to a greater lesser extent caused by present consumer lifestyles. This study suggests sustainable lifestyles towards environmental protection. It argues that this cannot be obtained without marked changes in consumer attitudes and consumer behavior. In accordance to the Agenda 21 Rio Conference Summit by the United Nations, promotion of a sustainable lifestyle requires a need to change the consumption patterns by promoting environmentally sound technologies, encouraging environmentally sound use of renewable resources, encouraging recycling and reduction in wasteful packaging. A sizeable growth of private consumption should also be stopped.

Sustainability is based on a long-term perspective. The World Commission on Environment and Development defines it as a development process that allow for an increase in the well-being of the present generation, with particular emphasis on the welfare of the poorest member of society while simultaneously avoiding uncompensated and significant costs, including environmental damage on future generation. The notion of sustainable household involves the modification and changes in lifestyle among household members.

The book entitled, *Philippine society and revolution* by Amado Guerrero helps understand the lifestyles and values of the Balili River Constituents. The author who comes from a socialist worldview argues the reasons behind the basic problems of the Filipino people. He proceeds in stating that from the very beginning our society has never really recovered from the subjugation and domination it

the needs of the *common people* should be the first priority of governance, which in reality was and never really is the case.

In the compendium of a book, entitled, *The future of Values: 21st-century talks,* edited by Jerome Bindě, it argues that ethics is still relevant amidst universalism and pluralism in our present world. It presents the notion that times are, indeed, changing but it does not necessarily mean that ethics is a bygone guide of life. It is still a very important facet of human relations. It is in this book, therefore, that one can strongly find the immense potentiality of Global ethic.

The book on *A Global Ethic for Global Politics and Economics* by Hans Küng presents an extensive research and analysis of the author regarding the history and present condition of world politics and economics. Basing from his findings he believes that the current trend in politics and economics today tends to keep the traditional order of things in which politics is equivalent to having power and economics as the tool to propagate and ensure the continuation of this power. In a sense what permeates the two as it is used by people are only permanent interests devoid of considering the plight of others. Governments today sacrifice ethics over political and economic policies with an argument that survival is what matters most. In the end he also discusses the ethical considerations as people take part in the actualization of the two. This book is essential to all of the objectives in the study.

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Project 7. Title: Understanding Balili River Degradation Through Urbanization

Researchers:

Geoffrey Amlos (Project Leader)
Noel Parinas
Tecah Sagandoy
Gregorio Taag

Brief Description of the Study:

In the contemporary era of urbanization, a place/society is no longer independent in terms of economy, religion, communication, knowledge and practices (Duindam, 2007). Each society is inserted to the overlapping layers of jurisdiction – barangay, municipality, province, region and a state and each jurisdiction is governed by laws and ordinances which include the protection of the environment. And there is no doubt that these laws have clout enough to prohibit the abuse of nature. But even without in placed researches on why people cannot carry out their obligations, a yawning gap pops out resulting into the spiral rise of garbage. Enriquez might be right in claiming that the reason why Filipinos have difficulty obeying laws is because they are uprooted from their space to the space of legality. He bluntly puts it, "The Philippine system of laws did not grow from the people. Rather, the people were forced to grow into the law. People cannot be compelled to do things unless these things are part of their belief system."

The situation in La Trinidad is not far from the situation mentioned above. Republic Acts and Municipal Ordinances cover the protection of Balili River and its tributaries. Since 1980s, the local government of La Trinidad and Baguio initiated moves to revitalize the river but failed due to less commitment among stakeholders. At present, there is a pressing demand to address the degradation. Before this effort will again be in vain and palliative, an overarching knowledge on the things transpiring in an area is needed.

Significance of the Study

This study rests on the provocative reflections of social theorists especially that of Henri Lefebvre. From his reflections, insights were derived to see the problem of La Trinidad urbanization, specifically on the degradation of Balili River. The study radically shows that individual life affects in great magnitude the ecology. The life of an individual today has notoriously changed to a level that continues to devastate ecology through a programmed consumption.

The researchers believe that when there is a grandiose knowledge of the dynamics of modern society, responses in the forms of policies, advocacies and infrastructures can respond to the real need of the people residing in the area.

Specifically, it aims:

1. To define what urbanization is
2. To identify the effects of urbanization to the environment and valuing of people
3. To determine the relation of valuing, structures, and economy to the degradation of Balili River

Methodology

The study utilized descriptive analysis of the situation in La Trinidad that resulted into the abuse (conscious and unconscious) of the environment, which includes the famed Balili River. Though it is an armchair study, it made use of past studies on chemical and biological indicators as jump offs in advancing the argument. There is also a solid reliance on western researches about urbanization and on the management of river systems. In general, this study is a comparison but is careful with the limitation of the place in terms of politics and mindset.

Initial Review of Related Literature

This catalogues researchers, reflections, and arguments on urbanization, Rivers, and the Balili River. There are many studies on urbanization and the Balili River, but the following will for the main time serve as backdrops of the study. They are arranged according to themes-urbanization, History of La Trinidad, and the economic profiles of the people, from whom the skeletal make up of the whole paper is derived from.

The works of Henri Lefebvre, a French sociologist contributed much in the framing of the concept of urbanization and the tendencies of the society. In his books *The Production of Space, Everyday Life in the Modern World, Writing on Cities, Rhymthanalysis, Critique of Everyday Life, and Urban Revolution,* he discussed the shift of the orientation of western society, affecting all modes of societies around the globe. In these books he dialectically argues that the production of societies rests on the everyday practices. He too discussed some structures as the very expressions of the ideology that is at work in the society.

The work *Urban Subject: City Scapes and The Production of New Subjectivity*, an unpublished thesis helped elucidate Lefebvre's theory of Urban. It affirms that urban is a result of binary treatment of reality. *Urban Pattern* by G. Eisner presents the feature of the city as a place of anonymity. This book gives a better glimpse on western society. Mc Rae's work entitle *Play, City Life: Henri Lefebvre's Exploration and Re-Imagined Possibilities for Urban Life* offers a profound understanding of the change in landscape of communities particularly in western societies. It argues that change in the concept of space, time and measurement paved the way for the development and perfection of urbans.

There are studies that delve on understanding the phenomenon affecting the history of La Trinidad. The work of S. Anongos entitled *Colonial Vegetable Garden: The History of Agriculture in La Trinidad During the Early American Period* provides a glimpse of the historical maneuver where the famous river is located. The compilation too of Cordillera Peoples' Alliance on the works of Boquiren, Gimenez, Tauli and Solang give accounts on the space of the Igorots (which includes the Ibalois of La Trinidad and Baguio). These compilations give hints on the early space on the knowledge of ownership, time and measurement. These three forms of knowledge are very important in the discussions because

were necessary for the shifting of western societies to urban. Though the changing of these knowledge in the western society is gradual, the insertion into the Cordillera space caused "consciousness rattle" on how people perceive and remedy situations.

Various studies too on rivers conducted in other countries served as jump off points in the paper. The works of Michael Paul and companions served as basis of the study. These researches delve on the biological indicators, chemical components, and structural remedies of urbanization. One thing is common among these works, they show that response to river degradation is not revitalization but mitigation.

Since the work is an armchair research, updated socio-economic profile is of paramount importance. The information on geography, population, economic condition, health, education and social welfare made ready data to be developed.

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Project 8. Title: MATHEMATICAL- BASED ANALYSES OF THE ENVIRONMENTAL DEGRADATION IN THE BALILI RIVER

Project Leader: Phil Ocampo

RATIONALE

Rivers have been a focus of human activities throughout ancient and modern times. So important to humanity are the benefits obtained from rivers, and so necessary is the protection against floods and other river disasters, that pursuit for knowledge of river systems has advanced in leaps and bounds. While engineers are interested in water supply, channel design, flood control, river regulation, navigation improvement, and so on, it is clear that rivers, as a part of nature, can be mastered not by force but by understanding. Rivers have been a subject of study by engineers and scientists who have been fascinated by their self-formed geometric shapes and their responses to changes in nature and human interference. In addition to engineering, understanding river behaviour is also necessary for environmental enhancement.

In the locality, the Balili River is part of the Baguio Water District's so called- "inferred aquifer zone"- areas for groundwater extraction that are considered high-yielding because of transmissive flow path. This means that the discharge/recharge process of water in these areas is quite active.

These aquifer zones include the Trancoville, Teachers's Camp-M Roxas and Busol aquifers. BWD is convinced that groundwater behavior in these areas act in a manner that, as water drains into the Balili River, the River itself, through its underground tributaries, acts as recharge point for ground water replenishment. The potential contribution of the Balili River as a water source indicates one of the biggest challenges for ground/surface water source management for all sectors concerned. One of the obstacles that have been identified is the rapid rate of urbanization in the general area of the Balili River, which is La Trinidad, Benguet and Baguio City.

Urbanization brings about an increase in the demand for water, the problem on waste generation and disposal, the conversion of land to residential, commercial and industrial use, leak and spill of toxic and hazardous substances into waterways. The consequential effects of urbanization in the impairment of water resources is largely foreseen. This gradually reduces the effective watersheds of major river systems- including the Balili River- and ultimately groundwater recharge. It is therefore recommended to identify solutions to the Balili River problem in this particular context.

PROJECT OBJECTIVES:

The study intends to map the Balili River water system. Specifically, the following are the objectives of the study:

Study 1. Spatial Distribution (Nearest Neighbor Technique) of the Water Pollutants in the Balili River

Objective: To determine the spatial distribution (Nearest Neighbor Technique) of the identified water pollutants in order to know the potential location of water treatments.

Phil Ocampo (Study Leader)
Monica Alimondo
Julie Buasen
Marilyn Toledo
Kenneth Pakipac
Danni Loven Fulwani
Serano Oryan
Florence Palasi

Study 2: Odds-Ratio Estimate of the Socio-economic Activities Contributory to the Water Pollution of the Balili River

Phil Ocampo
Monica Alimondo
Julie Buasen
Marilyn Toledo
Kenneth Pakipac
Danni Loven Fulwani
Serano Oryan (Study Leader)
Florence Palasi

METHODOLOGY

Locale and Time of the Study

The study area includes Baguio and La Trinidad and this study will be conducted from March to December 2014.

Data Collection

Actual visits of the study area will be done to determine the altitude and latitude for mapping purposes. Sample survey using interview method will be used to determine the socio-economic characteristics of the concerned residents, type of pollutants and frequency of waste disposal.

Statistical Analysis

The nearest neighbour technique will be employed to determine the presence, the location and the degree of concentration of pollutants in the study area or basically the spatial distribution of the water pollutants. Odds-ratio estimation will be used to determine the socio-economic activities contributing to the water pollution in the Balili River.

Project 9. Title: TREND AND BEHAVIOUR ANALYSES OF PHYSICO-CHEMICAL AND CLIMATE ATTRIBUTES OF THE BALILI RIVER ECOSYSTEM

Project Leader: Bretel B. Dolipas

Brief Description of the Study

The Balili River system has its upstream or headwaters in Baguio called the Sagudin River, its midstream in La Trinidad and downstream in Sablan. The Sagudin River covers a stretch of 17.7 kilometers including its tributaries and found in Trancoville barangay, Baguio City. It is sustained by tributary creeks coming from Pacdal, Cabinet Hill, New Lucban, Honeymoon, Guisad, and Sto. Nino (formerly Slaughter Compound) barangays. The water of the tributary creek from Sto. Nino comes from Burnham Lake and other effluents from the business districts of Baguio City like Magsaysay Avenue and Session Road. In the city, the Balili river catchment is critical as it feeds on the Central Business District where 40 percent of the city population lives (PIA, n.d.). The waters mentioned converge and flow downstream towards La Trinidad, Benguet as the Balili River, which in turn drains into Naguilian River.

Population rise could not be curtailed in an instant. The aim now is to educate the population. If not educate, at least bring to them the awareness and reality of the status of the Balili River. Benguet State University is one of the frontrunners in the Balili River Rehabilitation Program. Together with other agencies, the community, and even employees and students of BSU are walking hand in hand in the attainment of the objectives of this program.

Abundant and clean water is the cornerstone of prosperous and healthy community. But as we move towards industrialization and urbanization, water demand is expected to increase with population growth. The consequences of urbanization together with industrialization and the changing climatic patterns water supply is foreseen to be continuously depleting.

The EMB-DENR findings showed that pollution along the Balili river system is two-

management coupled with the domestic sewage of households leading to the river and untreated effluents from business establishments such as oil from motor and machine shops, as well as car washing activities are contributory to the sickening Balili river according to Moreno. The compounded effect of the contributing factors together with the social behaviour as found by UP researchers further contribute to the worsening condition of the Balili river. In this context clean water supply is continuously being threatened, hence Balili river needs to be rehabilitated. To address the worsening condition of the river, the DENR has recommended to identify solutions to the problem.

Exploratory studies should be conducted first as benchmarks for monitoring and evaluation purposes of this project. Thus, two study components have to be conducted.

PROJECT OBJECTIVES:

The specific objectives of the project by study are as follows:

Study 1: Trends and Behaviour Analyses of the Physico-Chemical Attributes of the Balili River Ecosystem

Objective1: To determine the trends and behaviour of the physical and chemical attributes of the Balili River ecosystem

Objective 2: To determine the quality of water as compared to standard quality.

Bretel Dolipas
Joel V. Lubrica
Jennifer Lyn Ramos (Study Leader)
Jovalsen Abiasen

Study 2: Trends and Behaviour Analysis of the Climate Characteristics Along Balili River

Objective 1: To determine the trends and behaviour analysis of the climate characteristics along the Balili River

Objective 2: To compare the behaviour of the Balili River's water physico-characteristics and the climate attributes

Bretel Dolipas (Study Leader)
Joel V. Lubrica
Jennifer Lyn Ramos
Jovalsen Abiasen

METHODOLOGY

Locale and Time of Study

The study area includes Baguio and La Trinidad and this study will be conducted from March to December 2014.

Data Collection

Physico-chemical Parameters of the Balili Water System. The selected Physio-Chemical and Coliform Characteristics to be considered in the study will be limited to the data regularly collected by the Environmental Management Bureau (EMB) of the Department of Energy and Natural Resources (DENR),Cordillera Administrative Region (CAR). The following physio-chemical and coliform characteristics are to be considered in the study: pH, conductivity, Dissolved Oxygen (DO), Temperature, Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Cadmium content, copper content, lead content, zinc content, mercury content, ammonia content, phosphate content, total Coliform and Fecal Coliform. Data collected by EMB which would be used in the study are those gathered from 2003 to September of 2013. Samples were collected quarterly by the EMB during the months of January, April, July, and October. For the years 2010 to third quarter of 2012, there were three sampling stations considered. along the Trancoville Bridge area, the Chinese temple Bridge area, and the bridge at Capitol, km6 La Trinidad. For the fourth quarter of 2012 to the second quarter of 2013, 21 sample stations were considered along the Balili River System.

Data Treatment

In most environmental time series, a shift in the mean or known as change point is very common. With environmental data such as rainfall and temperature change point may occur due to climate change. If change in the mean before and after the event occurs, then a nonparametric technique is suggested. An appropriate and useful technique for examining the occurrences of abrupt changes in climatic records is the Mann – Whitney Pettit (MWP) test.

Project 10. Title: STATISTICAL-BASED FEASIBILITY STUDY OF A BALILI ECOPARK PROJECT

Project Leader: Salvacion Beligan

RATIONALE/Brief Description of the Study

Abundant and clean water is the cornerstone of prosperous and healthy community. But as we move towards industrialization and urbanization, water demand is expected to increase with population growth. The consequences of urbanization together with industrialization and the changing climatic patterns water supply is foreseen to be continuously depleting.

The problem on waste generation and disposal, the conversion of land to residential, commercial and industrial use, leak and spill of toxic and hazardous substances into waterways will consequently result to impairment of water resources. It is foreseen by the Department of Energy and Natural Resources (DENR) that the impairment of water resources could gradually reduce the effective watersheds and ground recharge of major river systems including the Balili river.

The EMB-DENR findings showed that pollution along the Balili river system is two-pronged, solid and liquid wastes with household wastes are most commonly seen floating. Poor waste management coupled with the domestic sewage of households leading to the river and untreated effluents from business establishments such as oil from motor and machine shops, as well as car washing activities are contributory to the sickening Balili River according to Moreno. The compounded effect of the contributing factors together with the social behaviour as found by UP researchers further contribute to the worsening condition of the Balili river. In this context clean water supply is continuously being threatened, hence Balili river needs to be rehabilitated. To address the worsening condition of the river, the DENR has recommended to identify solutions to the problem.

In addition to the already implemented waste management and installed water treatments in some areas in Baguio and Benguet, the potential, long-term and sustainable solutions to the current problems, are the installation of more and appropriate water treatment plants to locations that calls for them and the creation of an eco-park.

An ecopark is a place with diverse landscape, flora and fauna and an ideal place to educate our young people about the need for habitat conservation, biodiversity and sustainability. It must provide a natural countryside experience, fresh air with healthful outdoor recreational facilities for picnics, family outings and educational trips. Access for disabled users should be of prime consideration throughout the site. Most importantly, an ecopark is one that has the potential to be a forward looking educational center capable of offering solutions to a variety of the environmental challenges we are facing today.

To see the impact of this project in the near future, exploratory studies should be conducted first as benchmarks for monitoring and evaluation purposes of this project. Thus, two study components have to be conducted first prior to the implementation of the proposed project.

PROJECT OBJECTIVES:
The specific objectives of the project by study are as follows:

Study 1: Feasibility Study of an Ecopark at Balili Area: A Conjoint Analysis

Objective1:To identify possible physical amenities preferred to be installed to the proposed ecopark.

Salvacion Beligan (Study Leader)
Marycel Sajise
Valerie Baniwas
Precious Magallanes
Maria Azucena B. Lubrica

Study 2: A Logistics Regression Analysis on the Willingness of Balili Residents to Adopt an Ecopark Project

Objective: To determine the willingness of Balili residents to adopt an ecopark project.

Maria Azucena B. Lubrica (Study Leader)
Salvacion Beligan
Marycel Sajise
Valerie Baniwas
Precious Magallanes

METHODOLOGY

Locale and Time of Study

The respondents will be the prospective local tourists and residents along the Balili River. This will be conducted from March 2014 to December 2014.

Data Collection

In the Conjoint Analysis of Study 1, exploratory identification process of will be done first to determine the different attributes preferred by the residents for the proposed Ecopark. Knowing the attributes of an Ecopark, different attributes at different levels will be combined to come up with different profiles. A questionnaire consisting of the different profiles will be presented to the selected respondents (prospective local tourists) for evaluation. A combination with the highest pathworth will be considered as the Ecopark package that will be suggested to the adopting entities for implementation.

For the 2nd Study, a questionnaire will be floated to the residents to determine their willingness to adopt an Ecopark Project.

Data Analysis

The basic conjoint analysis model may be represented as (Carroll and Green 1995; Haaijer, Kamakura, and Wedel 2000):

$$U\ (X) = \sum_{i=1}^{m} \sum_{j=1}^{ki} \alpha_{ij} x_{ij}$$

Where U (X) = overall utility (importance) of an attribute

α_{ij} = part – worth utility of the jth level of the ith attribute

x_{ij} = 1, if the jth level of the ith attribute is present

= 0, otherwise

The basic model was estimated with the ordinary least squares (OLS) regression parametric mathematic algorithm (Fox 1997) using dummy variable regression. The preference ratings were the predicted (dependent) variable and predictor variables consist of dummy variables for the attribute levels. This algorithm calculates partial values by homogenizing the rate fluctuations based on the normal distribution (Green and Krieger 1993). Partial values were then used to calculate the total mean perceptual values. To facilitate the computation different statistics, SAS software (trial version) will be utilized.

Logistic regression analysis will be used for the 2nd Study.

Project 11 Title: An Assessment of the Balili River System Revitalization Information Education Campaign

Researchers:

Mildred L. Takinan (Project Leader)
Dominga S. Tomas
Lily Joy C. Kepes
Evangeline Rachel D. Leaño

Brief Description of the Study:

For so long, there has been a lot of effort extended for the Balili River System revitalization. Despite these, the river is still polluted. As a result, the water quality has not really improved. Various information and education campaigns have been done by different environmental advocates and concerned agencies/individuals in the hope of drumming up awareness on the need to protect and rehabilitate the river. It is the aim of this study to determine the effectiveness of the IECs done so far in rehabilitation efforts.

Objectives:

The study aims to assess the effectiveness of the information education campaign conducted for the Balili River System revitalization.

Specifically, the study aims to:

1. To identify the different IECs so far conducted
2. To evaluate the effectiveness of the past IECs conducted
3. To identify the language preference to be used for future IEC
4. To determine the preference of the stakeholders in terms of the mode of IEC to be conducted/reinforced

Methodology:

A. Assessment on the IEC conducted
B. Assessment on the effectiveness of the past IECs conducted
C. Language Preference to be used for the IEC
D. Mode of IEC to be conducted/reinforced

WORK PLAN FOR THE ENTIRE PROGRAM

Activities	Outputs	Date
Collection of Data	Data	March2014 – April 2015
Encoding of Data	Tabulated Data	June - August 2015
Analysis of data and interpretation of results	Analyzed data; Interpreted results	September – October 2015
Final writing of research	Research write-up	November– December 2015

BUDGETARY OUTLAY/LINE ITEM BUDGET

Maintenance and Other Operating Expenses (MOOE)	**Amount**
Travel/ Transportation Expenses	30,000.00
Supplies and Materials 1. Collection and Reproduction of Research Data 2. Paper, ink, Folders, Fasteners	30,000.00
Chemicals	50,000.00
Communication Expenses	10,000.00
Meals/ Snacks	60,000.00

Honoraria Project Leader Study Leader Study Members Enumerators	100,000.00
TOTAL	300,000.00

PROPOSED COLLEGE EXTENSION ACTIVITIES RESULTING FROM PROBABLE OUTPUTS OF THE CAS RESEARCH PROGRAM

1. Conduct of Information and Education Campaigns- for students, BSU Faculty and Staff, adopted barangay (Barangay Balili), other stakeholders through media, newspaper articles, television, use of the BRSRC website and web-monitoring system

2. Regular river clean-ups

3. Making of brochures and signages

4. Making of appropriate IEC materials

5. Activities for adopted estero (at barangay Betag)

6. Conceptualization of other relevant researches

7. Conduct of seminar-workshops and trainings

8. Monitoring and evaluation of extension activities conducted

9. Dissemination of research results

10. Linkaging with barangays and other LGU's, government entities, NGO's, private institutions, other environmental advocates (regional, national and international levels)

11. Others as needed

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