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ABASOLO, ANACORITA O.

Agro-environmental Sustainability of Conventional Organic Vegetable Production Systems in Tayabas, Quezon, Philippines -- 2015.

The goal of increasing agricultural production resulted in deforestation, massive land conversion and inappropriate use of modern agricultural techniques. The widespread application of chemical fertilizers and pesticides disrupts the natural balance of the ecosystem and posed harmful risks to human health. Impacts of conventional farming practices have been documented but there is a dearth of information on its comparison with organic agriculture hence, this study.

Environmental burdens of the different components of conventional and organic vegetable production systems in Tayabas, Quezon were evaluated using the Life Cycle Assessment (LCA) approach. The study quantified the material inputs, outputs and emissions in a defined boundary, from land preparation to transport to market. Impact categories evaluated were global warming (GWP), acidification (AP), eutrophication (EP) and human toxicity (HTP) potentials based on the functional units of 1 kg and 1 ha production area.

Conventional vegetable farming contributions to global warming potential was 2.12E-01 kg CO₂-eq kg⁻¹ of vegetable which was 19% higher than organic farming (4.00E-02 kg CO₂-eq kg⁻¹). Acidification potential expressed as g SO₂-eq kg⁻¹ of conventional (4.76E-03 g SO₂-eq kg⁻¹) was 23% higher than organic vegetable production (1.06E-03 g SO₂-eq kg⁻¹). Organic farming contributed 3.03E+00 kg PO₄-eq kg⁻¹ potential eutrophication which was 16% higher than conventional with only 4.7E+01 kg PO₄-eq kg⁻¹.

The application of chemical pesticides of conventional farms contributed to human toxicity potential calculated for both soil and air compartments. Cypermethrin had the highest total human toxicity in soil and air with 7.88E+06 g 1,4 DCB-eq ha⁻¹ and 1.84E+02 g 1,4 DCB-eq ha⁻¹, respectively. Organic farms had zero human toxicity potential in this study since organic farmers did not use chemical pesticides.

The farmers' decision on what crops should be planted still depends on the seasonality of crops and the prevailing market price. In this study, the overall benefit cost ratio of organic and conventional vegetable production systems showed that bitter melon, eggplant, and ginger provided higher income to organic farmers while string beans, tomato and okra gave higher benefit for conventional farmers. Conventional farmers have additional expenses in inorganic fertilizers and chemical pesticides, thus, farmers will get higher benefit when production expenses are lowered. This study provided evidence on the possible environmental contributions to emissions and economic feasibility of conventional and organic vegetable production systems.

ABASOLO, EMMA P.

Evaluating the sustainability of resin production practices in Samar, Philippines and their influence on the conservation of almaciga (*Agathis dammara* (Lamb.) Rich) -- 2002

This study was conducted to evaluate the sustainability of tapping practices for Almaciga resin production in Samar and their impacts on the conservation of almaciga. Four levels of analysis were done: first level analyzes the relationship of the socio-economic factors with the resin tapping practices, second level focuses on various resin tapping practices in the study area in relation to predetermined set of evaluation criteria, third level concentrates on the relationship of the practices with the resin yield, and the fourth level looks at the relationship of the practices with the total number of tree deaths. Trend analyses were done in the first, third, and fourth levels of analysis. Regression and correlation analyses were likewise conducted to support the results. The second level, which is the emphasis of this study, has been placed on analyzing whether or not the current practices significantly deviated from the ideal practices stipulated in DENR Ordinary Minor Forest Products Licensing (DENR Form F-16) and ITTO-FPRDI guidelines in resin tapping.

The study assumed that unsustainable practice would be at least 25 percent higher than the maximum requirement or 25 percent lower than the minimum requirement for tapping activities. Results were then validated using the Chi-square test. Majority of the respondents are within the working age of 21-59 years; has finished primary education; and Waray in origin. The average monthly household income was computed to be PhP3,000 while the average monthly expenses was pegged at PhP2,000. Income of the respondents generally comes from resin tapping with farming as an alternative source. Many of them are more than 8 years in the industry and are responsible for about 200 trees with diameter at breast height (DBH) of 1 meter and above/respondent.

Except for the choice of DBH, the trend analyses of resin tapping practices with age indicates that young tappers tap almaciga unsustainably. That is, they made longer, wider and deeper cuts, and harvest the resin more frequently. The

same trend was observed with education, number of years devoted in tapping, and attendance on training. Highly educated respondents and those respondents who are new to the industry and have not attended any training on proper Almaciga tapping made cuts longer, wider, and deeper than what is sustainable. In contrast, income did not show any influence over resin tapping practices except for the choice of DBH and harvest cycle.

Unsustainable practices in the area identified in this study are cutting width, cutting length and the harvesting cycle. As practiced in the area, the maximum tapping width and length is far beyond the recommendation. Similarly, the harvesting cycle used also exceeded the recommended harvesting days. Both economic and environmental implications for this situation are high. For one, the unsustainable tapping increases the number of deaths of trees in the concession area considered in the study. The primary cause of tree deaths identified was termite attack. Deep, wide and long wounds on the bark create an avenue for these organisms to infest the tree and slowly cause it to die. Unless resource managers in the area would find an effective management strategy to address these unsustainable tapping practices, income from resin will not only be adversely affected, but the Almaciga stand will continue to be threatened.

ABEJERO, ALMA LORELEI D.

Utilization of Kapok (*Ceiba pentandra* (L.) Gaertn.) Fibers as Sorbent for Diesel Oil Spill and Its Ex situ Bioremediation. -- 2012

Marine oil spill is inevitable due to industrialization and urbanization that led to increased shipping activities. The effects of oil spill on the ecosystem and human lives are unprecedented. Early response and containment of the oil spill is the best approach in reducing the environmental impacts. Kapok (*Ceiba pentandra* (L.) Gaertn.) fibers packed in Nylon net were found to be good diesel oil sorbent. Oil adsorption is through capillary action with an oil sorption capacity of 15.5g g⁻¹ fibers. Kapok sorbent offers easy retrieval and handling. Adsorbed oil in the fiber can be recovered by squeezing. The use of sorbents for oil spill clean-up is relatively acceptable but the treatment for disposal is another concern. Bioremediation done ex situ is a technique that can be employed to degrade the contaminant. A consortium of *Bacillus megaterium*, *Corynebacterium flavescens*, *Micrococcus luteus* and *Pseudomonas putida* with nutrient amendment (0.15g N and 0.03g P per gram oil) was used. Microbial population was sustained for six weeks and all species contributed in the degradation. Biosurfactant production was observed in the seawater media. Degradation products of adsorbed oil in Kapok fiber were detected by gas chromatography after one week of treatment.

ABELLA, EVARISTO A.

Stakeholder's participation in the management of marine sanctuary in Sitio Balanoy, San Teodoro, Mabini, Batangas, Philippines -- 2003

The role of the major stakeholders in the management of Twin Rocks Sanctuary in Sitio Balanoy, San Teodoro, Mabini, Batangas was determined and their interactions were assessed. Critical factors to a successful sanctuary management and associated problems were identified and examined. People's perception, attitude and knowledge about the sanctuary and strategies by which the resort can be complementary to sanctuary management were also the concerns of this study. Data were gathered through focus group discussions and interviews. The interacting stakeholders were the community, LGU and the resort. The relationship among the stakeholders was weak, particularly between the resort and the community. The weak interactions among the stakeholders do not seem to affect the status of the sanctuary. However, this may negatively affect it in the long term. Based on the secondary data, the sanctuary has improved in terms of coral cover and target species.

The sanctuary management was likewise confronted with lack of committed and concerned community leaders, lack of initiatives among community members, absence of a viable alternative livelihood, biased implementation of the law, unsupportive barangay leaders, absence of a well defined plan and management structure, and problems on tourism, pollution and solid waste disposal. The stakeholders considered them as critical factors to successful sanctuary management. In addition, other critical factors such as genuine participation and collaborative management were identified. Identification of the specific benefits derived from the sanctuary was also considered significant in its management. The stakeholders recommended solutions to the above-mentioned problems. In addition, they suggested that the former people's organization be reactivated. Strategies by which tourism (i.e. resort) can be complementary to sanctuary management have been suggested.

ABONETE, PROSPERIDAD J.

Livelihood vulnerability and adaptation to rainfall variability of the Eskaya Indigenous peoples community in Duero, Bohol, Philippines -- 2012

The Livelihood Vulnerability Index (LVI) approach was used to evaluate the risks posed by rainfall variability to the livelihood system of the indigenous Eskaya community in Duero, Bohol, Philippines. Socio-economic profile, livelihood strategies, social networks, health condition, food and water adequacy, and weather events obtained from the household

survey were used to construct the vulnerability index to assess the exposure, sensitivity and adaptive capacity of the community to rainfall variability.

Rainfall variability was a foremost livelihood hazard in the indigenous Eskaya community in Duero, Bohol, Philippines. Food adequacy in the community was highly sensitive to extreme rainfall events and typhoons. Components of the community's livelihood strategies and social networks contributed to the community's low adaptive capacity to the impacts of rainfall variability. The critical aspects of livelihood strategies that needed attention include the community's high dependence on agriculture as its main source of income, limited alternative livelihood strategies and non-farm income opportunities in the community, full reliance on rainwater for the irrigation of cultivated crops, and inadequate livelihood support services extended to the community. These issues call for the improvement of the current agricultural practices, diversification of livelihood strategies, improved delivery of livelihood support services and formulation of a local adaptation policy that is responsive to the needs of the vulnerable community.

ABREA, RENOIR A.

Eucheuma farming : an assessment of production, its ecological and social factors : the Mantigue island Camiguin, Province case -- 1994

Test planting of *Kappaphycus alvarezii*, Doty (1988) indicated high growth rate (3.8 percent) from March 17 to May 13, suggesting that the reef area of Mantigue Island can support *Eucheuma* farming during the northeast monsoon season or "amihan". Less than 1% growth rate was obtained during the succeeding periods from May 20 to June 18 during the southwest monsoon season or "habagat". Growth and production of *Kappaphycus* sp. was related with the parameters associated with season. High growth rate (3.8 percent) coincided with high solar irradiance (70 percent) less cloud cover (25 percent), low temperature (26 C) during "amihan" (i.e. March 17 to May 13).

Reversal of season from northeast to southwest monsoon or "habagat" preceded the occurrence of "ice-ice" disease and reduced the growth rate of *Kappaphycus* to less than 1d during the southwest monsoon. Recurring "ice-ice" disease both as major and limiting factor to *Eucheuma* farming. Demographic profile (e.g. age, education, and household size) was not directly related with production of *Kappaphycus*. All farmers report better living condition during the time when they still had their *Eucheuma* farm. The present study showed that *Eucheuma* farming is still an attractive income generating alternative for the inhabitants of Mantigue island.

ABRIGO, REXEL O.

Assessment of the sustainability of Kaliwa watershed, Rizal and Quezon Provinces, Philippines. -- 2004

A set of Criteria and Indicators (CI) was developed and tested in Kaliwa Watershed using the CIFOR methodology. An interdisciplinary team of experts developed an initial set of CI and analyzed the set using Multi Criteria Analysis (MCA) to streamline and identify the relative weights of the elements of the resulting set. A total of 6 principles, 16 criteria and 65 indicators were identified. The CI set was tested in Kaliwa Watershed to determine the applicability of the CI set and assess the performance of the current watershed management framework. At the level of principles, Principle Number 1: "Maintaining Watershed Ecosystem Integrity" had the highest score of 3.19. Based on the scoring system used, this translates to a performance slightly above the acceptable standards. On the other hand, Principle number 4: "Sustained quality and quantity (yield) of goods and services from the watershed" had the lowest score of 2.38. This means that management needs to focus more on sustaining the quality and quantity (yield) of goods and services from the watershed. At the level of criteria, criteria number C.2.4: "Policies support the participation and empowerment of local communities" had the highest score of 3.74, while criteria number C.4.3: "Economic impact to stakeholders positive and favorable" has the lowest score of 1.70. Based on the indicators under these criteria, to ensure sustainability, current management system should address issues such as insufficient conservation efforts on soil and water resources, conflicting national and local policies affecting management efficiency, and strengthening the on-site management body (Watershed Management Council) and support systems (WRDP-KWMP).

ABUCAY, EDWIN R.

Modeling the dynamics of geobiophysical factors and human activities as key influences in predicting rainfall-induced landslides in Infanta, Quezon, Philippines – 2010.

The municipality of Infanta, Quezon was devastated by numerous landslides and flooding caused by successive typhoons (Unding, Violeta, Winnie and super typhoon Yoyong) in 2004 which resulted to damages to properties, infrastructure, agriculture and loss of lives. This study was conducted to develop a landslide susceptibility model based on the inter-relationship between the geobiophysical factors (geotechnical soil properties slope, vegetation, land use), human activities (agricultural practices, charcoal making) and climate variability (rainfall amount) utilizing tools such as Geographic Information System (GIS) for the spatial analysis and dynamic systems modelling in STELLA.

Results showed that barangay Magsaysay (uplan) was susceptible to landslide attributed to the geotechnical properties of the soil e.g. deep clay soil with low to moderate expansion potential (P1= 16.53-33.04) and drastic change in land use in a span of six years (e.g. 52.27 percent reduction in forest cover, 97 percent increase in areas planted to annual crops). The simulated Landslide Susceptibility Index (LSI) values of the systems model further revealed that the geobiophysical characteristics of the area, impacts of human activities such as charcoal making coupled high rainfall intensity during typhoon occurrences resulted to higher landslide susceptibilities (LSI <0.7) of the study area.

ABUCAY-MANAIG, LAVINIA MARIE

Adoption of Green Building Technologies in the Renovation and Retrofit of UPLB Dormitories -- 2019

Green Building focuses on increasing the efficiency of resource use while reducing impacts on human health and the environment during the building's life cycle. Retrofitting and renovation of the existing old buildings are the best candidates where GB technologies can be applied in UPLB. About 242 student dormitory residents were surveyed to assess their current dormitory living conditions and determine the present GBT features in their respective dormitories. Key informant interviews were done to identify the factors that influence the adoption of GB technologies/strategies. The study revealed that barriers include lack of budget, knowledge, and experts, procurement process, and political will. Meanwhile, the drivers identified are availability of funds, energy-efficiency, improved productivity, improved company image, and reduced environmental impact. Furthermore, promoters identified are financial incentive, good publicity, educational promotion, policy and law, and institutional framework.

The findings of the study can provide valuable input to UPLB's planning and decision making towards the adoption of GBTs, thus develop suitable policies. The study recommends continuing the works on the inventory of GBTs and monitoring of actual resource consumption and waste generation, among others. Ultimately, UPLB must showcase the GBTs and practices in the academic institution, which may serve as a catalyst for other institutions to follow.

ACEDERA, MARI-ANN M.

Assessment of the environmental impacts of the proposed water resource development project on the lake water and aquaculture industry of Taal Lake, Batangas Province -- 1993

The study was undertaken to predict and assess the significant environmental impacts of the proposed Water Resource Development Project on Taal Lake ecosystem. It viewed the lake as an ecosystem consisting of three functionally related sub-systems, namely, the physico-chemical, biological and socio-economic subsystems in the assessment of the project's impact through an environmental impact assessment study.

The study considered the lake as the unit of analysis with regard to lake volume and data were gathered from the fish cage operators of Birinayan and Leviste for the aquaculture component. Water resource projects can cause a major effect of altering water level and consequently have effects on the lake's resources and other uses such as for aquaculture. Using a mathematical equation in the projection of water demand for a period of 50 years, the study showed that water withdrawal for municipal water supply for the intended 17 municipality beneficiaries is feasible with lake volume as the only consideration. However, withdrawal of water for both municipal and irrigation water supply pose a threat as it can lower the water to about 3.5 to 3.9 m which is beyond the critical 2.5 m surface water level of the lake above sea level.

Other impact identified and discussed include change in land use, erosion and sedimentation, reduction in freshwater flows, possible salt water intrusion downstream, and probable interference to migration, spawning and development stages of aquatic organisms. Impacts on water quality include deterioration of water quality caused by pollution depending on where the proposed developments will be located. Birinayan and Leviste, sites for aquaculture, may be most effected as culture of fish depends on good water quality. In terms of exposure, the cages will not be affected very much as these are located in very deep areas except for some cages located near the shore. Recommendations to be included in the proposed project include incorporation of a watershed management plan, monitoring of water quality, and provision for waste treatment facilities, among others. Above all, volcanic activity poses a constant threat as it can destroy the project in the event of eruption or earthquakes. There is also the need for public information on the need for the project to give a better understanding of the benefits versus the drawbacks of the proposed activity.

ADORADA, JOEL L.

Assessment of vermicomposting as a waste management technology an a livelihood alternative -- 2007

A survey was conducted to assess vermicomposting as a waste management technology and a livelihood technology. Twenty-four (24) vermicomposting facilities all over the country were visited and documented. The vermicomposting adoptors consist mostly of middle to upper class farmer entrepreneurs. They have innovated the technology in order to optimize the performance of their systems and make use of their available resources.

In terms of economic viability, the technology was proven to be a good source of income aside from the various benefits which can be derived from its various products - compost worms and vermicompost. Aside from the economic gains, savings were also derived by using the product itself and its derivatives.

The social impact for most of the adoptors is not yet realized since small scale and newly initiated vermi projects did not entail much labor workforce in its operation and maintenance. Only the large scale vermi facilities demonstrated the positive social influence of the technology.

For the environmental impacts, the technology has the potential to affect water, air and land resources positively. Some possible impacts include organic waste management, air pollution reduction and reduction in the application of chemical fertilizers and pesticides to some extent. However, extensive adoption especially in urban areas is necessary in order to address its solid waste problems.

In general, the technology is very cost effective, environment-friendly, and has many potential positive impacts to the society, economy and environment. Once given enough attention and support from the government, the technology could even amplify its impact to national level. Mass adoption would lead to government savings from importation of petrochemicals and inorganic fertilizers, savings from waste management, farmers' empowerment, agricultural sustainability, and furthermore sustainable development.

ADRIANO, JOEL D.

An assessment of the intellectual property rights provisions of the convention on biological diversity and the world trade organization agreements -- 2000

The study assesses the Intellectual Property Rights (IPR) provisions of the Convention on Biological Diversity (CBD) and the World Trade Organization (WTO) Agreements. It explains the conflict between the two agreements over IPR and attempts to answer how their differences may be best addressed. The study uses text interpretation, mainly hermeneutics which was originally used for theological studies but which is now an accepted method that emphasizes detailed examination of texts and meanings. The study finds three major areas where CBD and WTO IPR Agreements are not consistent with each other. These are through : (1) national sovereignty over biological resources, (2) local/farmers' and breeders' rights; and (3) indigenous community rights.

The CBD primarily recognizes the rights of nations to control and access conditions regarding access to genetic resources. An overstatement of this right could violate the WTO principle of free movement of ideas and materials. Likewise, countries may irreconcilably differ if they insist mainly on either the collective rights of indigenous and farming communities or the tradable private sector and individual rights. The study indicates two options that will be left to Parties of the two Agreements. They could either adopt a non-formal protocol of tolerance of violations or reconcile them in their respective national legislation. This will harmonize policy measures and legislation on trade, investment and agricultural and industrial practices, and avoid the problems of duplication, variation and inconsistencies in implementing national measures to comply with the two Agreements.

ALAIRA, ELEAZAR S.

Sustainability indicators of good environmental governance on solid waste management in the municipality of Los Banos, Laguna, Philippines -- 2007

This research is a case that aimed to identify sustainability indicators of good environmental governance in the implementation of solid waste management in a municipality from the perspective of the business sector and civil society. The case studied was the Solid Waste Management Program of the Municipality of Los Banos. Good governance practices were identified from the strategies employed by the municipality in the management of its solid waste.

The bipophysical, social, and economic environment that facilitated the adoption of good environmental governance practices in solid waste management was drawn from the results of the interviews with key informants and from a review of secondary information. The identification and prioritization of indicators of good environmental governance were obtained from a survey of one hundred seventy three respondents representing ten percent of the total number of the business establishments and civil society organizations in the municipality. These informations were validated through Key Informant from the Local Government Units. The indicators of good environmental governance practices of the LGU that were considered in the study focused on the Rule of Law (RoL), accountability, participatory and transparency. The priority indicators were selected and rated from a total of seventy-six process indicators describing strategic objectives under the development goals of the major sustainable development elements.

Results of the study showed that the transformation from traditional management to a decentralized, catalytic, community-owned and customer-driven form of governance was facilitated by the need to respond to major environmental constraints that inhibit the implementation of an ecologically sound solid waste management program. In such situation, the response would usually require support from other stakeholders.

The study likewise revealed that all process indicators provided in the survey were selected as important. The level of importance, however, varied depending on the respondents' preference for other indicators. The relationships of the variables were determined using the Chi-square and Spearman's Correlation tests. The relevant indicators of good

environmental governance in the municipality were summarized under six major concerns. These concerns include the 1) consultative processes; 2) legal bases; 3) presence of solid waste management unit or desk; 4) presence of plans and programs; 5) definition of roles and responsibilities; and 6) evidences of impacts.

ALAIRA, SOFIA A.

Ecological and socio-economic impacts of the cage culture of Maliputo (*Caranx ignobilis* Forsskal) in Taal Lake, Batangas, Philippines -- 2010

One of the major factors considered that contributed to the series of fish kill events that have been devastating the fishery industry of the lakeshore municipalities of Batangas is the deteriorating water quality of the lake. This was attributed to intensive feeding requirement of Tilapia and Bangus fish cages, overstocking and proliferation of illegal fish cages. Such practices have compromised the carrying capacity of the lake environment. The need for other fish farming species that would not contribute to the degradation of the lake environment revived the interests for promoting Maliputo fish cage farming. This study assessed the impacts of cage culture of Maliputo to the relevant physical and chemical properties of the lake water. It also determined the biological requirements and the economic and financial viability of the Maliputo fish cage farming. An evaluation of the issues and problems related to Maliputo fish cage farming was also undertaken.

The analysis of relevant physico-chemical properties of the lake such as water temperature, DO, pH, alkalinity, hardness, ammonia, and nitrite taken from varying distances of the three fish cages from the two study sites during the months of March, April and June showed that they are still within the normal levels and within the ranges favorable to aquaculture. Other findings of the study showed that the mortality rate of fingerlings from source to release to fish cage is 40 percent indicating that the initial stocking rate of a 10m x 10m fish cage is 900 fingerlings. The mortality rate during harvest is about 12 percent. The study also confirmed that Maliputo, being a carnivorous species, is also a voracious feeder. Its FCR is 6.405 kg meaning it will have to consume 6.405 kg of trash fish to attain a weight of 1 kg. Trash fish used are called hibay, undersized and deformed species which command lesser commercial value. Trash fish are chopped and minced into small pieces before being fed to Maliputo.

The KII and FGD generated the personal as well as household profile of the operator who would venture into and stay in Maliputo fish cage farming. The financial analysis of the Maliputo fish cage farming has shown positive NPV and BCR, assuring financial return to the operators, however, the financial sensitivity analysis noted a substantial decrease in the NPV and BCR, if there will be decreased in the price of Maliputo or an increase in the operational cost. Foregoing considered, the study concluded that Maliputo will be a potential and acceptable alternative aquaculture species. Maliputo fish cage farming has minimal impact to the environment and is an effective in-situ conservation strategy for an ecologically valuable Maliputo.

ALBANO, SHIELA V.

Development of Environmental Criteria and Indicators for the Establishment of Forest Canopy Adventure and Its Potential at the Makiling Botanic Gardens, Laguna, Philippines. – 2013.

The Forest Canopy Adventure (FCA) is an outdoor recreation facility that allows visitors to appreciate, experience and learn about the forest canopy ecosystem. It also highlights ecotourism principles like promote conservation through environmental education. These principles coincide with the objectives of the Makiling Botanic Gardens (MBG) located at Mt. Makiling Forest Reserve (MFR). Seeing the potentials of MBG, an FCA provider proposed that an FCA be built. However, concerned stakeholders perceived that it can produce socioeconomic benefits and environmental costs during its construction and operation. These constraints can be addressed through an assessment tool – Criteria and Indicators (C&I). It is designed to measure, monitor, predict and prevent the probable impacts of a policy, program or project in an environment. In this study, these tools were generated through Delphi Technique. It required a number of experts to screen out the initial candidates of C&I based on the ecotourism principles, site's mandates, and the conditions provided during the two rounds of Delphi Technique. At the end of the second round, results include eight principles, seven criteria, 32 indicators and eight sub-indicators. These tools were used to determine the potentials and challenges of an FCA in its possible establishment at MBG.

ALEJO, KENNETHJER G.

River System Assessment for Conservation of Viray River, Natividad, Pangasinan Province, Philippines. -- 2022

The Viray watershed, originating from the rugged Caraballo Mountain ranges in the municipality of Natividad, Pangasinan Province, has its rivers in pristine condition and offers multiple ecosystem services that go beyond its boundaries. The upstream portion of the watershed serves as a constant destination for tourists, and as the river drains further, the midstream and downstream portions are agricultural areas that offer livelihood for the neighboring community. Locals also use the river as a local food source because of its rich aquatic biodiversity. Due to its current state, tourism sites

are highly promoted in the area. Alterations to the current condition of the watershed caused by human-induced pressures and disturbances to sediment and water flows may irreversibly impact overall watershed conditions. Management of a specific watershed should be based upon an understanding of its own rivers and the ecosystem services that it offers to the community. The study aimed to assess the river system of Viray by looking at the current state of its water quality, fish biodiversity, land cover, and ecosystem services, focusing on the impacts of tourism. Based on the in-situ water quality analysis using a multiparameter probe, the water quality parameters of the Viray watershed meet the standards for DAO 2016-18 and DAO 2021-19 for Class A waters for both the dry and wet seasons, which confirmed the pristine conditions of its rivers. In terms of fish biodiversity, the *Kalaskas*, or an indigenous method of catching fish in the community, was able to determine six (6) freshwater fish species of goby.

Statistical analysis revealed that the abundance of fish in the different sections of the watershed was mainly due to water conditions, specifically its temperature, pH, and dissolved oxygen. The land cover change analysis of the watershed for 2010, 2015, and 2020 revealed that the conversion of one class to another was very low to no change, which signifies preservation of the watershed land uses. Discussion with the local community confirmed the limited changes in the watershed land classes, focusing only on the limited conversion of land classes to built-up areas. The contingent valuation focusing on the ecotourism of the watershed showed that tourists and the local community are willing to take part in the conservation of the Viray River. Logit regression analysis used to estimate the willingness to pay gave an estimate of Php 15 to 18, which suggests the amount residents are willing to pay for the conservation of the Viray River. Findings from the river system assessment can be used by the local government and community to find a more holistic approach to the management of the Viray watershed.

ALINDOGAN, MARY GRACE J.

Economic analysis of environmental impacts of power plants in the Philippines. -- 2005

The integration of the environmental dimension in the energy project planning and implementation of selected power projects was evaluated. The Investment Coordination Committee (ICC) Evaluation Guidelines and Procedures, the actual practice of project evaluation, and the Environmental Impact Statement (EIS) of various energy projects in the country were analyzed.

In actual practice, evaluation of power projects often includes only the investment and operating and maintenance costs and the benefits from revenues generated by the plant. However, existing policies/guidelines, specifically the ICC Guidelines and Procedures and the EIS Guidelines (DAO 96-37) provide that environmental evaluation to be done for these projects prior to implementation. These two policies were further analyzed to recommend means to reconcile and streamline the procedures for amore substantive evaluation process.

A review of the samples EIS documents also revealed that costs of environmental impacts are not included in the economic evaluation of these projects. Suggestions were made to revisit the scoping guidelines and, if possible, add a provision to explicitly require the proponent cost estimates of environmental impacts in the evaluation.

Environmental cost data is essential in presenting information to distinguish between power generation projects with less environmental impacts.

ALMARIO, MANUEL RAY M.

Effects of Tenurial Arrangement on forest resource management at Barangay Poitan, Banaue, Ifugao. -- 1999

The study aimed to identify the customary legal and usufruct practices to trees and assess the resource utilization among the members of the community. Barangay Poitan, Banaue, Ifugao was chosen as the study site. Its resources use pattern represents those found in other barangays of the town. A concept of tenure "niche" by Fortmann was adopted to describe property relationship with regards to land. There were two types of tenure in the study area, woodlot under private holding and forest managed by the community. A rapid rural appraisal methodology was used to gather information on the physical aspects of the territory, use rights and management of resources. It also involved small group discussions for participatory mapping, transect methodology and calendar approach. Semi-structured interviews were conducted in 52 households, from which 28 were woodlot owners and 24 were communal forest users. In the privately held woodlot, the planted trees are mostly endemic species used for carving purposes. While trees that are only used for firewood or soil erosion buffers are found to be less on this tenure. Sizes of the trees in the private and communal forest, are becoming smaller as a result of frequent harvesting, particularly of endemic species used for carving. The alnus tree is fast becoming a dominant species in the forest landscapes of the community. Property rights in the private woodlot and communal forest are based on kinship and membership in the village, respectively. The customary rules resolve conflicts that arise from resources disputed within the community. The concept of exclusions between members is an important aspect on use of trees in the commons.

The management of the forest lands is constrained by the policies imposed by the state to the existing customary law. The indigenous legal system reflects native wisdom accumulated over many generations of occupancy. On the other hand, the national property laws eschew the indigenous concepts of communal ownership. Despite the discrimination of the legal system, the indigenous concepts and values remain. Recognition of indigenous land tenure systems by issuing

Certificate of Ancestral Domain/Land Claims by the Department of Environment and Natural Resources (DENR) is a recent task. Although the community has yet to apply for a certificate, it would likely nurture their receptiveness to equitable development plans designed to increase sustainability and productivity of land. The study recommends that an ecosystem management approach be incorporated in conducting development plans on resource use of the community. This concept uses a holistic analysis to guide the management of lands and water for products, services, and conservation of biodiversity. Sustainable forestry is recommended for private and communal forest management.

ALMOCERA, ATANACIO T.

An assessment of the environmental suitability of a potential site for land application of effluents from wastewater treatment facilities in Cebu, Philippines -- 2001

As the demand for domestic and industrial use of water increases, the potential threat to the environment in terms of pollutants from the wastewater can increase. The nutrients present in the wastewater may have negative impact to the environment. To a receiving body of water, this can cause undesirable effect such as eutrophication and unpleasant odor. It would be disastrous for the environment if this wastewater were not checked. A good, effective and pro-active wastewater management is important for sustainable development in the region such as Cebu. Land application is a potential alternative choice for its treat wastewater as a resource rather than a problem to be rectified.

The result of the study may contribute to improving the policy and regulations on wastewater management in the Philippines. This study hopes to show insights for wastewater treatment plant operators and promote further technical as well as scientific research on land application development.

ALTAREZ, RICHARD DEIN D.

Social Vulnerability and Geographic Information System Approach to Community Disaster Risk Assessment. -- 2013

A community's risk to disaster was assessed using an innovative simple, participatory and cost-effective based approach, integrated with GIS. The methodology was tested at Brgys. Maguya and Cabilang Baybay in Carmona, Cavite, Philippines. Using only social vulnerability to determine the communities' risk to disaster did an innovation to the traditional risk assessment procedure. KII and FGD were used to determine social vulnerability and spatially processed through GIS. Traditional risk assessment wherein expressed as Risk = Hazard x Vulnerability was validated using the reconstructed Typhoon *Milenyo* flood extent on September 28, 2006 that was derived from household survey and likewise processed in GIS. Results of the analysis reveals a 60.25% accuracy. However, in cases when the information on hazard factor is not available, one can still derive communities' risk through social vulnerability with the integration of GIS. In comparison with the traditional assessment, result of the study reveals a lower accuracy as validated by the reconstructed Typhoon *Milenyo* flood height with three (3) and five (5) classifications at 47.37% and 13.61%, respectively.

ANASTACIO, NICO JAYSON C.

Willingness-to-Payoff the Swine and Poultry Operators for the Water Quality Improvement of the Calumpang River Basin, Batangas -- 2014.

Pollution has been a major concern to various sectors and industries along the Calumpang River. Although it was recognized that this problem was not caused solely by an industry alone, many people within the river basin associated it mostly with swine and poultry operations. Several proposals to improve the water quality of the Calumpang River were done by different organizations. Since there were identified users of the resource, it was suggested that the fund be collected from them. However, there is no existing benchmark of the value of payment that should be collected from these users.

This study is a preliminary attempt to estimate the economic value of the improvement of the water quality of the Calumpang River using Contingent Valuation Method (CVM). A total of 470 swine and poultry operators from Batangas City, Ibaan and Rosario were interviewed. Through the use of econometric model, the Mean Maximum Willingness-to-Pay (WTP) was estimated to be Php 2192.156, with a total annual Social WTP of Php 28,252,506.528. The effect of protest responses to the Mean Maximum WTP was also analysed in the study. It showed that there was a significant increase in the value of the Mean Maximum WTP when all protest bidders were removed from the sampling population. These results suggested that, overall, most swine and poultry operators were willing to pay for the proposed improvement of the Calumpang River, and hence, it is recommended that a Payment for Ecosystem Services (PES) scheme be implemented by all Local Government Units within the Calumpang River Basin, after a more comprehensive feasibility study.

AMARILLE, MEYCEL C.

Assessment of Environmental Fund for the Protection of Taguibo Watershed, Butuan City, Philippines. -- 2013

Taguibo River Watershed Forest Reserve (TRWFR) is the main source of water supply in Butuan city but threatened by illegal activities within the proclaimed protected area. The management of environmental fund of the Taguibo Watershed, Butuan City environmental fund system, and participation of the stakeholders were assessed. Semi-structured survey questionnaires were used in the interview of the household and key informant interview was also conducted.

The Butuan City Water District (BCWD) has voluntarily set aside environmental fund to be used for the conservation of the TRWFR. The results show that the plow back of environmental fund is allocated for agro-forestry program, water system and sanitation, livelihood program, information and education campaign and capacity building with a total amount of 1,139, 000.00. Most of the revenues generated are allocated on the administrative cost (69percent), production cost (15percent), construction and maintenance (11percent) and commercial cost (5percent) of the total operations and maintenance expenditures.

The watershed management is highly fragmented and policies are poorly enforced due to the political and conflict of interest. Thus, retooling of watershed management council, additional work force of BCWD, endemic species and forest trees species, sustained public awareness and environmental campaign, proposed additional fund and environmental fund instead of reforestation account are deem recommended.

ANCHETA, ARLEN A.

Domestic solid waste management in San Antonio : an urbanizing Barangay in San Pedro, Laguna -- 1999

The existing domestic solid waste stream and resource recovery strategies at the household and community levels of urbanizing barangay of San Antonio in San Pedro, Laguna were determined. The influences of educational level, age, household income, and household size vis-a-vis the perception and behavior of the households on generation of wastes were also determined. A integrative approach of structured survey, direct observation and measurement, and key informant interview were utilized to meet the objectives. Food and kitchen wastes were the most predominantly generated refuse together with disposable packaging of plastics, papers, bottles, and metals. The households practiced reuse and recycling of the residual resources. Domestic solid wastes were disposed by collection, open dumping or burning on vacant lots, and dumping on waterways.

Education and income had a significant correlation with perception of the households on generation and disposal of wastes. Moreover, these two variables were significantly correlated with households's behavior inconsistencies on the practices of waste segregation and the ranking of food and kitchen refuse in the waste stream. Proposed resource recovery strategies for the households of Barangay San Antonio are 1) source reduction through proper consumption behavior, 2) waste segregation before disposal, 3) reuse, and 4) recycling. The recommended community resource recovery strategies are composting, waste segregation using labeled containers, and recycling. Active participation by the households, local leaders and NGOs in the community is seen to be necessary for effective community solid waste management.

ANCOG, RICO C.

Application of Environmental User's Fee System to Households for Enhanced Water Pollution Control in Laguna de Bay, Philippines -- 2006

The instituted Environmental Users Fee System (EUFS) of the Laguna Lake Development Authority (LLDA) has been assessed with problems and limitations as water pollution in Laguna de Bay continued to persist. Thus, one of the identified enhancement measures is the necessary inclusion of the household sector which was accounted by recent studies to about 70 percent of BOD loading of the lake. The willingness to pay (WTP) of the households from both the lakeshore and inland municipalities of Laguna de Bay region for the improvement of the lake's water quality were assessed. Using contingent valuation methodology (CVM), a total of 1643 households from eight municipalities (Angono, Baras, Binan, Carmona, Pakil, Los Banos, Lucban, Sto. Tomas) and two cities (Sta. Rosa City and Taguig City) were assessed. In addition, households' awareness, perception of and attitude towards Laguna de Bay were also studied in relation to its condition, uses and other related environmental issues and problems.

About 31percent of the respondents were unaware that their barangays belong to the Laguna de Bay watershed region. Majority of the respondents (70percent) disposed their wastewater directly into the canals that would eventually drains into the lake. Also, about 63percent of the respondents perceived the lake as being polluted and 88 percent of them believed that household sector is the major contributor to its pollution in confirmation to prior studies. About 70 percent of the respondents were willing to pay of about 46.43 pesos/household/month for the construction of the treatment facility as an indicator of their means of contributing to the improvement of the lake's water quality. Households' total monthly income and educational attainment had significant positive correlation with WTP values but age of respondents

was negatively correlated. It was observed that respondents from lakeshore and inland municipalities were supportive to the application of Environmental Users' Fee System as a means of enhancing water pollution control of the lake. Thus, their contribution and participation for the establishment of the Wastewater Treatment Facility that would hopefully improve the lake's water quality could be expected.

ANGELES, BRANDO M.

Water Balance Estimation for the San Juan Subwatershed, Laguna De Bay Basin, Philippines--2017

Hydrological approaches were performed to estimate the water balance in San Juan Subwatershed during 2015. As a water inflow, the total precipitation (P) volume (2,711,418,712 m³) was computed through Inverse Weighted Distance (IWD) and Thiessen Polygon methods. The 61,381 m³ infiltration (I) and 1,158,915,990 m³ evapotranspiration (ET) was determined through equations of Holtan and Thornthwaite, respectively. The HEC-HMS 4.2 simulated 25,240,820 m³ run-off (Q) for the watershed. Consequently, the water balance represented by $P = I + Q + ET$. During the January to June., water outflow (I, Q and ET) exceeded the amount of inflow (P). However, precipitation volume was higher than the outflow during July to December. As a result of the annual water balance, 1,527,200,522 m³ of water was stored in the watershed.

The research estimated baseflow (BF) through baseflow recession curve and combines it to Q as surface water resources. The baseflow (40,996,800 m³) was added to total Q and compared with the 182 was added to total Q and compared with the 182,354 m³/day water consumption of the industrial, agricultural and domestic sectors. The volume of water consumption at 10,110,083 m³ exceeded the surface water resources during January to June. Nevertheless, surface water resource production was higher than the consumption during July to December at 9,788,472 m³.

ANGHAD, MARVIN M.

Scenario Modeling of Coastal Flood due to Storm Surge in the Alibijan Wilderness Area (AWA), San Andres, Quezon, Philippines -- 2022

Climate change has greatly influenced the changes in Earth's surface, and it brings a negative impact to all living organisms. The most noticeable impacts of climate change are the following: extreme drought and flooding, formation of super typhoons, and sea level rise. Furthermore, to combat the negative impact of climate change we need to study and plan appropriately based on the existing conditions and status of our environment. This study focuses mainly on the coastal flood brought by storm surges in Alibijaban Wilderness Area (AWA), and this is done through GIS approach. Different scenarios to understand and analyze the coastal flood brought by storm surge were formulated. The main objective of this study is to come up with a storm surge flood hazard map using multi-scenario analysis. As a result of scenario modeling, a total of 16.67ha (Scenario 1) up to 218.14ha (Scenario 5) of AWA would be inundated during a coastal flooding event brought by storm surge and the most affected land cover type are the mangrove forest, residential area, and agricultural area. Through GIS approach we can delineate areas in AWA that are affected by coastal flood brought by storm surge and in terms of environmental modeling especially in coastal management, threat analysis and pattern, and scenario modeling gives a great innovation to planners and managers because this approach will enable us to compare different scenarios before the implementation of the proposed strategy in the real world. Furthermore, the result of this study will be helpful in formulating and identifying appropriate adaptive measure for a climate change proof management plan.

ANIT, KHARMINA PAOLA A.

Assessment of Vulnerability of Smallholder Farmers and its Implications on the Design of a Co-investment Scheme in Lantapan, Bukidnon, Philippines – 2019

Vulnerability assessment has been widely used to develop strategies towards better resilience to impacts of climate change. Various methods have been applied in assessing vulnerability of farmers to climate change, of which most are scientific in nature. This paper used the Capacity-Strengthening Approach to Vulnerability Assessment (CaSAVA) Framework to assess the vulnerability of smallholder farmers in Lantapan, Bukidnon to climate-related shocks. It combines both scientific and local ecological knowledge to identify existing livelihood assets and deficits within the watershed. Balanced weighted average approach was done to generate the vulnerability index for the three sub-watersheds based on the identified level of exposure, existing livelihood assets, and responses to the impacts of climate change.

Results revealed Tugasan Cluster as the most vulnerable among the three clusters with a vulnerability index of 0.45. This was followed by Alanib Cluster with 0.43 and Kulasihan Cluster with 0.39. Among the three clusters, Tugasan is located at the highest portion of the Manupali Watershed. It was found to be most vulnerable in terms of its human, natural, financial, and physical capital thereby reflecting the lowest adaptive capacity and highest sensitivity relative to the other two clusters. Results of this study served as an input in the development of a conservation financing scheme in the municipality of Lantapan.

ANUNCIADO, ISABEL MILDRED L.

Influence of forest land use change on agricultural production : the case of Sipit watershed Mount Makiling, Philippines -- 1993

The concerns of this study were to assess the changes in land use and migration pattern of kaingineros which were then related with sediment yield, soil erosion, soil fertility status, runoff, irrigation input, flood level and crop yield of agricultural lands supported by the watershed. Valuation of the cost of forest destruction on agricultural production in the lowlands was also done. To be able to achieve the objectives using the holistic approach, the unit of analysis used was the watershed. The watershed with its bio-physical linkages acts like a system such that each part is an integral part of the whole and is necessary for the efficient functioning of the whole system. Primary data on the farming activities of the kaingineros and soil fertility were gathered. Secondary data used consisted of maps (land use, topographic, cadastral survey and slope), soils data, rainfall data and agricultural yield. Three land use patterns of the following years 1970, 1981 and 1990 presented in maps were used. The Agricultural Non-Point Source Pollution Model (AGNPS) was used in calculating the soil erosion, sediment yield, sediment-associated and water soluble yields and runoff.

Results showed that sediment-associated and water soluble yields of nitrogen and phosphorus, runoff volume, soil erosion and sediment yield was high in the brushland areas and alienable and disposable lands or private lands than in the forests. There were six kaingineros who migrated to the forest reserve from 1931 up to 1986. Since these farmers mostly maintained their farmlots or have expanded a little and have learned to use conservation measures such as planting trees themselves, less of the soil erosion that occurred in the watershed could be attributed to their activities.

Much of the soil erosion that occurred in the area can be attributed to the activities in the brushlands and private lands. The total sediment yield trend in those three years was high in 1970, decreased in 1981 and increased in 1990. The irregular trend was due to the vegetation that existed in the area and the rainfall pattern. Results of the regression done using the same variables used in the AGNPS model showed that cover and management factor, Manning's roughness coefficient for the channel and slope were highly significant. Land use of the watershed affected soil erosion which had an impact on agricultural production in the lowlands. Agricultural production trend was the reverse of the total sediment yield. The great loss in the value of agricultural produce on a per hectare basis (P81,826) was observed in 1981 based on 1970 prices. Therefore, planning and management of the Makiling Forest Reserve should not be centered in the areas covered by the reserve alone but also include alienable and disposable lands or by applying the watershed approach.

APLAL, AMIER ASHAN K.

Physico-chemical and microbiological assessment on selected groundwater sources in the Municipality of Los Banos, Laguna, Philippines. -- 2011

Water quality assessment and monitoring of 25 groundwater wells in selected barangays of the municipality of Los Banos were conducted in three sampling periods, September 2010, November 2010, and January 2011. The pH, temperature, TDS, nitrate, selected heavy metals (lead, hexavalent chromium, and iron), total coliforms and E.coli were determined. The results of analyses shows that the majority of the groundwater wells are within the standard set by the World Health Organization (WHO) for water quality and potability. Nevertheless, microbial contamination due to E.coli was present in 13 groundwater wells.

High populated barangays that exceeded 2000 households have elevated nitrate concentration. Although, these values are within the acceptable limits set by WHO. Major source of groundwater contamination of nitrate in the area is caused mainly by the presence of septic systems owned by the residents.

Admits the danger posed by particular contaminants in some parts of the municipality, a number of wells are still safe for drinking and are currently used by the residents. The enhancement of the present sanitation practice by the municipality is highly recommended to prevent waterborne disease and prevent additional degradation of the groundwater.

AQUINO, DANNICA ROSE G.

Forest Fragmentation and the Economic Value of Conservation: The Case of Bataan Natural Park (BNP), Philippines. -- 2022

Forest ecosystems provide multiple benefits vital in supporting human systems, but rapid population change and land use conflict continue to degrade natural forests that undermine their values. The Bataan Natural Park (BNP) is no exception to these problems. This study aims to assess the forest landscape fragmentation and economic value of conserving BNP. The forest cover analysis showed a slight decrease from 63% in 2003 to 60% in 2020. In line with this,

forest fragmentation analysis showed a decrease of 6% in large core forest while forest edges increased by 2% from 2003 to 2020. Despite these trends, the park is still dominated by core forest which constitutes 87% of the total forest area.

The economic value of conservation was analyzed through the discrete choices of 345 park inhabitants. Forest cover, flood regulation and livelihood were the significant factors enhancing the utility of individuals. Among the attributes, the highest value was placed on forest attribute (Php 112.01), indicating households' preference and priority for enhancing forest cover. Overall, households were willing to pay an additional Php 21.81 per month to finance high-level improvements indicated in the conservation program. Despite having indications of fragmentation, the high importance of forest attribute could be explained by the fact that the landscape still functions as core forest. Analysis of policy options supports that the conservation of the park is a worthy investment, since benefits derived from this outweighed the costs.

AQUINO, DANTE M.

Analysis of non-timber products utilization in San Mariano, Isabela – 1993

This study focused on non-timber forest products (NTFP) as a significant component of the forest ecosystem and as an alternative source of income for the people of San Mariano, Isabela. The utilization system for rattan and buho was described and analyzed. The analysis includes the activities, participants involved, processing steps, pricing structures, and other related information. The socio-economic profile of NTFP gatherers in the area was likewise characterized in terms of demographic information, property ownership and agricultural activities, income derived from different sources, and utilization of rattan and buho.

Using stepwise multiple regression analysis, statistical models were developed to identify some factors significantly influencing NTFP utilization in the area. An estimation model was developed to mimic some rattan utilization scenarios in the study area. Using two area scenarios and three cut levels, the sustainability of rattan gathering was evaluated for each combination. Results of the estimation process runs indicate that rattan stocking cannot sustain the prevailing rate of extraction. Using the same model, an alternative sustained yield cut (SYC) was also estimated. Some potentials and limitations of the estimation model were presented. Based on the insights derived, the recommendations of the study include: 1) the necessity of strict implementation of the rattan management system and the establishment of one for buho; 2) trading for NTFP should be free and prices standardized; 3) the need for the revision of the 25-meter minimum harvestable length for rattan; 4) the establishment of physical boundaries for rattan blocks; 5) the necessity of planning in the gathering of NTFPs; 6) the systematic implementation of monitoring systems of NTFPs from the cutting area to the outlets; 7) the consideration of sustainability in policy decisions on NTFP utilization; and 8) the active role of the local people in making policy decisions on NTFP utilization and management.

AQUINO, FAYE REGINA M.

Comparative distribution of total mercury in water and sediment in selected rivermouths and some biota in Laguna de Bay, Philippines – 2002

Laguna de Bay is the sink for all the industrial, agricultural and residential wastes from the communities around the lake. Mercury is among the pollutants that can be present in the industrial wastes. The levels of total mercury in sediment and water from selected rivermouths in the different bays of Laguna de Bay were determined. Shrimp, bivalves and fish were collected from the different bays and were also analyzed to total mercury. Among the fish samples pooled were ayungin, tilapia, kanduli and biya.

The total mercury concentrations in the samples collected were associated with the natural and industrial activities in the different bay areas. AATotal mercury analysis was done using cold vapor-atomic absorption spectroscopy (CV-AA). The total mercury concentrations in water were non-detectable and levels in sediments ranged from non-detectable to 0.112 ug/g Hg. Sediment from Manila Bay had a total mercury concentration of 0.112 ug/g Hg but among the sediment samples from the rivermouths, sediment from Bay-Calauan River had the highest total mercury concentration (0.019 ug/g Hg). Non-detectable levels were determined from the sediment samples from Sta. Cruz and Pagsanjan Rivers.

Total mercury concentrations in sediments were within the acceptable limits of 0.4 ug/g Hg. The shrimp and tulya analyzed, those from Napindan Channel had the highest total mercury concentration (0.0070 ug/g Hg for shrimp and 0.0034 ug/g Hg for tulya) and the lowest was in shrimp from Tanay (0.0013 ug/g Hg). Total mercury concentrations of fish from the different bays showed mercury contamination but of relatively low levels and did not exceed the acceptable limit of 0.5 ug/g Hg. Biya from Sta. Rosa had the highest total mercury level (0.052 ug/g Hg) and the lowest level of 0.002 ug/g Hg was in tilapia from Tanay and Tunasan and biya from Sta. Cruz. Although the total levels of mercury in the water, biota and sediment analyzed were low and were within the acceptable limits, mercury may tend to accumulate in the body of the organisms when they are constantly exposed to it. However, accumulation depends on the size, age and the feeding habit of the organism. Mercury in fish and shrimp can find its way from the base of the food chain to the end consumer when the shrimp or fish is eaten by another fish which is then eaten by a larger fish or by man or when tulya, a filter-feeder is eaten by man.

AQUINO, JESSA O.

Assessment of the Management of Water Service Facility in Barangay Santa Cruz, Bay, Laguna, Philippines –2016.

Santa Cruz Water Service Cooperative is the present institution that manages the water service facility in Santa Cruz, Bay, Laguna. Laguna Water District Aquatech Resources is being proposed as the new management entity. In order to assess the water service facility management in the area, household survey, Transect mapping, Key Informant Interview, Focus Group Discussion and secondary data gathering were conducted.

It was hypothesized that several socio-demographic and economic as well as structural and contextual factors affect the constituent's choice on the water delivery services management. It was found out that the socio-demographic and economic characteristics are not significant water management services entity preference. However, cost of water, payment adequacy, repair and maintenance services, policy on disconnection and sense of ownership to water service facility are positively correlated with the respondents' preference with their choice leaning towards the Cooperative. Likewise, majority of the respondents still preferred the Cooperative in water delivery services in the area.

In conclusion, a number of complex changes are expected to happen from the present due to the uncertainties in environmental behavior, pollution and population pressure. The institutions should have improvements to face these intricacies that may pose danger to the resources present in the community.

ARMERO, MARYJOIE A.

Melanomacrophage Centers (MMCCs) Proliferation in the Liver and Spleen of Nile Tilapia (*Oreochromis niloticus* L.) as a Biomarker of Pesticides Loading in the East Bay of Laguna de Bay, Philippines. -- 2011

Freshly caught *O. niloticus* were collected from Paete, Pila, Bay and fishpond in five consecutive weeks during dry and wet season to measure the level of exposure and impact of pesticides in aquatic fauna specifically the Nile Tilapia through the proliferation of MMCs in liver and spleen. Purposive interview with farmers were also conducted. Key focus of the interview were on the pattern of usage of pesticides, kind, brand name of pesticides, dosage, and frequency of application of pesticides used and the area of the farm. Study revealed that there were significant differences in the number of splenic MMCs for dry and wet season, X^2 value of 10.267, $P < 0.05$ and $KW = 0.018$, $P < 0.05$ respectively. But there were no significant differences in the sizes of MMCs. There were significant differences in the average pigment composition among the different MMCs pigment structure in each sampling site : reference pond during dry season ($X^2 = 10.50$, $P > 0.05$) and wet season ($KW = 0.002$, $P < 0.05$); Bay area during dry season ($KW = 0.05$, $P = 0.05$) and wet season ($KW = 0.05$, $P = 0.05$) in Pila area during dry season ($KW = 0.002$, $P < 0.05$) and wet season ($KW = 0.015$, $P < 0.05$); and in Paete area during dry season ($KW = 0.009$, $P < 0.05$) and wet season ($KW = 0.006$, $P < 0.05$). The hepatic MMCs, had appeared to be smaller in size and have an average of one (1) MMC during dry season, while, mostly absent during wet season in all selected sampling site. Interview results showed that the most widely used pesticide by farmers in the East Bay region is Brodan. The active ingredients in Brodan are chlorpyrifos (organophosphate) and BPMC (carbamate). The pattern of pigment compositions of MMC observed among test sites suggests that the type of pesticides mostly used by farmers may have influence on macrophage development.

It was also found that the recommended dosage rates on the package of pesticides were not quite comprehensible and confusing to farmers, which may lead to misuse and malpractice. Hence, these consequences may result to pesticide pollution, toxicity in fish and even bioaccumulations.

ARREZA, KALEB P.

Assessment of potential human health risk from exposure to select heavy metals in road dust around mining sites in Carrascal, Surigao del Sur, Philippines—2020.

Road dust samples around human settlements nearby mining areas in Carrascal, Surigao del Sur, Philippines were investigated to quantify the levels of and assess the potential health risks from select heavy metals. Metal concentrations of chromium (Cr), nickel (Ni), manganese (Mn), and zinc (Zn) in road dust were analyzed using Energy Dispersive X-ray Fluorescence (EDXRF) spectrometer. Analytical results showed that the average concentrations of Cr, Ni, Mn, and Zn were very high at 15,668, 14,814, 7,054, and 684 mg/kgdw, respectively. Measured concentrations exceeded standards stipulated in international regulations and guidelines by several orders of magnitude. Mortality and morbidity cases with causes probably related to dust inhalation (e.g., upper respiratory tract infection and pneumonia) noticeably increased during the peak years of mining operations. Non-carcinogenic health risk assessment revealed that children are more prone to develop non-carcinogenic health effects than adults (HI values > 1 for Cr, Ni and Mn for children and only Cr for adults), owing to their smaller body weight and activities exposing them to these metals via the ingestion route. Assessment of carcinogenic risk value or the lifetime probability of an individual to develop cancer due to exposure to Ni revealed that such risk is negligible. This study suggests that mining companies and government units should proactively take measures to reduce dust exposure (e.g., dust inhalation) of mine workers and residents in nearby communities. In developing management measures, children should be provided attention given their greater risk of developing dust-related illnesses and diseases.

ASIA, FACUNDO B.

Bio-physico-chemical and socioeconomic assessment of Sarnap Lake in relation to its fishery productivity. -- 1990

The main concern of the study was to assess the bio-physico-chemical and socioeconomic factors affecting the productivity of Sarnap Lake as bases for the formulation of policies on optimum lake utilization. Baseline data on selected bio-physico-chemical characteristics of the lake gathered and analyzed from November 1987 to April 1988. Trends observed were compared with those of other lakes in the country, particularly those found in Luzon. Apparent similarities were noted. Socioeconomic data on the fishing households in the study area along the levels of fish production for open fishing in the lake, were also established. Aggregate fish production during the study period was 6,287.6 kilos, with gill net giving the biggest share (31.3percent) of the catch. It was followed by fish shelter (28percent), pole and lines (23.2percent), and fish traps (17.5percent). The productivity of selected fishing gears was determined, as well as the bio-physico-chemical changes and the socioeconomic factors, which affect productivity. Simple cost and returns analyses of the different fishing gears revealed that they were economically profitable, except "as-asad.". Recommendations on how to develop and manage the lake's resources were formulated based on the findings.

ASIO, JOHANNES REINER G.

A Thematic Analysis on the Organismic Impacts and Environmental Safety of Sodium Lauryl Sulfate.—2022.

Due to its ubiquitous presence in the environment and the lack of a scientific consensus regarding the environmental safety of the widely used anionic surfactant Sodium Lauryl Sulfate (SLS) (CAS No: 151-21-3), a systematic literature review (SLR) and qualitative synthesis was conducted by reviewing all studies about SLS in the environment in key databases, with coding methods being done to identify impact categories from SLS exposure and Qualitative Evidence Synthesis (QES) without potential narration bias.

Based on the limited number of studies on SLS, there is empirical evidence of SLS contributing to environmental toxicity at various concentrations (0.004 - 3509 mg L⁻¹), with aquatic organisms at higher risk from SLS exposure. Furthermore, exposure to SLS can elicit changes to various organismic processes and environmental equilibrium. Hence, further study on SLS in various environmental compartments is recommended to monitor the level of SLS pollution, understand its behavior upon contact to various environmental media, and understand its impacts to flora and fauna. Lastly, SLS quantification should be done on commonly-used consumer products to potentially regulate its use and to consequently curb SLS pollution from source.

AUSTRIA, CESAR O.

Environmental performance of the forest products research and development institute -- 2002

The environmental performance of Forest Products Research and Development Institute (FPRDI) was assessed in terms of input, emissions, clients, and resource measures. Initial assessment review was conducted. The FPRDI had low performance in terms of input measure, lacking comprehensive environmental health and safety policies and having low compliance with national environmental policies. Its funding for environmental projects was only 0.5percent of its total annual budget and it had low commitment to the continuous improvement of its environmental performance. It had low performance in terms of emissions measure. It had inadequate air pollution control measures, it did not treat its effluents prior to disposal into the creek and it had no solid waste management program. The FPRDI had low performance in terms of resource use measure. Its energy use was inefficient. It had wasteful use of water and has not undertaken water recycling. Some of its facilities posed hazard to its employees and had no proper management of chemical supplies.

The Institute had mixed performance in terms of client measure. It addressed the needs of its external clients and acted speedily on their complaints. However, the internal clients were exposed to occupational and health hazards in the work place. The negative impacts on its external clients included pollution of Molawin Creek and deterioration of ambient air quality. The over-all environmental performance of the Institute was low. The Institute's personnel were aware of the various environmental management practices. They were willing to be part of the environmental unit and to spend extra effort and time to attend relevant training. This proposed unit shall formulate environmental policies, an environmental management system and conduct environmental audit. A priority action plan to improve the FPRDI's environmental performance is proposed.

AVILA, TEODORA N.

Socio-cultural and economic correlates of farming systems at Bagong Silang, Los Banos. -- 1987

The study described the farming systems in Bagong Silang, Los Banos situated within the Mt. Makiling Forest Reserve, and the socio-cultural and economic circumstances of the farmers. It also examined the extent to which socio-

cultural and economic variables are associated with farming systems identified. Structured interview schedules were used in gathering data for both the preliminary investigation phase and the formal survey phase of the study. Unstructured interviews with the Barangay Captain and other key informants were also conducted.

Upland farmers who are household heads composed the respondents of the study. Generally, the respondents belong to the middle-age group, have low level of educational attainment and have a mean annual gross income of P16,405.70. Cropping system served as the basis for classifying farming systems in the area since other components such as livestock production and involvement in non- and off-farm enterprises play relatively minor roles as compared to crop production.

There are four cropping systems in the area namely : intercropped annuals (IA), intercropped perennials (IP), intercropped annuals and perennials (IAP), intercropped annuals-intercropped perennials (IAIP). The intercropped annuals was treated as a special category since there are only two respondents adopting it. Thus, quantitative and qualitative analysis were focused on the other three cropping systems. Of the 24 variables tested for association with farming systems, only four were found to be significant using the chi-square method. These are : family life cycle stage, interaction with neighbors, identification and interaction with leaders in the community and size of land cultivated. Respondents in the beginning and contracting stages of family life cycle adopt the IP cropping systems, while those in the expanding and the retirement stages adopt the IAP system. Respondents who interact with neighbors in social and economic terms adopt the IAP and the IAIP cropping systems, while those who interact with neighbors on social terms adopt the IP cropping systems. Respondents who have interaction only with the barrio captain adopt an IP cropping combination, while those who interact with the barrio captain as well as the councilors adopt the IAP or IAP cropping system. Respondents with large size of land for cultivation adopt the IA, IP and IAP cropping system, while those with small land size cultivated adopt the IAIP cropping combination. The qualitative analysis of the study, showed that variables such as : use of hired labor, number of farm parcels owned, household size, and ethno-linguistic identification of respondents also affect variations of farming systems in the area.

BAACO, ALLAINE T.

Institutional arrangements in the management and utilization of the Iwahig upland ecosystem -- 1999

This study was designed to assess the influence of institutional processes on the sound utilization and management of the publicly-owned upland resource of the Iwahig Prison and Penal Farm (IPPF) reservation. Specifically, it aimed to identify the institutional stakeholders; determine the management strategies they employed; determine the extent of their participation in the planning and enforcement of policies and regulations pertaining to environmental protection; determine the socio-economic, environmental and political factors contributing to the utilization of resources. Above mentioned objectives were attained by gathering the data from the people who was supposed to be involved in the management of the IPPF's natural resources. Purposive sampling was used to determine the key informants who provided the data analyzed in this study.

There is no institutional arrangement among the stakeholders, namely : the Iwahig Prison and Penal Farm, the Department of Environment and Natural Resources, and the City government of Puerto Princesa. The IPPF is the one who does the planning and the enforcement of policies formulated by the DOJ concerning resource use and management in the IPPF reservation. The City government and DENR's role only emphasized the regulation and monitoring of resource utilization to avoid over-exploitation of resources. The study also revealed that the presence of the inmates contribute to the preservation of the area.

BAGARINAO, RICARDO T.

Salinization of aquifers and estimation of its damage and the cost of groundwater protection in Cebu City, Philippines -- 1999

Seawater intrusion, which is caused by over-extraction is a major problem in Cebu City. This study was conducted to estimate the costs associated with seawater intrusion and the protection of the aquifer from further intrusion. A benefit-cost analysis for reduction of extraction using surface water, desalted water, desalted saline groundwater, and metering was conducted. Cost-based approaches including averted expenditures, cost of illness, and loss of revenue were used in the estimation of damages of salinization. The damage of intrusion on well production capacities (both private and MCWD) and on health (i.e, urinary tract infection and renal failure) was valued. The damage by distance of seawater intrusion was also determined. Estimation showed that the costs of seawater intrusion is about PhP130.6 million which is almost 0.2 percent of the 1997 gross provincial product (GPP) for Cebu. About 93 percent of this total is due to loss of well production capacities while 7 percent is accounted for the health damage.

The costs vary with the distance of seawater intrusion from the coast. The distance category 0-500 m has the highest value of impacts ranging from PhP0.14 million for the loss of drinking water to PhP4.12 million for health damage. The distance category 1500-2000 m got the lowest estimated value of damage. Reducing the groundwater extraction to the safe yield through metering would cost P420.48 million, which is 47 percent lower than the cost to be incurred if surface water were used, 600 percent for the desalted seawater alternative, and 300 percent if desalted saline groundwater

were used. The reduction using desalted seawater has the highest estimated cost of P3.11 billion. The benefit-cost analysis for these strategies indicated positive net present values (NPV's) for metering and shifting to surface water and negative NPV for the others. The results justify the implementation of the proposed surface water development projects in Cebu and the intensification of metering in the area.

BAGUI, DIANE ESTEPHANIE M.

Recycling of Swine Anaerobically Digested Sludge and Liquor as Organic Fertilizer. -- 2015

The intensification of swine production increases the needs to manage the wastewater from the farms to prevent pollution of surface water, groundwater and air. Recycling of fresh swine anaerobically digested sludge as organic fertilizer and liquor from digested-facultative lagoon system as irrigation water on the growth and yields of transplanted mustard and okra grown in the greenhouse are evaluated. Different sludge amounts, application methods and incubation periods and liquor dilutions were used.

The band placement, deep application (10-cm depth below the surface level) and mixing with the soil are not significantly different in improving the growth and yield of mustard, but deep application performs well. Three and six weeks incubation of applied sludge are also not significantly different. Considerable amounts of organic carbon are added into the soil with sludge application as organic fertilizer. A ton of fresh sludge can potentially add 327kg of organic carbon into the soil.

Pure liquor with BOD of 212 mg/l from swine digester-facultative lagoon system is not significantly different with diluted ones as irrigation water for mustard and okra production.

BALDERO, KATRINE MAE L.

Vegetation Analysis of Rehabilitated and Unrehabilitated Area in an Inactive Mined Out Site in Mogpog, Marinduque, Philippines. -- 2016

The vegetation analysis was done to evaluate the rehabilitation efforts done in the inactive mined out site of Consolidated Mines Incorporated in Mogpog, Marinduque through the collaboration of UPLB, LGU of Mogpog and BLGU – Capayang last 2007. Soil analysis and plant diversity assessment was conducted by establishing six (6) 20m x 20 m quadrats, four in rehabilitated and two in unrehabilitated area. Soil samples were collected in each quadrat and were screened, air dried and submitted to BIOTECH and CA_ CASL of UPLB. Plant diversity assessment was conducted by quadrat nesting. Key informants and selected respondents (n = 112) were interviewed.

Results of the study show that there is a minimal difference in soil characteristics between rehabilitated and unrehabilitated area. There is a 90% difference between the two areas in terms of basal area while only grasses are dominant in the unrehabilitated area. Based on the survey, there is a high awareness among the respondents on the rehabilitation efforts and its impacts on the mined-out area. About 95% of those interviewed expressed willingness to take part in future rehabilitation activities.

BALTAZAR, DALTON ERICK S.

A River Health Status model based on water quality, macroinvertebrates and land use for Niyugan River, Cabuyao City, Laguna, Philippines -- 2012

A River Health Status Model was created for Niyugan River. The model consists of two component parameters : response and pressure. The response parameters, water quality (represented by 15 indicators : pH, Cadmium, Lead, Chl a, TSS, surfactants, air and water temperature difference, DO, Conductivity, BODs, Phosphorus, TKN, OG, Total coliform, and Fecal Coliform) and Ephemeroptera-Plecoptera-Trichoptera (EPT) proportion measure the current state of the river. Pressure parameters, land use, infrastructure, and riparian vegetation proportion represent the factors that can aggravate or worsen the current river condition. Water quality indicator values were determined using on-site measurements and water samples brought to MTEC Laboratories. Benthic macroinvertebrates were collected from all the eight sampling sites. The land use, infrastructure, and riparian vegetation proportions were derived from a map created using Arcmap 10. For efficient parameter input and sensitivity analysis, a calculator-like interface was developed using Stella modeling software. The river health score resulted to a value of 37.07, which corresponds to a "poor" river health.

Sensitivity analyses showed that the river health score is influenced at a greater extent, by the combination of water quality indicators rather than the number of water quality indicators included in the model. River health score was also found to be influenced by the magnitude of separate indicators within a parameter category. Therefore, the model should be evaluated using data sets from other rivers to further investigate its sensitivity. This model can be used to establish the health of other river tributaries of Laguna Lake. It can also serve as a basis for developing more dynamic river health models for the Philippines.

Carbon storage of land cover types in the Western margin of Mt. Makiling, Laguna, Philippines -- 2003

Carbon storage of land cover types that represent stages of a commonland use system in Barangay Puting Lupa, Calamba City, at the western margin of the Mt. Makiling Forest Reserve was determined. The land cover types are an open kaingin (cultivated for 1 year), 13- and 22 year old abandoned kaingins, ipil-ipil (*Leucaena leucocephala*) - dominated stand, and secondary forest located at the ridges. The C stock in the following pools was measured using field methods : live trees, coarse woody debris, understorey vegetation, standing litter, coarse-and fine roots, and soil up to a 30 cm depth. AADeterministic models were used to estimate aboveground tree biomass and coarse woody debris necromass. The estimates for C stored in live trees are : 19.09 - 40.13 Mg/ha for the open kaingin; 24.78 - 46.62 Mg/ha for the 13 year old abandoned kaingin; 38.00 - 67.16 Mg/ha for the 22 year old abandoned kaingin; 38.75-74.78 Mg/ha for the ipil-ipil stand, and 33.42-67.16 Mg./ha for the secondary forest. For coarse woody debris, the estimates are : 1.66-2.58 Mg/ha for the open kaingin; 0.11 Mg/ha for the 13 year old abandoned kaingin; 2.21 - 3.17 Mg/ha for the 22 year old abandoned kaingin; 10.43 Mg/ha for the ipil-ipil stand, and 3.34 - 6.72 Mg/ha for the secondary forest.

The understorey C stocks are : 0.02 Mg/ha for the open kaingin; 5.71 Mg/ha for the 13 year old abandoned kaingin; 0.90 Mg/ha for the 22 year old abandoned kaingin; 6.55 Mg/ha for the ipil-ipil stand, and 0.72 Mg/ha for the secondary forest. The estimated C stocks in standing litter are : 1.352 Mg/ha for th open kaingin; 3.075 Mg/ha for the 13 year old abandoned kaingin; 3.038 Mg/ha for the 22 year old abandoned kaingin; 3.044 Mg/ha for the ipil-ipil stand, and 3.501 Mg/ha for the secondary forest, while for roots, the values are : 0.524 Mg/ha for the open kaingin; 0.618 Mg/ha for the 13 year old abandoned kaingin; 0.517 Mg/ha for the 22 year old abandoned kaingin; 0.877 Mg/ha for the ipil-ipil stand, and 1.767 Mg/ha for the secondary forest. AAThe open kaingin has the lowest total soil C storage (42.11 Mg/ha), followed by the 22 year old abandoned kaingin (50.74 Mg/ha); secondary forest (57.70 Mg/ha); 13-year old abandoned kaingin (57.83 Mg/ha), and ipil-ipil stand (66.65 Mg/ha). AAThe land cover types, in decreasing order of total C stock are : ipil-ipil stand secondary forest 22-year old abandoned kaingin 13 year old abandoned kaingin open kaingin. Estimates for C stock and aboveground C accumulation rates (2 Mg/ha/yr for the abandoned kaingins and 2-3 Mg/ha/yr for the ipil-ipil stand) indicate that belowground C storage is less prone to losses from land use and natural disturbances but greater C sequestration will be potentially achieved aboveground. Land use analysis of the study area indicates that for the past 20-30 years the system has been in CO₂ equilibrium, and that a potential net gain in total system C stocks can occur if the direction of land use continues to shift towards permanent tree-based systems (agroforests), with adequate protection of regenerating lands.

BARIL, MA. THERESA

Environmental changes and resource use patterns among the Aeta in the Kanawan reservation area, Morong, Bataan - 1995

The study was conducted to describe and analyze the resource use pattern (RUP) of the Aeta in Kanawan Reservation Area in Morong, Bataan as a result of environmental changes that have taken place, primarily shrinking forest areas and the penetration of market economy. The methodologies used were participant observation, key informant interview and household interview. The Aeta traditional resource use pattern mainly consisted of wildlife trapping, forest products gathering and swidden farming. As traced to their resource use history, they have not fully abandoned these traditional subsistence strategies. Instead, they employed a diverse resource use pattern by engaging in more than one strategy and by utilizing both the forest and farm zones of their agroecosystem. Their shift from swidden to sedentary farming, however, was brought about by ecological (deforestation), economic (market forces) and sociocultural (land tenure insecurity) factors.

Resource use patterns among the 35 households in Kanawan still varied in terms of the dominance of non-traditional activities (such as sedentary farming and wage labor) introduced to them by the lowlanders over traditional ones (like trapping and gathering). The pure Aeta families tended to diversify by combining the traditional and non-traditional while the mixed Aeta families tended to engage more in non-traditional. The non-Aeta families were fully devoted to non-traditional activities. Their resource use patterns were also found to be directly related to their degree of market linkage, defined here as the extent by which production and consumption is oriented to the market for obtaining basic needs as measured by four indicators, (a) source of inputs, (b) labor source, (c) disposal of products, and (d) dependency ration. The pure Aeta, mixed Aeta and non-Aeta households were found to have a low, medium, and high degree of market linkage respectively. Thus, the findings indicate that those who are engaged more in traditional and/or non-traditional strategies like the pure and mixed Aeta are less market-oriented than those who are fully devoted to non-traditional activities like the non-Aeta.

BARLA, CHRIS HAROLD M.

Life Cycle Sustainability Assessment of Solid Waste Management, Carmona, Cavite, Philippines. -- 2013

The solid waste management (SWM) program of Municipality of Carmona, Cavite, Philippines is recognized as one of the best in the country but needs to be optimized to ensure its sustainability. Life Cycle Sustainability Assessment (LCSA) was used to determine the best SWM scenario with the least global warming potential while enhancing economic and social sustainability. Out of four SWM scenarios, composting and recycling prior to landfilling and combustion had the highest global warming potential reduction while the scenario with composting and recycling prior to landfilling was the most economically viable using NPV, IRR and BCR as indicators. The best SWM scenario is the current management strategy of composting and recycling prior to landfilling but with enhanced income-generating activities. The SWM workers received minimal compensation and benefits but provided and guided with health and safety related precautions without human rights violation.

Since the software used for determining the global warming potential and energy yield and management cost and benefits of each material is based on the technology developed in advanced countries, it needs to be adopted using local technologies and market prices. Improvement in life cycle social assessment of the workers is recommended. An extended implementation period may also be used to analyze the economic sustainability of the management efforts such as waste-to-energy facility in the case of combustion.

BARRE, ARDEL S.

Environmental impacts of land use systems within the Western Mindanao State University experimental forest at Upper La Paz, Zamboanga City -- 1995

The study was conducted to determine the present ecological status of the WMSU Experimental Forest and how it could be affected by the different land use systems applied to it. These were established through a Resources Basic Inventory and interview of key-informants who have been in the area for at least twenty-five years. The results showed that the WMSU Experimental Forest is a marginal second growth forest with few patches of old growth forest stand. Logging, followed by extensive and unsustainable upland farming practices, caused the denudation of the area. Migration, which further degraded the bio-geo-physical resources in the area, stands as an obstacle to resource development through natural regeneration. New land use systems in the area, such as the fighting-cock breeding, added pressures unto the already heavily burdened natural resources, threatening its very existence.

Immediate action is needed to protect the remaining resources in the area. This will not only benefit those who directly depend on such resources but also to its adjacent protected area, the Zamboanga Watershed Reservation.

BATANG-AY, MILANIE JUNE C.

Floral diversity and utilization of resources in two *saguday* property regimes in Sagada, Philippines – 2015.

The study was conducted to assess the *saguday* under common and private property regimes of Fedilisan and Tanulong *ilis* in Sagada based on three major factors: floristic diversity, utilization and equitable access of resources. Circular plots composed of three concentric circles randomly distributed within the sampling plots were used to gather and analyze data on floral diversity. A total of 336 individuals were interviewed using semi structured questionnaires to determine the resources they gathered and to analyze their knowledge, attitudes, perceptions, and participation in *saguday* management. The data were analyzed using descriptive statistics and chi-square tests. Key informant interviews and focus group discussions were also employed to cross-check data derived from the interview.

Different floral diversity indices were computed to ensure significant level of confidence in the results and revealed a higher diversity in the *saguday* managed as common property. Furthermore, soil characteristics are not a major determinant in the biodiversity assessment since there is no consistent significant difference in the soil characteristics of the areas.

Tangible benefits are derived in both the *sagudays* managed as common and as private property. However, the beneficiaries of the resources for the commonly managed *saguday* are the *sinpangapo* or the *dumap-ay* while only the family members benefit for the privately managed *saguday*. Additionally, *sagudays* managed as common property are utilized because of its intangible benefits such as cultural, religious, recreation and tourism purposes.

Only a few residents were knowledgeable of the *saguday* indicating weak information transfer from the older to the younger generation. The membership, allocation, harvesting and management rules are based on customary laws are orally transmitted from generation to generation. With the different developments happening in the area, the *saguday* are being threatened but can be strengthened with collective participation of different institutions. Nonetheless, the respondents are willing to cooperate and support management initiatives to be able to sustain the *sagudays* in the communities. The knowledge, attitude, perception and participation of the respondents based on the type of management employed were also analyzed and found out that there is a difference in the form of acquisition and the rules and regulations employed.

The institutional robustness of the *sagudays* was also evaluated based on the different attributes or design principles that are illustrated by long-enduring common-pool resource institutions. Based on the result of the study, most of the different attributes are exhibited by the *saguday* managed as common property that could explain the relative success of the community-based institutions in local management.

BAUTISTA, MA. ABIGAIL V.

Guimaras Island as a habitat for wild pollinators of mango (*Mangifera indica* L.) – 2016.

This study assessed Guimaras Island as a habitat for wild pollinators of mango based on two basic requirements: nesting site and floral resource. The result of the study showed that Land Use Type Forest, providing both cavity and ground nesting for pollinators at a nesting availability index value of 100%, had a land area of 11,006.91 ha which made up 18% of the province's total land area.

Among *Tetragonula biroi*'s preferred floral resources, coconut had a considerably wider land area allocated (9,607 ha) and flowered all year, making it the most stable food source for local bees in the island.

Coconut areas found under Land Use Type Forest, representing pollination supply, had an area of 3,865.88 ha or 6.39% of the island province's total land area. However, pollination supply areas within mango areas was only 39.81 ha which was 2% of the latter's (2,436.64 ha) and 0.07% of the island province's total land area. The 250- and 500-meter buffer zones, inclusive of the pollination supply areas, covered 49% (1,189 ha) and 78% (1,903 ha), respectively, of the island province's total mango land area; hence, the remaining 22% of the mango areas were beyond the 500-meter foraging distance of *T. biroi*.

BAUTISTA, MARIA ALTHEA T.

Resilience of Flood Risk Barangays in the Municipality of Bay, Laguna, Philippines -- 2019

A survey of 245 respondents assessed the resilience of flood risk barangays in Bay, Laguna, namely Tagumpay, Maitim and San Isidro, based on their access to the five resilience dimensions (human, social, physical, financial and natural), derived from the Sustainable Livelihoods Framework (SLF). 24 indicators and 68 sub-indicators under the five resilience dimensions were subjected to Balanced Weighted Approach and Analytic Hierarchy Process, to derive their level of resilience to flood. From 1986-2016, total rainfall in Bay is variable across seasons: DJF season showed an increasing but not significant trend; MAM season showed a slightly increasing but not significant trend; JJA season showed an increasing but not significant trend; and SON season showed a decreasing but not significant trend. A horizontal flood timeline was generated based from observed anomalies in total rainfall, coupled by results of the household survey and Key Informant Interview. Flooding in the study areas are usually caused by tropical cyclones and the southwest monsoon. Flood Resilience Indices showed that Maitim consistently have higher indices compared to San Isidro and Tagumpay. Results can be used by the community and local government in prioritizing measures to avoid and reduce impacts associated to flooding.

BAYHON, MARIS ASUNCION L.

Detection of Lead in Groundwater and its Remediation Using Nanosilica/Chitosan-coated Superparamagnetic Iron Oxide Nanoparticles in Los Baños, Laguna, Philippines -- 2022.

A novel Nanosilica/Chitosan-coated Superparamagnetic Iron Oxide Nanoparticles (NSCSmag) were developed for removal of lead Pb(II) from the aqueous solution by adsorption. Several techniques, such as Atomic Force Microscopy (AFM), Dynamic Light Scattering (DLS), X-Ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Dynamic Light Scattering (DSC), Raman spectroscopy, and Brunauer-Emmett-Teller Analyzer (BET), were used to characterize the product. Results showed that NSCSmag with core-shell dense coating was successfully prepared. Batch experiments were conducted to investigate the parameters affecting the adsorption of the novel magnetic nano-adsorbent to Pb(II), such as adsorption isotherm, kinetics, and thermodynamics.

The pseudo-second order model described the adsorption equilibrium with calculated q_e , 116.28 $\mu\text{g/g}$, statistically significant with the experimental q_e , 116.04 $\mu\text{g/g}$ ($p < 0.01$). Langmuir model was a better fit as the adsorption isotherm, and the predicted maximum adsorption capacity of Pb(II) was 260.42 $\mu\text{g/g}$. For the adsorption, exothermic, and decreased randomness at the solid/solution interface during the adsorption process, respectively. Results using Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) are determined with the following optimized conditions: 100 mg NSCSmag dispersed in a neutral 25 mL solution and shaken for 2 hours in a room temperature environment. The percent efficiency of NSCSmag in remediating 500 $\mu\text{g/L}$ Pb is around $94.60\% \pm 1.87$. The adsorbent could be reused at least five times using 1M HNO₃ as a desorbing agent. To test the NSCSmag in a real-life context, the adsorbent was used to remediate Pb in selected groundwater samples from Los Baños, Laguna. Pb was undetected after undergoing adsorption with NSCSmag. Thus, NSCSmag is a very promising adsorbent of Pb contaminated water.

BELGICA, MA. CHONA REANTASO

Assessment of biogas technology as a rural waste management alternative -- 1993

The study resulted in the following specific observations : 1) the generated effluent quality after anaerobic digestion falls below the standards set by EMB, DENR for receiving fresh waterbodies; 2) biogas technology is a viable treatment for the removal of obnoxious odors produced in livestock farms; 3) economic viability relies upon both the utilization of biogas technology by-products and as a pollution abatement measure; 4) maintenance of income generated from the livestock farm is the greatest factor towards adoption of biogas technology; 5) the resource recovery component of biogas technology particularly the biogas is also a strong attraction for its adoption; and 6) the level of knowledge and expertise of the rural biogas owners about biogas technology is adequate to sustain the operation and maintenance of a biogas system. However, adequate utilization of by-products is limited to biogas.

With the findings of the study, the following modifications are hereby suggested for incorporation in the design : 1) anaerobic pre-treatment sections can be eliminated not only to increase biogas production but to decrease total capital investment; 2) circular digesters are preferred than rectangular digesters to eliminate dead volumes for a more stabilized slurry and effluent; and 3) additional treatment system is needed after anaerobic digestion for the effluent to be discharged to receiving bodies of water or be re-use for irrigation, livestock washing, etc. The study therefore, recommended the following : 1) more emphasis on resource recovery component and waste treatment aspect; 2) more direct involvement of future biogas owners during construction for wider knowledge; 3) setting up of the nearest existing biogas system in the area as the demonstration set for credibility of its use and importance as well as its operation and maintenance capabilities; and 4) more capital support for the low level income rural farmers from the government and other agencies in order to meet the high capital expenditure for the biogas system.

BERGONIA, ALICIA

An analysis of eutrophication problem of Laguna de Bay -- 1995

An analysis of eutrophication problem in Laguna de Bay was conducted to determine the factors affecting and accelerating the eutrophication process, and to predict water quality or trophic state of Laguna de Bay and its impact on net primary productivity (NPP) and fish production. The study confirmed that industrialization of Laguna de Bay's watershed has caused population growth in the watershed particularly through migration. Industrialization attracts people looking for employment opportunities. As industries and population in the watershed grow rapidly, many less developed areas and municipalities become workplace and urbanized, and consequently, resulting to increased generation of industrial and domestic wastes with the Laguna de Bay serving as sink of these wastes.

Actual and project wastes generated by these industries have increased through time, and potentially contributing to eutrophication of the lake. Analysis, showed that the number of industries alone in the Laguna de Bay watershed from 1973 to 1988 was not significantly linearly correlated with neither nitrogen nor phosphorus levels in the lake. However, this does not suggest the industrialization has no effect on eutrophication. The data collection was not specifically designed to monitor the effects and impacts of these industries on the lake. Thus, strategic sampling points and cost-effective sampling strategy should be established to capture and isolate industrialization impact with other possible sources of eutrophication on the lake. Available historical data on three lake water quality variables, namely nitrogen, phosphorus and turbidity show increasing levels in time. Compared with international standards, the average concentrations of these nutrients classify the lake as highly eutrophic. In examining the effect of these parameters to net primary productivity (NPP), turbidity was found to be negatively correlated while nitrogen and phosphorus levels were positively correlated to NPP. Net primary productivity was found to be decreasing through time due to increasing turbidity. Likewise, fish production exhibited the same declining trend as net primary productivity.

BERGONIA, JOSEPH A.

Socio-economic factors affecting the crop diversity of farms in lowland forest in Subic Bay Freeport Zone -- 1998

The study focused on the Aetas living in the lowland forest of Subic and was conducted to analyze the socio-economic factors affecting the crop diversity of their farms, assess such farm crop diversity, and describe their farm management practices using different methods of diversity assessment. To determine crop biodiversity, it employed index of qualitative variation (IQV), Number of plant species (S), and biodiversity checklist. The study findings confirm that the Aeta farmers have been practicing the multiple cropping system and prefer to plant more crops because such system would make the crops not susceptible to pest and diseases, it would entail less costs and it would make the farm easy to manage. Aetas were able to adopt and learn ways to manage and operate their farm according to their schedules and their needs. Such farming activities were nevertheless found not to replace but to supplement the hunting and gathering activities of the Aetas. The Aetas consider their farms as ancestral domain and they do not have size limit for such farm. However, since they are mostly engaged in other activities like working as hired labor or involved in ecotourism activities

for Subic Bay Metropolitan Authority, their farm size only range from 0.5 to 1.50 hectares. The crop they grow in their farms are sweet potatoes, cassava, corn and gabi, and fruit trees like mango, guava, guyabano, banana, papaya and cashew. The Aeta farmer generally starts planting at the onset of the rainy season which is usually in May.

In terms of crop diversity, all the three measures of diversity showed that Aeta's farms are high in biodiversity, with an average computed IQV of 88 percent and an average S of 11 species. The multi-cropping system and farm management practices thus observed were found to fit the Aeta's daily activities, needs, and farm setting. For the regression model, the log-linear model was found to have the best fit with an R² of 81 percent for the IQV model and an R² of 75 percent for the S model. The significant explanatory variables common to both models and have an inverse relationship are involvement to other activities like ecotourism and hired labor and access to credit. Another is household size which has a direct relationship to the level of biodiversity. Other significant explanatory variables for the IQV model which have a direct relationship are capability of the farm, and household income. For the S model, both the tenurial security and age have a negative relationship.

The results from the IQV model and S model are not relatively different from each other. The study suggests that the thrust of the government which shows more inclination towards intensified mono-cropping system, must be aware of such consequences. Although there have been promotions in organic farming and integrated pest management, it is also necessary to encourage multi-cropping and to emphasize its benefits to biodiversity conservation. The study shows that a traditional agricultural system such as the Aeta's multiple cropping can be potential path towards biodiversity conservation. The interactions and dynamics of the determinants of crop biodiversity will provide a better measure for such farm management cum biodiversity conservation strategy.

BERNARDO, DORA FE H.

Crown-of-thorns Starfish (*Acanthaster planci*) Population Outbreak and its Impact on the Management of Coral Reef Resources of Hilapad Reef Fish sanctuary in Tolosa, Leyte, Philippines – 2015.

Coral reef cover of Hilapad reef Fish Sanctuary or Marine Protected Area (MPA) decreased from 60% live coral in 2004 to 10% in 2011. Based on remote sensing or satellite imagery, the natural factor that caused coral degradation is the Sea Surface Temperature (SST). SST range from 23-30°C in the area did not cause coral bleaching due to El Niño events or climate change since more than 30 C is required to cause coral mortality. However, SST of 27-28°C that occur during the midsummer in 2008 significantly triggers the spawning of Crown-of-Thorns (COT) starfish which is a coral predator.

According to the Key Informant Interview (KII) and Focused Group Discussion (FGD), COT outbreak was reported in 2008 but the COT population was never counted until 2011 when the present study was conducted. Likewise, local fishers in the community affirmed that their catch declined since the coral reefs were destroyed. They are aware that coral reefs are biologically productive habitat for feeding, spawning, breeding and nursery grounds of marine flora and fauna.

To further confirm the importance of the coral reef and the effect of COT starfish, the Cuatro Islas, an isolated MPA in the province were also assessed. There was no COT outbreak and coral cover was in better condition. Unlike Hilapad Reef, Cuatro Islas has no human settlement and agro-industrial development such as beach resorts, houses, coconut plantation, and oil mill with port. The former is situated in San Pedro Bay which has water current that is conducive for COT and human settlement. Tolosa is prone to erosion based on the geo-hazard map and the high rainfall brings the silt as river run-off to the sea. Thus, sedimentation or siltation due to land use change was considered as the anthropogenic factor. Human use of coastal zone has increased the nutrients flowing to the sea and resulted in an increase in planktonic food for COT larvae. The pH of the water from the broiler was tested and found to be at 11.8 which is lethal to fish and other marine organisms. Based on the 2011 Fish Visual Census, one family was no longer found as compared to 2009 data from BFAR. Photo documentation was taken during the reef survey to identify other species or invertebrates that are involved in the predator-prey relationship of food chain and ecological succession.

FGD and KII were summarized using the SWOT analysis. Within the 18-day sampling, COT gathered in the site has density of 256 species ha⁻¹ with a mean weight of 461 g per individual- a value which is considered an outbreak.

Coastal Resource Management (CRM) issues were identified and the remedial options were recommended to address the problem. A proposed revision of the Philippine Coastal Management Guidebook was suggested to include climate change or increasing SST and COT predation as indirect and direct factors, respectively. Further research on the economic use of COT and coral transplantation or artificial reefs are suggested areas for future studies.

BERNARDO, ROBERT G.

Environmental impacts and distribution of benefits of Apo Island marine sanctuary, Dauin, Negros Oriental, Philippines – 2001

The Apo Island marine sanctuary was evaluated in terms of its environmental (ie, coral cover and diversity, reef fish yield, fish diversity, and fish catch) and socioeconomic (ie., fishing income, household income, sanctuary income, skills development, environmental awareness, capacity to manage, and capability to enhance/generate local policies) impacts.

The study showed that there have been significant improvements in all the identified indicators since the sanctuary was established in 1984. However, measured improvements in reef fish yield did not seem to translate into increased fish catch among fishers. Fish catch was found to be decreasing in the last five years. Tourism has improved local employment and created alternative livelihood activities for local residents. Conflicts between scuba divers and local fishers seemed to be increasing, a possible indication that existing fishery and tourist activities may be nearing the carrying capacity of the island. Benefits derived from the sanctuary starting in 2000 is estimated to range from US\$193,138.08 to US\$238,487.28. Benefits from the island's coral reefs is estimated to be higher than previous estimates of sustainable coral reef economic benefits.

The Net Present Value (NPV) of the sanctuary's net benefits from 1979 to 2001 at 6 discount rate was computed at P134,758,657.66. Most of the total benefits starting in 1979 were attributed to fish catch (81.63percent), while most of the estimated costs incurred in managing the sanctuary were incurred by technical experts (38.50%) who were largely unpaid. The Benefit-Cost Ratio was computed at 4:64:1. Starting in 2000, a shift was observed in the distribution of benefits. Of the total benefits derived from the sanctuary in 2000, majority (50.86% to 59.67%) went to resorts and dive shops; only about 26.07% to 31.54% went to the community. Community benefits were mainly in terms of employment in resorts (32.61% to 33.97%), fish catch (31.42% to 32.07%), and ferry boat operation (21.71% to 22.16%). Apo Island has been a model site for community-based resource management, but the implementation of the NIPAS actually took the sanctuary's leadership away from the community to DENR, and apparently is creating a shift in local values from volunteerism to compensated labor contributions. Policy recommendations are discussed to address existing issues in the island.

BIBAL, ANA CHRISTINA M.

Political ecology of almaciga forest livelihood in Mount Mantalingahan, PALAWAN – 2020.

Almaciga (*Agathis philippinensis* sp.) within Mount Mantalingahan, Palawan is a significant economic-resource base of the national resin industry and livelihood of indigenous communities. Almaciga trees locally termed as bagtik with its high economic value, cultural meaning, and ecologically threatened and vulnerable status is considered a distinct forest genetic resource (FGR) in need of conservation. This qualitative research contributes to filling the void of scientific understanding of the socio-cultural dimensions, historical context, and political underpinnings that influence the sustainability of resin livelihood, forest conservation, and resource rights. Mount Mantalingahan host the last remaining ecologically intact, oldest, most extensive, and highly productive resin trees under distinct traditional forest custodians. The socio-cultural dimensions and historical policy dynamics of bagtik livelihoods are analyzed through the lens of political ecology. Narrative analysis of indigenous oral history keepers and participant observations revealed that the bagtik is considered a sacred heirloom tree that is central to their cultural heritage. Customary practices, cohesive community relations, intergenerational transfer of knowledge, and traditional knowledge contribute to the ecological protection and productivity of the Almaciga forest. Historical policy dynamics highlighted three political-ecological trajectories of analysis. First, the process of social appropriation of almaciga forest into an economic commodity under colonial forest regimes. Second, the peak production in the 1980s towards the mid-1990s saw the consolidation of private economic monopoly, ecological degradation, and marginalization under the dominant extractive and elite forestry sector. As a political response, indigenous resin tappers organized themselves, codified their customary laws and declared the Almaciga as exclusive communal forests and prohibited the practice of tipusod or blood pact, endowment, selling, and leasing of resin trees to non-IP migrant settlers thru strict observation of customary law. Third, the paradigm shifts to devolution, community forestry, and conservation in the 1990s to 2000s present critical moments in the political assertion of indigenous peoples' Almaciga concession rights. Instead of facilitating concession rights, the highly bureaucratic, tedious, and costly process had contributed to debt dependence and concession restrictions - resulting to market and bureaucratic co-optation of IP rights. Pervasive issues of discrimination, tourism encroachment, and privatization of forests hinder the realization of policy reforms from paper to practice. Uneven power relations, conflicting environmental worldviews, resource interests, and policy perspectives mold the complex politics of Almaciga forest livelihood in Mount Mantalingahan

BIGORNIA, JERICO STEFAN R.

Environmental Performance of Water Saving Technologies for Irrigated Lowland Rice Production. – 2016.

Field experiments and surveys in farmers' fields were conducted to assess the effects of direct seeded rice (DSR), alternate wetting and drying (AWD) and continuously flooding (CF) on rice crop health and the environmental risk of applying pesticides using Environmental Impact Quotient (EIQ).

Weed coverage was higher in DSR compared with both AWD and CF. Insect damages and diseases such as bacterial leaf streak and tungro were lower in both AWD and DSR compared with CF, but a higher incidence of rice blast was observed in AWD. There was no yield difference observed between AWD and CF. With the use of AWD, insecticide applications were reduced to an average of 1.17 per season, a reduction of more than 50% compared with CF (2.48). The number of herbicide applications did not vary significantly between AWD and CF (1.23 and 1.39,

respectively). Fungicide applications slightly increased from 0.84 to 1 application, because of the higher incidence of leaf blast in AWD. Overall, field EIQ was 4.78 and 7.42 for AWD and CF respectively, which illustrates a 34% decrease in potential environmental risk under AWD.

AWD should be promoted for it reduced pest problems resulting to low EIQ in addition to lowering the carbon footprint and water consumption in rice production.

BIGUERRAS, MALVIN G.

Effects of Land Cover Change and Population Growth on the Water Budget of Lucban-Botocan Subwatershed, Quezon-Laguna, Philippines – 2019

The study mainly determined the potential impacts of land cover change and population growth on the water budget of Lucban-Botocan Subwatershed. Part of the study was also to provide baseline information of the area through watershed characterization. Other analysis conducted include estimation of water budget using HEC-HMS model and assessment of impacts of land cover change and population growth on the water budget in 2015 and 2030. The MOLUSCE model was further utilized to generate the 2030 land cover of the watershed. Based on the results, the study was able to estimate the groundwater recharge for 2015 which amounts to about 16.9 MCM. The study also revealed the months of February to July as water deficit months while the months of August to January as water sufficient months. Overall, the estimated available water in 2015 across all months is still about 16.8 MCM.

The impacts of land cover change on the discharge volume of the watershed between 2010 and 2015 was also estimated and a decrease of 0.01 m³/s was observed. Moreover, the impact of population in 2015 on domestic water consumption was also calculated and the consumption was estimated around 997,720 m³. Meanwhile based on the modeling output of MOLUSCE, it was found that there's an increase in the perennial crop, closed forest, and built-up areas in 2030. The discharge volume between 2015 and 2030, on the other hand, was observed to decrease while the population in the area is expected to increase up to 64,158 individuals which further increase the domestic water demand in the future.

BILLENA, TESSIER REY M.

Adsorption and utilization of available nutrients from river water using coconut coir-charcoal briquettes -- 2003

Agricultural practices like the application of fertilizers release excess nutrients which find their way into ponds, streams, rivers and large bodies of water. On the other hand by products from industrial processes pose environmental problem of disposal. This study was done to recycle excess nutrients by adsorption on agricultural by-products.

Coconut coir dust (CCD) and Charcoal dust (CD) and their combinations were prepared as briquettes and analyzed in order to determine their ability to adsorb nitrogen, phosphorus and potassium from river water. The combinations were as follows : Pure CCD (T1), 25%t CD 75% CCD (T2), 50% CD:50% CCD (T3) and 75% CD:25% CCD (T4). The briquettes immersed in river water showed a slight increase in the nitrogen and phosphorus content (9.00% and 6.38% increase respectively) but not statistically significant. On the other hand, potassium was observed to be leaching out. The amount of leached potassium in pure CCD was higher than the other combinations. The combinations immersed in IAS lagoon water had significant increased in the nitrogen and phosphorus content. This was due to the relatively higher nitrogen and phosphorus content of lagoon water (124.10mg/L and 44.49 mg/L respectively) compared to that of the river water (1.50 mg/L and 0.3 mg/L respectively). However, the different combinations had equal capacity to adsorb nitrogen. Phosphorus adsorption showed that 75% CD: 25% D had the highest amount adsorbed (54.58%-83.70 %) followed by 50% CD: 50% CCD (28.76% - 10.72%). The same pattern of potassium adsorption was observed. The amount of nitrogen and potassium adsorbed by the combinations were affected by the concentration of nutrients in the water. Furthermore, the different combinations of charcoal dust and coconut coir dust had the same capacity to adsorb nitrogen. Phosphorus adsorption is directly correlated with the amount of charcoal dust present in the combination.

Utilizing the adsorbed nutrients from the different combinations in growing mungbean resulted to a comparable plant growth of mungbean planted in garden soil. Plant height, shoot fresh and dry weight, root length, root fresh and dry weight, root to shoot ratio, total leaf surface area and average number of leaves were observed for 20 days. The different briquettes, which were soaked in river and lagoon waters, were evaluated as a growing medium for mungbean. The growth parameters evaluated did not show significant differences with the ordinary garden soil.

BINOBO, GIDEON D.

Plant diversity in a Subanen community in Mount Malindang Natural park, Philippines -- 2004

This study focused on the inventory of plant diversity along the three levels of biodiversity in Barangay Lake Duminagat, Don Victoriano, Misamis Oriental; documentation of Subanen indigenous classification of biodiversity resources; and documentation of Subanen beliefs and practices related to biodiversity conservation and management in Mount Malindang Natural Park (MMNP). Results of the study showed that MMNP is biologically diverse along the three

levels of biodiversity. At the ecosystem level, various terrestrial and aquatic ecosystems contributed to ecosystem diversity. At the species level, mostly forest tree species achieved the highest importance value in different ecological zones. Furthermore, the differentiation of crops into several varieties in Subanen agroecosystem revealed genetic diversity. Results of the study also disclosed that Subanens classify biodiversity resources based on indigenous uses, which contributed to use diversity along the three levels of biodiversity.

Subanens also possess some beliefs and practices related to biodiversity utilization, conservation and management. First, Subanens believe that MMNP is their ultimate home, legacy and last frontier. Thus MMNP deserves protection. Second, Subanens look up to their past leader Pedro "Mali" Villamino as a source of instruction and inspiration in utilizing and managing Lake Duminagat and the forests. Third, Subanens consider Lake Duminagat as very sacred, thus the use of Lake Duminagat is governed by some indigenous sanctions. Fourth, Subanens believe that Lake Duminagat and adjacent forests are interdependent. Thus the adjacent forests need to be conserved in order to sustain the water in the lake. Fifth, Subanens believe that there are various spirits living in different parts of the environment. And in view of their observance of tabiya (self-regulation because of the fear that spirits might be offended), access to and utilization of biodiversity are regulated. Sixth, Subanens perform a set of rituals called kano, which facilitates community interactions that contribute to resolutions of some issues and concerns which include biodiversity utilization and management.

BOBILES, SAMUEL C.

Surfactant-aided bioremediation of Chlorpyrifos in the soil -- 2002

Bioremediation is the biologically catalyzed reduction in complexity of chemicals such as pesticides and petroleum oils by microorganisms utilizing them as carbon source for growth and metabolism. Bioremediation of pesticide contaminated soils is often hindered by absorption thus limiting the bioavailability of the chemical. Surfactants, compounds that reduce interfacial tensions, can enhance bioavailability of these chemicals. A laboratory study on the effect of a surfactant, coconut fatty alcohol sulfate (CFAS) on biodegradation rate of chlorpyrifos, an organophosphate insecticide, in the soil was conducted to evaluate the possible use of CFAS to facilitate bioremediation. Soil sampling and analysis were done at the National Crop Protection Center, UPLB, College, Laguna from January to March 2002. Four soil treatments with three replicates each, placed in covered square plastic containers were set-up to compare total bacterial colonies. Treatment 1 (T1) served as the control soil, Treatment 2 (T2) - with 0.5 g/L CFAS, Treatment 3 (T3) - with 3,125 ug/g chlorpyrifos 20EC and Treatment 4 (T4) - with 3,125 ug/g chlorpyrifos 20EC and 0.5 g/L CFAS. Total bacterial colonies served as an indication of the rate of biodegradation. The physico-chemical properties such as pH, organic matter, water holding capacity and textural grade of the soil used were determined to account for initial conditions that may affect total bacterial colonies. Total bacterial colonies were counted at 0, 7, 14, 21, 28, 35 and 43 days. Soil samples from T3 and T4 taken at 0, 21 and 43 days were analyzed for remaining chlorpyrifos using gas chromatography.

Values of the physico-chemical properties were pH, 6.0, organic matter, 3.55 percent waterholding capacity, 88.28 percent and a textural grade of clay. Mean total bacterial colonies expressed as 10^7 / 10g which do not differ significantly from each other. Total bacterial colonies for T4 (with chlorpyrifos and CFAS) ranged from 3 to 2870. From 14 days to 21 days, the mean total bacterial colonies for T4 increased by 1,893 percent. The increasing trend continued until 43 days. From 21 days to 43 days, total bacterial colonies increased by 2,199%. Mean concentration values for chlorpyrifos was significant at 0 and 43 days. Values (ug/g) for T3 were : 0 day, 1676 and 43 days, 837 and for T4 : 0 day, 1082 and 43 days, 338. T4 (with chlorpyrifos and CFAS) has a higher percentage decrease (75.94%) which complimented the high mean total bacterial colonies for this treatment compared with T3 (with chlorpyrifos) with a percent decrease of 61.33percent. The results showed that CFAS enhanced the rate of biodegradation of chlorpyrifos in the soil by increasing the bioavailability of chlorpyrifos for the growth and metabolism of bacteria. Half-life of chlorpyrifos in the soil from T3 using first-order kinetics was 43.31 days. T4 exhibited a shorter half-life of 25.67 days.

BONDOC, SARAHME CORAZON L.

Development of an environmental performance evaluation (EPE) protocol for a medium scale forest products-based furniture manufacturing firm in Pampanga, Philippines -- 2008

The study aimed to develop a reliable and cost-effective firm-level environmental performance evaluation (EPE) protocol for a Pampanga-based medium-scale furniture manufacturer that uses forest products as raw materials. The EPE consists of appropriate parameters, indicators and methods for monitoring and assessment of the firm's management and operational performances relative to the environmental conditions within the plant site.

Results of the initial EPE showed that the firm presently lacks an environmental management system although it maintains good general housekeeping and safety practices. Its manufacturing system generates solid wastes materials such as spent containers and material trimmings, dust emissions mostly during sanding and fumes from finishes and additives. Air analysis indicated that there are pressing concerns regarding the proliferation of nuisance dust and volatile organic compounds (VOCs) in the sanding and finishing departments. A key informant survey of supporting institutional roles and relationships conducted revealed that managing industrial environmental performance is perceived to be a

responsibility relegated to the individual firm since each firm has different strategies that are dependent on the environmental standards and regulations imposed by the Department of Environment and Natural Resources (DENR) and foreign vendors, buyers and traders.

Following the ISO 14031 standard, the designed firm-level EPE protocol includes parameters and indicators for measuring the firm's management performance in terms of environmental awards and penalties, operational performance in terms of efficiency of its manufacturing system and environmental conditions considering the management of dust and VOC emissions. The protocol also specifies the mobilization of an EPE group to spearhead the evaluation to be conducted at the last quarter of each year which is the peak of firm operation.

Analysis of potential costs and benefits using a SWOT framework indicated that the firm lacks sufficient working knowledge and technical skills, adequate understanding of related environmental issues and additional resources. However, EPE application may lead to increasing competitiveness and market demand for its furniture products, ensuring health and safety of its workers and employees and improving compliance and conformance to environmental regulations and standards. On the other hand, a benefit-cost analysis showed that the firm will have net present value (NPV) of P19,481,759 and -P2,702,994 with and without EPE, respectively, in 10 years at an 18% discount rate. With a benefit-cost ratio (BCR) of 1.36, the firm stands to gain more economic profits with an EPE system set-up despite the additional costs in its implementation; thus, the designed EPE system is more reliable and cost-effective to implement than using the present systems for monitoring and improving firm-level environmental performance.

BOONGALING, CHEAMSON GARRET K.

Modeling Run-off and Sediment Yield in Calumpang Watershed, Batangas, Philippines and its Response to Land Cover Change – 2015.

The study aims to determine the impact of land cover change and establish the relationship between landscape pattern and hydrologic processes within Calumpang watershed. Land cover change was measured using supervised classification of SPOT images in 2003 and 2008. Results showed an increase of build-up areas (69%) and a reduction of mixed vegetation including riparian vegetation (-10%), which have significant effects on hydrology. The SWAT model was used to quantify the impacts on hydrology. Manual adjustment of parameters based on literature and sensitivity analysis was done. Comparing outputs with field-measured data showed the model is acceptable.

Results showed a significant increase in surface run-off (5%) and sediment yield (6%) and a reduction in baseflow (-11%) for the whole basin. It also showed the spatial and temporal variation of the impacts of land cover change. Sub-basins that underwent land cover degradation experienced increase streamflow (up to 31%) during stormy months and reduced baseflow (up to 26%) during dry months. In contrast, sub-basins that exhibited improved land cover although minimally, have decreased stormflow (up to -4%), and increased baseflow (up to 5%) during dry months. At the class level, nine landscape metrics known to affect hydrology were quantified using Fragstats and was correlated with surface runoff, baseflow and sediment yield as a response variables. Partial least square regression (PLSR) technique was used to address multicollinearity of the metrics. The final regression model suggested that surface runoff and sediment yield tend to decrease with higher patch density (agricultural) and largest patch index (forest), and tend to increase with higher cohesion (agricultural) and aggregation index (agricultural). On the other hand, baseflow tend to increase with higher patch density (agricultural) and largest patch index (forest), and tend to decrease with higher cohesion (agricultural) and aggregation index (agricultural). To some extent, all other landscape metrics are related with the response variables; however, their contributions are not as significant. It is recommended that the results of this study be used for watershed planning and management.

BORNILLA, LUDIVINA F.

Residential land use of steep slopes in Baguio City -- 1995

The study discusses the land use policies that allowed the residential land use of steep slopes in Baguio City. The land values that prevailed at the start of the settlement and its appreciation were determined and the reasons of the people for moving in to settle in the slopes were identified. Key issues and problems related to the residential land use were determined and used to identify and evaluate impacts on the biophysical and socioeconomic aspects of life in the communities. The study also looked into the management strategies employed by the residents to the impacts of the land use.

BOUNMY PHOMMAKONE

Impact of climate variability on traditional upland rice production and farmers' adaptation mechanisms in Luangprabang Province, Lao PDR -- 2009

This study was conducted to assess the impacts of climate variability on traditional upland rice production and farmers' adaptation mechanisms in the three villages of Luangprabang Province. Specifically, it aimed to determine social

and biophysical characteristics; assess the upland-rice yield potential with the changes in temperature scenarios, analyze the farmers' adaptation mechanisms to low rice yield due to climate variability, and assess and recommend agricultural upland-use policy to meet food sufficiency and food security.

The primary data were collected through direct interviews with the respondents and focused group discussions (FGDs). The historical weather data 11 years were generated through the LARS-WG program, an additional 50 years of synthetic weather data. Both historical and synthetic weather data were used in the FORTRAN Simulation Environment (FSE) to simulate increasing temperature scenarios from +0NC, +0.5NC, +1NC, +1.5NC and +2NC using the ORYZA2000 crop simulation model. Simulation analysis showed that as the temperature increases the yield potential was reduced. However, an increase in temperature, it was more risky to upland-rice yield potential likewise increased the CV values. Low rice productivity, self-insufficiency, upland-use policy, natural phenomenon and poverty were the five attributes of adaptation which led the respondents to develop their own adaptation mechanisms to low rice yield. These adaptation mechanisms were classified into two types: cultural such as indigenous knowledge handed down from generation to generation; and change in cropping system such as shift from upland rice production to cash and annual crop productions.

Many upland rice cultivators were aware of the changing in the metrological factors and that the short- and long-term strategies and development plans of the government. Most of the farmers are in agreement with the direction the government is taking. The result of the focus group discussions with the key informants support the contention that shifting from upland rice cultivation to cash and annual crops improved their living conditions.

BRAGAIS, MILBEN ALEJANDRO.

Simulation of Runoff and Sediment Yield of Silang-Santa Rosa River Subwatershed, Laguna, Philippines. -- 2014

The KINEROS Model was parameterized to estimate runoff and sediment yield in the Silang-Santa Rosa River subwatershed. The parameter inputs required to run the GIS-assisted model were digital elevation model, land cover, soil characteristics and erosive rainfall. Rainfall data were measured using tipping bucket rain gauge with data logger, installed inside the catchment. Stage heights were measured using water level logger mounted at the watershed outlet in Macablang dam. Discharge rates (m^3/s) were obtained from the observed water levels and rating curve generated using Manning's equation. At calibration, the observed and predicted discharge rates have a good agreement with a coefficient of determination (R^2) of 0.90.

The model was used to simulate runoff and sediment yield of different land cover scenarios. Under the current land cover, the 271-mm rainfall even on October 24-26, 2012 produced runoff volume of 1,546,167 m^3 (410 m^3/ha) and sediment yield of 31,537 tons (8.37 tons/ha). Conversion of perennials and coconut areas to built-up areas increased runoff (62%) and areas decreased runoff (7%) and sediment yield (9%). Therefore, land conversion affects the amount of runoff and sediment yield in the subwatershed.

BRECHJE MARECHAL

Sustainable natural resource management through clay amendments in the rainfed lowland rice agroecosystem in Savannakhet and Pakse, Lao PDR -- 2012

Sustainable management of natural resources in Lao PDR's lowland rice agroecosystem combined with a required increase in production could be realised through clay amendments because soils in the area where most rainfed lowland rice is produced are predominantly poor and drought-prone with low moisture and nutrient retention capacities. To verify this, experiments with different rates of Bentonite clay were established in Savannakhet and Pakse. At one tonne clay ha^{-1} , a 95% rice yield increase was achieved at Savannakhet.

The biodiversity assessment showed the presence of a wide variety of beneficial insects and negative effects of the clay treatments on biodiversity were considered unlikely. At Savannakhet, estimated water lost through percolation has been reduced as more was used for transpiration to produce the additional biomass while at the same time reducing pollution from nutrient leaching.

Clay applied at a rate of one tonne ha^{-1} in Savannakhet resulted in a profit from the second year onwards. But without a subsidy scheme it is difficult for farmers to adopt the clay amendments due to the high initial investment costs. The on-site conditions of Thasano Research Station were used to assess the potential of the method across Savannakhet province through extrapolations using GIS. Overlays of soil texture, land use, elevation, temperature and rainfall show a potential rice production increase of 8.4% at one tonne Bentonite ha^{-1} on 18% of the provincial rice area.

BUTARDO, MA. ZITA M.

Analysis of impacts of migrant settlers's activities on forest ecosystem of the UP Quezon Land Grant Real, Quezon -- 1993

The interactions between the social system of the migrant farmers and the forest environment of the UP-Quezon Land Grant in Real, Quezon was evaluated using the conceptual framework of human ecology. The socio-economic

characteristics and forest resource uses of the migrant farmers were obtained from interview of 56 farmer respondents and five key informants. The impacts of kaingin activities were assessed by comparing the newly-opened, one-year old, two-year old, three-year old and five-year old kaingins with a secondary forest as baseline. Fifty nine percent of the respondents were forest product gatherers while forty one percent were non-forest product gatherers. Charcoal-making and carabao logging were the main income sources from the forest. The other forest products obtained as sources of income were wild fruits, wild animals, firewood and rattan. The presence of ready market, the huge demand for forest products, lack of alternative sources of income and low farm productivity have strengthened the settlers' dependence on forest product gathering.

Forest product gathering was associated with absence of off-farm income and forested farm location. The age of the kainginero, educational attainment, perception of the forest value, size and number of land parcels, previous residence, previous occupation, knowledge of forestry laws and soil conservation and household size were not related to forest product gathering. Occupancy of the land grant and the use and condition of its forest and land resources have changed the settlers' lifestyle, affected their income, nutrition and health conditions and impacted on community relationships as well as on the University of the Philippines' administration of the area.

Deforestation through kaingin-making, charcoal-making and carabao-logging has resulted in the changes in microclimatic conditions. Cultivation decreased soil pH, organic matter content and total nitrogen and available phosphorus and potassium of the soil. Kaingin-making has resulted in the lowering of species diversity and change in growth form and species composition from woody to herbaceous and from forest to grass-dominated stands. Very crucial issues for effective management of the UPQLG are the settlement of the land tenurial disputes and proper mix and balance of biophysical, social, political, incentives, technical and locational factors. This would entail a comprehensive survey of the area's existing human and natural resources. Rational land use evaluation and allocation are imperative as well as the screening for occupants. Existing resource maps have to be updated and the boundaries should be properly marked. Identification and immediate segregation of critical watershed, forest and wildlife protection area and sanctuary are highly recommended to preserve the ecological integrity and uniqueness of the area. The National Botanic Garden should be kept intact and its activities should be enhanced through appropriate support-mechanisms.

BRUNO-TOLEDO, ANGELA GRACE I.

Biodiversity and resources management among Bukidnon Pulangiyan in Bukidnon, Philippines. – 2000.

The study examined biodiversity and resources management among Bukid'non Pulangiyan using the cultural biodiversity approach. It is an approach that focuses on the link between biodiversity to community's culture, ecology, events, scenarios and resources management strategies. The different hierarchical levels of biodiversity introduced in this study show how the understanding of biodiversity relates to its broader context of community resources management. To establish the link, the methodology of the study combines quantitative methods (line transect and cluster plot) and qualitative methods (community mapping, informal interviews and interactions, community discussions and sharing) to allow both researchers and community to define and understand biodiversity.

The study found out that species diversity in different forest types differs but does not vary in terms of uses. All forest types offer different users, utilization mechanisms and options that are crucial to the community's cultural ecology. This illustrates the interdependence and link between community and biodiversity. Biodiversity is affected by how the community responds to the changes and events that occurred in their biophysical and cultural landscapes. Since the community is in a transitional stage, management of their resources combines both their traditional practices and that of the mainstream culture. Government programs and policies are the community's venue to gain legal recognition and be able to relate to the mainstream society.

The study showed the need to understand biodiversity, and resources management has to be understood in the context of community scenarios. Providing venues for the community to share their knowledge with outsiders, which is product of years of using and interacting with the diverse flora and fauna, allows the development of strategies and responses for the management of biodiversity.

BUHUNGAN, MARCIA B.

The Ifugao Rice Terraces Under Changing Climate: Farmers' Perception and Adaptation Strategies – 2019.

The study focused on the Ifugao Rice Terraces, a UNESCO World Heritage Site and the first Globally Important Agricultural Heritage Sites (GIAHS) in the Philippines. Known to be over 2,000 years old, the system is a showcase of how Filipino farmers have adapted to changes in the environment through time. This study assessed the perception and agricultural adaptation to climate changes of the farmers in the barangays of Amganad and Bangaan, Banaue, Ifugao. Aided by key informant interviews and semi-structured questionnaire, the study found out that most of the farmers are aware of climate change, despite low level of knowledge about its technicalities. Observed changes in the climate and weather patterns are consistent with scientific data available and the impacts of these changes in farming have already been felt. Water management, importing food, seeking additional or alternate nonfarm sources of income, adjusting planting calendar, and using early maturing rice varieties, are the top adaptive measures practiced

by the farmers, which all agree to what they consider most important. On the other hand, lack of access to water resources, financial incapacity, inadequate farm labor, lack of access to timely weather information, and lack of access to agricultural subsidies are the top barriers to adaptation.

CABANILLA, ABIGAIL M.

Stakeholders analysis for the coastal zone management (CZM) of Barangay Hugom, San Juan, Batangas -- 2002

Barangay Hugom of San Juan, Batangas is a small coastal community devoted to fishing, farming and tourism. It is also the object of various non-governmental organization (NGOs) environmental awareness and conservation interventions. These diverse stakeholders to the coastal zone resources and their respective interests undeniably give rise to conflict. In the context of CZM, it is crucial that the different stakeholder's interests are analyzed for their power relations so that resource managers, or the resource users themselves, can effectively situate themselves to successfully address the different conflicts and issues confronting the stakeholders. The study's general objective is to describe and analyze the power relations among different stakeholders to the CZM of Barangay Hugom, San Juan, Batangas. Specifically, this study aims to (1) to describe the bio-physical and social environments of coastal zone; (2) to identify and describe the key stakeholders to the CZM; and (3) to analyze resource use patterns and power relations among the key stakeholders. The study employed a multiple method design, which explores the complexity of stakeholders - roles, interests and power relations - in the context of CZM. Qualitative research methods and participatory techniques to stakeholder analysis were used.

The description of the bio-physical and social environment provided the context for the stakeholders' activities and social relations. An understanding of this context led to the identification of stakeholders and a description of their interests and network of relations. This study defined stakeholders for CZM as any individual or group who can significantly affect or is affected by the decision-making activities in the CZM of the barangay. The stakeholders were classified as primary, or those directly affected, and secondary, or those who facilitate in the CZM. The primary stakeholders are : the tourism, business operators, concerned landowners, people's organization's, consisting of fishermen, farmers, and mountaineering guides. The secondary stakeholders are : the non-governmental organizations, comprised of Hayuma and the University of the Philippines Mountaineers (UPM), and several local government units. In the analysis of power relations, this study conceptualized CZM power issues to promote the interests of stakeholders. The power issues are the following (1) inequity in the distribution of benefits from and responsibilities for conserving the marine sanctuary, (2) competition among fishermen, (3) conflict over uses of the beach due to the absence of zoning and land use regulations, (4) conflict over use rights to private properties, (5) agroecotourism development versus waste management, (6) farming and road construction versus siltation and reef degradation. The study operationalized a definition and categorization of stakeholders by examining stakeholder power relations, and by providing the impetus for stakeholder collaboration. It also demonstrated the merits of using multiple methods and participatory techniques to stakeholder analysis. And finally, the study can be used to facilitate collaboration for CZM through the analysis of power relations.

CABANOG, ROGELYN C.

Assessment of solid waste management programs of three municipalities in Misamis Occidental, Philippines -- 2008

Solid waste is increasingly a problem as the population and the economy grows. It is a major concern especially for poor countries that cannot afford the cost of cleaning up the waste but also cannot afford to have a continuing environmental degradation resulting from solid waste disposal.

Interviews of key informants and randomly selected households were done using structured questionnaire in the three selected municipalities of Misamis Occidental. The existing solid waste management programs in the sites were influenced by revenue, literacy rate, and the political will of the leader of the municipalities. The inadequacy of local revenue, lack of environmental awareness of the community, and lack of political will of the local executives were the barriers to ecological solid waste management. Community based solid waste management program was proposed for these municipalities.

CABREDO, PATRICIA MARIE A.

Sustainability Assessment Of The Community-Based Tourism In Lake Pandin, San Pablo City, Philippines – 2015.

The socio-ecological-governance system of the community-based Lake Pandin tourism was assessed and applicable Global Sustainable Tourism Council (GSTC) criteria were used to evaluate the various aspects of lake tourism. Rapid rural appraisal of the lake and its watershed was done. The members of FARMC involved in lake tourism, barangay and city officials, visitors and non-government organizations involved in the lake tourism were interviewed. The institutional capability building and resources provided by the LLDA, local government, and civic organizations contributed to the sustainability of Lake Pandin tourism. The applicable Global Sustainability Tourism Council criteria identified the environmental concerns of the lake based tourism that need improvement. This can be used for

monitoring, evaluation, and modification of the management plan aided with SWOT analysis of various components of the lake tourism. Environmental management options to address the critical sensitivity of a crater lake were recommended.

CADULONG, JACKY JAY C.

Analysis Of Rice-Based Agroecosystem's Conditions, Trends and Responses to Changes: A Case Study of Barangay Ginatilan, Pikit, North Cotabato, Philippines. -- 2023

The study determined the current condition of rice-based agroecosystem in terms of land cover changes in Barangay Ginatilan, Pikit, Cotabato, Philippines using QGIS application and data from NAMRIA in the three (3) time periods 2010, 2015, 2020. Analysis on the land cover change from 2010 to 2020 showed 113.97 hectares or 92.07% decline in annual crop areas. Data revealed that from 2010-2015, a huge portion of annual crop (123.79 hectares) has been converted to grassland (39.04 hectares or 31.54%) and perennial crop (38.42 hectares or 31.04%) of the total annual crop area. Additionally, data revealed that from 2015-2020, a huge portion of annual crop (36.38 hectares) has been converted to perennial crop (29.19 hectares or 80.24%) of the total annual crop areas. Compared to the total rice production of Pikit in the first half of 2021, the rice yield in the first half of 2022 has decreased by 81.60%. The study also highlighted a moderately high level human well-being satisfaction with a mean value of 4.30. In addition, results from the guided interview that was participated by six key informants verified climate change as one of the drivers of changes. The study of human well-being, drivers of changes such as climate change and land cover change, and the status of rice-based agroecosystems is important for providing insights on the sustainability of current and future farming systems.

CAGUIOAO, CIMONETTE T.

Economic valuation of fishery resources as a determinant of community participation in the management of Balagbag reef fish sanctuary in Calauag, Quezon, Philippines -- 2005

The economic value of establishing a marine protected area (MPA) was determined and correlated with the potential for community participation in the management of the MPA. Household survey of 102 respondents out of the total 217 fisherfolk household of Sto. Angel, Calauag, Quezon was conducted as well a informal interviews of 18 key informants from different agencies and organizations. Secondary data on fishery benefits from marine sanctuaries were used for the benefits transfer method. Contingent valuation method was used to determine non-use values of the reef while benefits-transfer method was used to determine the fishery benefits from MPA. Other values were derived from the household surveys and key informant interviews. The net present value (NPV) of the MPA is P26,514,031.76 after 20 years with the presence of a MPA. Otherwise, the NPV is P12,928,305.17. The benefit-cost ratio (BCR) of having a fish sanctuary for 20 years is 2.23 while the BCR for not establishing one is 1.77. Thus, the establishment of a sanctuary is economically worthwhile.

The community has a high environmental awareness and potential for community participation in the management of the MPA. Both are critical in the success of the MPA. The fisherfolk's civil status is significantly correlated with community participation while education and membership to the People's Organization (PO) of the respondents are significantly correlated with Willingness-to-ay (WTP) values. The establishment of the Balagbag Reef Fish Sanctuary is a viable environmental projects. The initial opportunity loss from forgoing fishing in Balagbag reef will be offset by fishery production from spillover after the reef has recovered.

CALDAIRA, RACHEL E.

Performance Evaluation of Combined Constructed Wetland-Stabilization Pond System as an On-site Water Pollution Abatement Technology. – 2022.

On-site wastewater treatment system advocates high-performance, economical, technologically simple, reliable, and low-energy systems. In this research, a performance evaluation of the constructed wetland-stabilization pond system and its potential as an on-site water pollution abatement technology was investigated. The potential of the constructed wetland-stabilization pond system was assessed according to three pillars of sustainability – environmental, social, and economic. Each pillar was assessed accordingly through the conduct of water quality assessment, social acceptability assessment, and economic feasibility assessment. Based on the findings, the constructed wetland-stabilization pond has the potential to improve the quality of wastewater through its acceptable removal efficiency. However, with respect to the Department of Environment and Natural Resources administrative order 2016-08 Effluent Standards, some of the investigated parameters exceeded the permissible limits – nitrate and thermotolerant or fecal coliform. The constructed wetland-stabilization pond system obtained a favorable social acceptability in line with the experts' willingness to adopt it as technology due to its perceived sustainability and was described as economically feasible in reference to its cost estimations that showed how less costly the sewerage and sanitation cost per head computed. Overall, the constructed wetland-stabilization pond system is described as a potential sustainable solution based on its performance and socio-economic assessment.

CALICA, MARIA SYDNEY D.

Environmental Determinants of Schistosomiasis Transmission in Selected Endemic Communities in Caraga Region, Mindanao, Philippines -- 2021

Schistosomiasis (SCH) is a parasitic disease caused by *Schistosoma japonicum* here in the Philippines. It is usually prevalent in marginalized communities in rural areas. Its transmission and distribution are determined by the presence of its intermediate snail host, mammalian reservoirs, environmental reservoirs, and favorable environmental conditions. Thus, a total of 386 human fecal samples, 384 animal reservoir fecal samples, and 387 soil samples were collected from selected households in Agusan del Sur (ADS) and Surigao del Norte (SDN), Caraga Region, Mindanao. Human fecal samples were processed using Kato Katz, animal fecal samples were processed using both McMaster Egg Count, and Sedimentation techniques, and soil samples were processed using Modified Sucrose Flotation technique. QGIS was used to generate maps that showed interconnectivity through water bodies. SDN had the higher overall prevalence (5.68%) as compared with ADS (5.08%); humans contributed the most to the overall prevalence (13.99%), followed by animal reservoirs (2.08%), and soil (0.78%). The significant risk factors were wearing of boots when farming ($p=0.012$), exposure to rice fields ($p=0.023$), kind of toilet facility used ($p=0.001$), presence of farm animals ($p=0.045$), and where cattle are being kept ($p=0.029$). A One Health Approach is recommended to safeguard the welfare of humans, animals, and the environment by concurrently dealing with interconnected factors affecting SCH transmission and distribution.

CALICDAN, MELANIE A.

Institutional Arrangement on Mangrove Rehabilitation Management at Palau Island Protected Landscape and Seascape (PIPLS) San Vicente, Sta. Ana, Cagayan, Philippines. -- 2013

This study aimed to determine the institutional arrangement in the mangrove management of PIPLS. Biologically, the mangrove area is composed of 12 true mangroves, 4 minor and 10 associate species of mangrove. *Rhizophora apiculata* had the highest importance value while *Osbornia octodonta* had the lowest. Its mangrove fauna has records of 26 fish species, crustaceans, mollusks, reptiles, mammals and 5 families of waterbirds.

Institutionally, PIPLS is managed by fourteen institutions sitting as regular members of Protected Area Management Board (PAMB) for PIPLS. PAMB of Palau has been existing for several years since its establishment but the roles and responsibilities of each member institutions has not yet been clearly defined. There are overlapping and redundancy in the exercise of functions of each agency, thus resulting to a vague, unclear and confusing management. Though there are problems on the enforcement of laws (i.e lack of manpower and resources, inaccessibility of the administering authority, weak community-based enforcement and regulations, overlapping institutional roles) and weaknesses in management functions, collaboration and the lateral type of arrangement is still being exercised to prevent further confusions. Regulatory and non regulatory strategies are also being implemented to further protect and conserve the resources of the island.

CALUYA, MARGARITA P.

Environmental and socio-economic impacts of selected farming systems in the Quiaoit river watershed in Batac, Ilocos Norte -- 1994

A study in two barangays of the Quiaoit River Watershed System was conducted to determine the environmental and socio-economic impacts of the three dominant farming systems from May to December 1993. The different descriptors of farming system and the indicators that influence their adoption have the following relationships : land use descriptors such as cropping intensity index (CII) was significantly affected by number of parcels and family size; percent area cultivated to tobacco was negatively related to farm area and operator's age. Labor use descriptors which include : percent hired labor was positively related to the number of parcels and farm area but negatively related to operator's age and family size; percent unpaid family labor was positively related to family size however, negative to farm area, number of parcels, years in school and number of adults with non-farm occupation; percent non-farm labor was positively related to years in school and number of adults with farm occupation. The percentage of expense due to fertilizer, pesticides and insecticides was negatively related to operator's age. The output descriptor such as percent income from crop and livestock production were positively affected by the value of workstock/tools and by the number of adults with non-farm occupation, respectively. Income was significantly affected by total land area cultivated, area planted to tobacco, household size and the number of animals raised. Decisions on farm operations were primarily from the husband but in some cases the wife and older children are involved.

An in depth study of the 3 dominant farming systems : FS1 (rice-tobacco-corn+livestock and poultry), FS2 (rice-tobacco/garlic-corn+livestock and poultry) and FS3 (rice-tobacco-fallow+livestock and poultry) showed that cropping pattern was dependent on the availability of water. Majority of the respondents were share tenants tilling an average of 0.75 ha which are in scattered small parcels, 2-200 m away from their residence and from the river. Respondents in FS1, FS2 and FS3 has an average age of 44, 45 and 44 years, respectively. On the average, each farm household had 5

members. Each farmer in all the 3 farming systems were farming for an average of 21 years. All had formal schooling with majority reaching elementary level only. On a per hectare basis, FS3 had the highest net farm profit. Though FS2 had low income, farm practices were minimizing environmental degradation, so when considering profitability and ecological impact, FS2 was the most sustainable. Perceived/observed negative impacts of the continuous use of HYVs, commercial fertilizer, pesticides and insecticides were rapid depletion of soil nutrients, higher incidence and worsening of plant pests and diseases; soil hardening and drying up; disappearance of beneficial insects and birds and; the perceived more and higher incidence of chemical related human/animal accidents and diseases. The production and profit had also become unstable. It can be concluded that the existing farming systems and accompanying technologies had brought problems and constraints such that alternative crops and technologies must be looked into to minimize ecological degradation while producing the needs of the people.

CANAPE-DOTIMAS, CARMELA

Evaluation of Implementation of the 10-Year Solid Waste Management Plans of Selected Local Government Units in Laguna Province, Philippines. – 2021

Ten LGUs within Laguna province were assessed on their SWM implementation. One hundred fifty (150) households were surveyed to determine their knowledge, practices, and perception on SWM implementation of their respective LGUs. Male, Single, Educated, and Younger respondents have better segregation practices. Methods, means, frequency, leaders of SWM programs are not significantly correlated. Forty percent (40%) of the LGUs were not able to implement planned segregation at source, while almost all of them have implemented segregated collection. First to third class LGUs have operationalized Central MRF. Eighty percent (80%) of the LGUs were utilizing sanitary landfills as their disposal. Based on the result of the Cost Benefit Analysis, Scenario 3 is the best strategy where the LGUs will have to implement programs on recovery of recyclable wastes, increase by 30% every 10 years the garbage/environmental fees, and collect only residual and special wastes from the HHs. The LGUs must strictly enforce their ordinances to increase the compliance of the community to practice proper SWM. Certificate of Disposal of SW should be a mandatory document to LGUs. Further, DILG in coordination with the DENR may devise a manifest system where the SW can be tracked from the generator up to its disposal.

CANDO, EVARISTO NINO T. III

River System Assessment of the Mount Makiling Subwatersheds in the Municipalities of Los Banos and Bay, Laguna, Philippines. –2014

The hydrology and chemistry, fish assemblages and socioeconomic profiles of the six Mt. Makiling subwatersheds: Dampalit, Anos, Callos, Molawin, Maitim and Canbantoc-Calo in Los Banos and Bay, Laguna were assessed from November 2012 to May 2013. Fourteen sampling stations comprised of the pollution point sources, upstream and midstream areas of the creeks were established. All stations excluding the upstream areas of Dampalit and Molawin were hypereutrophic and exceeded the DENR standards for surface water in terms of fecal coliform concentration. The low water quality was attributed to the untreated effluents from the domestic, industrial-commercial, and research and academic institutions. Concentrations of heavy metals such as Cr⁶⁺, Pb²⁺ and Cd²⁺ in all stations were below the detectable limits set by DOST: the occurrence of "Habagat" precipitated 1424.2 mm of rainwater which dispersed it to Laguna de Bay. Ten species of ichthyofaunal assemblages were identified with *Giuris margaritacea* (33.73%) and *Channa striata* (5.41%) as dominant and present in all stations. Comparing all subwatersheds, Molawin had the highest index values for diversity ($H' = 1.93$), richness ($S' = 2.30$) and evenness ($E' = 0.927$) and low in terms of dominance ($D' = 0.342$): except in CEAT outfall where the condition was hypoxic. Household income and level of environmental awareness contributed to the contamination and pollution of the subwatersheds. Extreme poverty and low educational attainment increased the exposure and vulnerability of the households towards skin diseases, gastrointestinal complications and other illnesses.

CANONIZADO, FRANCES M.

An assessment of the current practice in the determination of the environmental guarantee fund under DENR Administrative Order 96-37 -- 1998

The Environmental Guarantee Fund (EGF) under DENR Administrative Order 96-37, series of 1996, was specifically established in order to answer for the risks and hazards that a development project may effect on the environment, despite the mitigating measures that a proponent must initially undertake following the conditionalities of an Environmental Clearance Certificate (ECC). It is meant to answer for damage to life, health, property and the natural environment, or it is a fund source for the identification of damages caused by the project. Because the EGF plays such an important role in the Environmental Impact Assessment Statement System, it is necessary to examine how it is determined and to discuss the ramification of its implementation. The purpose of the EGF was discussed and its determination was

assessed using the perspectives of all the parties involved, namely, the Environmental Management Bureau (EMB), the stakeholders, the proponents, and the experts in the field of environmental impact statement. Interviews with the Task Force on EGF Management at EMB, the stakeholders and proponents revealed their offering bases for determining the EGF.

The expert's perspective was obtained using the Delphi survey technique to achieve their consensus on the bases for computing the EGF. The survey resulted in a more detailed list of considerations to be used in the negotiation process involving the proponent, representatives of the affected stakeholders, representatives of a local non-government organization and the Environmental Management Bureau (or the DENR Regional Office). A common recommendation was the need to specify the list on a per project basis vis-a-vis site location to eliminate the ambiguity of the negotiation process. A similar method is employed by the Mines and Geosciences Bureau in the determination of the Contingent Liability and Rehabilitation Fund (CLRF) for mining projects. A discussion on the need to objectively assess the EGF followed because of the lack of scientific and economic methods employed in the determination process. In valuing damage costs, the economic methods of benefits transfer and replacement or restoration costs were explained. An application of a compensatory fund, in the form of the United States Environmental Protection Agency's Superfund program, was discussed as well. The final assessment of the study is that the current practice of determining the EGF is arbitrary and qualitative.

CAMITAN, NERI OCAMPO

Development of an Immunochromatographic Strip Complemented with a New *in situ* Microbial Concentrator for the Detection of *Pseudomonas aeruginosa* in Spring Waters for Environmental Health Assessment. -- 2013

Pseudomonas aeruginosa is not normally part of the microbial flora of natural springs. Its presence in spring water may, thus, be an indication of contamination. An Immunochromatographic strip and a new *in situ* microbial concentrator were developed for the environmental health assessment of natural springs. The developed technology was found effective for the detection of *P. aeruginosa* in spring waters. This technology had greater specificity (100%) but lower sensitivity (87.5%) compared to the membrane filtration method (8.3% and 100%, respectively). However, detection of *P. aeruginosa* using membrane filtration method required additional confirmatory procedures. The high positive value (PPV) (100%) and negative predictive value (NPV) (95%) of Immunochromatographic strip detection suggests that it is as good as the membrane filtration in detecting *P. aeruginosa* in water samples.

Environmental assessment of selected natural springs for *P. aeruginosa* using developed strip and concentrator revealed the same level of susceptibility to *P. aeruginosa* contamination regardless of the cause such as natural and anthropogenic. Nevertheless, the combination of the developed Immunochromatographic strip and newly designed microbial concentrator showed a potential for environmental health assessment and monitoring.

CAMPOSANO, DIVINE D.

Aquaculture Carrying Capacity in Tikub Lake Tiaong, Quezon, Philippines : Implications for Lake Management – 2023.

An aquaculture carrying capacity was conducted in Tikub lake Tiaong, Quezon, Philippines. The five sampling stations assigned to analyze the physico-chemical and biological water quality parameters in November 2022 and April 2023 revealed that the temperature, pH, TSS, BOD, DO were the standard set of DAO 2016-08 for classification B except for fecal coliform. The nitrate's concentration in November 2022 was 1mg/L (Stations 1,5), 1.2mg/L (Stations 2,4) and 1.1 mg/L (Station 3). The nitrates in April 2023 were lower (1.1 mg/L) in Station 2 while other stations remain, which indicates a lower concentration than the standard set of 7mg/L in DAO 2016-08. The phosphates ranges from <1.0 mg/L in all stations from the two the seasons were higher than the standard set of 0.025 mg/L in DAO 2021-19. Only 17 cages were operating in the aquaculture area in four consecutive years from 2020-2023. The calculated area of 1694.4 m² or 0.35% lake's currently occupied was relatively lower than the mandated <10% of total lake's surface for aquaculture according to R.A. 8550. The estimation of aquaculture CC was calculated using the adopted model developed by T. Legovic et al (2008). The fish culture contribution to the nutrient concentration was 7.1x10⁶ mg/L of TP and 6.82 Chl-a mg/L and the Chl-a concentration (<1.0mg/m³) based on the lab results were compared to DA FAO No. 214 s. 2001 for lake's primary productivity. The calculations showed that the aquaculture CC of 6,82 Chl-a mg/L of Tikub lake has not exceeded its limit and still within the threshold value. To preserve the condition of the lake, maintaining the current number of fish cages, monitoring of water quality, identification nutrients sources, and EIS were required to submit in the DENR for review and evaluation before initiating development, activities, and construction around the lake.

CAMUS, DONNY REY D. C.

Assessment of Subsurface Flow Constructed Wetland Systems as Secondary Wastewater Treatment for Reuse in Irrigation. – 2018

Reclaimed water reuse for indirect consumption purposes such as irrigation resolves two key issues in integrated water management – high freshwater abstraction and water source contamination. The study aimed at identifying the applicability and social acceptability of dairy farm wastewater reuse for irrigation using effluent quality and removal efficiency analysis and a perception-based (senses of sight and smell) Likert scale questionnaire. Effluent samples from the different subsurface flow constructed wetland systems were collected and analyzed. Samples were sent to 200 respondents together with a questionnaire to facilitate blind and learned perceptions analysis. From the laboratory test results, the two-phase systems were more efficient in contaminant removal. Based on the ANOVA and Duncan's Multi Range Test, acceptability level of the hybrid and the vertical in series subsurface flow constructed wetland systems are at 3.815 and 3.6225 out of 5.00, respectively. After an array of socio-economic factors were considered, results of the study showed wastewater reclamation and reuse is acceptable and that the local community surrounding the dairy farm is more willing to use reclaimed wastewater to irrigate their crops – ornamentals, vegetables and fruit bearing trees – after going through the two-phase subsurface flow constructed wetland systems than the one-phase systems.

CAPUNO, ROSA BUENA AOANAN.

Environmental Performance of Milkfish Fry Production in Dagupan City, Pangasinan, Philippines -- 2015

The environmental performance of the commercial milkfish fry production in the Bureau of Fisheries and Aquatic Resources milkfish hatchery in Dagupan City, Pangasinan was evaluated using the life cycle assessment and partial financial analysis. The system boundary was from spawning to larval rearing including production of algae and rotifer and the functional unit is 10,000 pieces of milkfish fry. Global warming potential, eutrophication potential, seawater and freshwater use, and wastewater quality (dissolved oxygen, biological oxygen demand, phosphate, ammonia, total coliform, and fecal coliform) were evaluated.

The spawning stage had the highest electricity (22.70 kWh) and seawater consumption (67,313 L). It also had the highest global warming potential (3.63 kg CO₂ equiv) and eutrophication potential (90.94 kg PO₄³⁻ equiv) which accounted to 56.93% and 99.22% contribution to global warming potential and eutrophication potential, respectively. Larval rearing stage had the highest freshwater consumption (222 L). The production of 10,000 pieces milkfish fry had a total cost of Php23,046. Recommended sustainable practices include the use of renewable energy resource such as solar panels and improvement of the watershed recycling process.

CASTAÑEDA, JAN IDEL EMMANUEL.

Utilization of a Crop Model for Management Decision in Rice Production: The Case of Calapan, Oriental Mindoro, Philippines – 2019.

The study aims to identify risk-efficient management practices in Calapan, Oriental Mindoro and fill information gaps for farm decision-making. Using available data for model calibration, the Decision Support System for Agro-technology Transfer (DSSAT) was used to simulate scenarios of varying planting dates and fertilizer rates. Climate variability was incorporated by grouping the yield distribution to El Niño Southern Oscillation (ENSO) years. Stochastic Dominance Analysis with Respect to a Function (SDRF) identified recommended planting schedules for risk averse individuals. These are May and September for El Niño; early May, late July and January for La Niña; and June, early October, and mid-December for Neutral years. Maximum efficiency occurs between 60N to 90N for wet season schedules. September and October planting dates have low yield even with high fertilizer levels compared to December and January. Planting early during dry season requires less inputs but are low yielding. Planting late on January have high potential yield due to high solar radiation during the latter stages but require more fertilizer and irrigation inputs. The results could be used for planning and improvement of rice production in the area. Effective extension services of climate information and adoption of risk-efficient practices among farmers are recommended.

CAYABYAB, ANABELLE L.

Assessment of the Olive Ridley Turtle Nesting Sites in the Province of Cavite, Philippines – 2016

The Olive ridley turtle, *Lepidochelys olivacea*, nests in the beaches of five municipalities in Cavite. However, there is insufficient historical baseline information and spatial analysis. The need to establish baseline data on the nesting beaches of *L. olivacea* is necessary to determine their specific locations, and identify considerable management activities to protect these habitats. This study documented local knowledge and practices of communities in nesting sites of *L. olivacea*, including the perceived effects of hazards, development, and management activities to nesting sites. Threat matrix analysis was used to rank the risks posed in the nesting beaches. Focus Group Discussions (FDG)

were conducted in 13 coastal barangays to strengthen historical and spatial data on previous and existing nesting sites. The variability of coastal changes in 1989, 2000, 2010, and 2015 were also identified using Landsat images. Increased exposure to coastal development, particularly tourism, settlement and industrialization in the study area, caused massive decline of the nesting beaches from 2011-2015, and is likely to worsen in the years to come. In addition, the olive ridley is being used to promote tourism, thus poor management practices, e.g., handling eggs, releasing hatchlings, could have a negative effect on the nesting population area. While hazards such as coastal erosion and changes in the coastline are highly visible in the area, there are no mitigating measures stated in the Comprehensive Land Use Planning (CLUPs) to address these. A long term coastal management plan for the whole province must be developed to achieve coherent actions to conserve the nesting beaches and the olive ridley turtles themselves.

CERO, AMYEL DALE L.

Environmental Assessment and Water Quality of Balsahan and Kay-Alamang Rivers of the Labac River System at Naic, Cavite, Philippines--2015.

The environment and water quality of Balsahan and Kay-Alamang Rivers of the Labac River System at Naic, Cavite, Philippines were evaluated. A multi-method research design consisting of water sampling, household survey, key informant interview, and statistical analysis was implemented to achieve the objective. Water quality assessment included the biophysical, physico-chemical, microbiological and biological characteristics of the rivers. The social surveys of the surrounding communities assessed the knowledge, attitude, and practices (KAP) towards the rivers.

The total coliform level exceeded the limit for Class C freshwater resources in all the five stations. An isolated case of low dissolved oxygen level and high biochemical oxygen demand was observed. Also, among the identified phytoplankton, there were genera with equivalent Palmer's pollution index indicating the presence of organic pollution in the rivers. The results prove that the rivers are contaminated and polluted.

Positive and high levels of knowledge, attitudes and practices from residents towards the rivers were observed. However, the key informants have expressed that there are still isolated cases of improper waste disposal and disobedience to existing municipal ordinances. Furthermore, both surveys showed that problems on waste disposal practices of piggeries and poultry farm have continuously contributed to deterioration of rivers.

CHAVEZ, JUDITH R.

Ecogeographic Distribution and Phenotypic Variation in Pili (*Canarium ovatum* Engl.) Native to Sorsogon Province, Philippines—2014.

The applicability of ecogeographic studies to the conservation and use of plant genetic resources is now gaining recognition. Pili (*Canarium ovatum* Engl.) is the 'tree of hope' for Bicolanos. It is endemic in the country and believed to have its center of origin in Sorsogon. However, most diversity and characterization-related researches on pili are largely from those collected in Albay province, hence, this study.

An ecogeographic survey of 154 pili trees native to Bulan and Gubat, Sorsogon was undertaken. Majority of the pili trees were sourced from natural vegetation in sloping areas with variety *Dagkoan* as the most popular among farmers. Results of the ethnobotanical survey showed that Sorsogonans have yet to maximize pili's benefits. Majority of the pili farmers practiced organic agriculture and integrated farming system.

Cluster analyses of the fruit characters revealed two main branching where the short (13) varieties and long (*Haralagba*) variety belong to separate groups. However, it does not necessarily distinguish the genetic identity of the varieties. Thus, molecular analysis is recommended. With anticipation, the ecogeographic data generated can supplement in the establishment of a knowledge baseline and use to formulate management and conservation strategies for pili in the province of Sorsogon.

CORALES, MA. CHRISTINA G.

Measuring Willingness-To-Pay for Improved Coral Reef Ecosystem: Comparing On-Site and Off-Site Stakeholders using Choice Experiment Approach. – 2018

The economic value of an improved coral reef ecosystem as a result of a coral rehabilitation that was implemented last 2012-2013, was determined by estimating and comparing the willingness-to-pay and consumer surplus using a choice experiment approach of fishermen and gleaners residing in barangays near to (on-site) and far from (off-site) the rehabilitated reef area. A total of 332 respondents were surveyed, of which 194 are from the off-site while 138 lives in the on-site barangays.

The results show that on-site respondents place higher total environmental scores for all value categories (direct use value, indirect use value, bequest value, and existence value) of coral reefs. As such, higher WTP estimates from the two models of Random Parameter Logit, that is attribute-only model and interaction model, was observed for the on-site respondents with P70.39, P 204.42, and P 50.25 for an increase in coral cover, fish abundance, and

maintenance of municipal fishing, respectively. The relatively higher preferences towards improved coral reef conditions can be associated by the actual benefits they derived from being near a rehabilitation site. These estimates are also influenced positively with higher education attainment and the respondents being a full-time fisher or gleaner.

Using the latent class model analysis, on the other hand, revealed that off-site gleaners who chose to move away from the status-quo have higher WTP estimates than on-site respondents. This result is significantly and strongly influenced by the nature of work of the respondent wherein full-time gleaners and fishermen who heavily dependent on the conditions of the reefs are more inclined to choose the improved rehabilitation outcomes.

Based from the computed consumer surplus for the three impact scenarios formulated, all the scenarios revealed an increase in the respondents' welfare as the reef condition improves, making them better-off than the status-quo condition. Along with the increased social well-being, this study also provided evidence that adopting a coral rehabilitation project is worthwhile as suggested by the high and positive net present value for all impact scenarios from reef rehabilitation and management.

CORTEZ, CARLOS V. JR.

Environmental and social life cycle assessment of Abaca fiber and cordage production in Bato, Catanduanes and Sto. Domingo, Albay, Philippines. -- 2012

Environmental and socio-economic burdens of abaca fiber and cordage production from plantation establishment to production of Types II and III cordage, as Philippine export products, were determined using environmental and social life cycle assessment. This had three phases; fiber production and fiber trading in Bato and Virac, Catanduanes, respectively, and cordage processing in Sto. Domingo, Albay. A Farmer Scientist and three other farmers were the farmer cooperators in environmental life cycle inventory of fiber production phase.

Abaca fiber was produced without chemical inputs. One hectare abaca plantation can produce 830 kilograms fiber with discarded biomass of 50.7 tons. The functional unit is 1 ton of each type of rope with type II having a total GWP of 926 while type III with 942.4 kg CO₂ equivalent.

The social life cycle inventory focused on work environment and health and safety of the farmers and workers. Farmers had lesser share of benefit from his produce. Replanting of abaca using quincunx method is recommended to increase number of hills per unit area. A value adding technology for discarded materials is necessary. Local policy to modify the "all-in" trading system is needed to encourage farmers to produce better fiber quality.

COSICO, RUSSEL SON ALVIZ

Farmer's Assessment of Impacts of Philippine Warty Pig (*Sus philippensis nehring*) on Agroforestry Systems in Mt. Makiling Forest Reserve, Laguna, Philippines. -- 2013

The social and economic impact of Philippine warty pig depredation on agroforestry crops was studied at the Makiling Forest Reserve. This was done through structures survey questionnaires. The locations of the physical evidences of Philippine warty pig were recorded as well as the location of the farms using GPS. Estimated average monetary losses were also determined on this study. The attitudes of farmers toward warty pig damage were analyzed based on symmetric five point scale from strongly disagree to strongly agree.

A total of 160 farmers were interviewed but only 50 farmers were positively affecting of warty pig depredation on crops.

Results showed that tubers were the main diet of the Philippine warty pig. It damaged woot crops such as gabi, cassava, ginger, sweet potato, and ubi, either through direct consumption or trampling. The physical evidences found were footprints/tracks, wallowing, bark damage due to their tusks, rest area/beddings and rooting. Farmers have positively agreed to conserve wildlife in the reserve including the Philippine warty pig. They have been also involved in various activities or program to manage, conserve and protect MFR.

CRUZ, FLEURDELIZ A.

An assessment of the potential for community-based conservation of Chocolate Hills, Bohol Province, Philippines -- 2001

The study examined the potentials for community-based conservation of Chocolate Hills by looking at environmental perception or the "panan-aw sa palibot" of various stakeholders of this resource. Three sitios of Barangay Buenos Aires in Carmen, Bohol Province were selected as study sites where 111 community respondents were interviewed on perceptions toward the Chocolate Hills and its conservation, community participation in conserving the hills, and community evaluation of ecotourism. Other respondents included thirty-six excursionists (36) and seventeen government officials (17). Highest education level attained was positively correlated while estimated distance of residences to Chocolate Hills Resort and Complex, age and household size were negatively correlated to perceptions of community respondents toward Chocolate Hills and its conservation. Number of years in residence, occupation, and annual family

income were not related to perceptions of community respondents toward Chocolate Hills and its conservation. Occupation was positively correlated while estimated distance of residences to Chocolate Hills Resort and Complex, age, number of years in residence, household size, highest education level attained, and annual family income were not related to community participation in conserving Chocolate Hills. Household size and highest education level attained were positively correlated while age and number of years in residence were negatively correlated to community evaluation of ecotourism. Estimated distance of residences to Chocolate Hills Resort and Complex, occupation, and annual family income were not related to community evaluation of ecotourism. Age, highest education level attained, and occupation were not related to perceptions of selected excursionist toward Chocolate Hills and its conservation. Also, age and highest education level attained were not related to perceptions of selected government officials toward Chocolate Hills and its conservation.

Community residents were found to be willing to participate in efforts to conserve Chocolate Hills if they were asked. The willingness of community residents to participate in conserving the Chocolate Hills indicated that there are potentials for community-based conservation of hills. Community respondents were generally hesitant to accept tourism as an economic development-cum-conservation tool. They noted the need for more information on ecotourism before they commit to participate in related activities. The question of availability of capital for ecotourism-related business also needs to be addressed. A study of "panan-aw" among community members contributed to an assessment of the potentials for community-based conservation of Chocolate Hills. It identified groups of stakeholders that could serve as anchor for community-based conservation of Chocolate Hills. However, their full participation was constrained by too much dependence on conventional authority, conflicting views among government agencies and their line offices on the best use of the resource and insufficient information on ecotourism.

CUBILLAS, MARIE ANGELI P.

Sustainability Assessment of the Community-Based Buffer Zone Project in Mt. Kitanglad Range Natural Park, Bukidnon, Philippines. – 2013

Sustainability assessment of the initial phase of the community-based buffer zone rehabilitation project with a non-government organization as main partner of the cultural communities in Mt. Kitanglad Range Natural Park (MKRNP) of Barangay Songco, Lantapan and Barangay Licoan, Sumilao, Bukidnon was conducted. The project planted lanzones, coffee and indigenous tree species through family approach. Ecological, socio-cultural, economic and environmental governance sustainability criteria, which consider both the attainment of the goal and immediate and long term impacts for mitigating and enhancing measures were used. Far, household survey and key informant interviews of the implementor and other stakeholders at different institutional scales were conducted.

Lanzones is not suitable due to low temperature while coffee is suitable but requires soil fertility improvement. Agroforestry with conservation farming system and use of indigenous trees enhance ecological sustainability. Capability strengthening of the people organizations to improve autonomy, enhancement of the local government social services on health and education and enhancement on knowledge and skills on climate change adaptation are needed to improve socio-cultural sustainability. Improvement of subsistent level of the communities, marketing of farm products and equitable access to resources would improve economic sustainability. The continuous support of the municipal and provincial LGU and local offices of national agencies ensures sustainability. Environmental management was recommended for project sustainability.

CUSTODIO, CARLO G. JR.

Community participation and social preparation in the establishment of Paluai island marine reserve -- 2001

Environmental degradation has brought about the need to set aside certain areas for protection. The Paluai Island Marine Reserve in Sta. Ana, Cagayan, Philippines is an example of such an undertaking. This study sought assess the community participation and social preparation conducted by the implementers in the study site since these factors would affect the sustainability of the reserve. A survey was used and data was analyzed using Pearson Correlation, Student's T-test and the Gamma Coefficient of Association. Secondary data and observations were used to complement the survey. People who participated in the activities leading to the protected area proclamation, environmental trainings and conservation programs had a slight to moderate increase in their knowledge, attitudes and practices. Attitudes and practices were enhanced by other IEC strategies and interaction with DENR personnel. Positive attitudes and practices were manifested through the use of environmentally friendly fishing methods, adheres to rules and involvement in area management activities.

Sustaining the positive attitudes and practices proved to be difficult task reflecting inadequate social preparation. The reduction of DENR's presence in the place resulted in low levels of participation in the community efforts in marine reserve management. There were few leaders trained to make the responsibility and the people's interest was reduced when project support dwindled. The lack of sustained interest can be partly due to the absence of significant increase in fish catch and income as reported by residents. Livelihood training seminars were conducted by the implementers to give the residents additional income but there were no opportunities to apply these skills in the area. The experience in the

area showed that the people were not yet equipped by community organizers to handle the responsibility. Furthermore, support to enhance the livelihood opportunities should be given to the people.

DA COSTA, DELFIM

Effects of Local Farming Practices on Soil Degradation in Raumoco Watershed in Timor-Leste.-- 2016

Timor-Leste is currently battling the effects of soil degradation that resulted from a long history of socio-political unrest followed by decades of poor land utilization and unhealthy farming practices. As a step towards ameliorating the presently deplorable conditions, this study was conducted to provide baseline information on the state of soil health in the Raumoco Watershed. Additionally, and with the recognition that the success of any future efforts targeted to improve soil health requires the full and sustainable participation of communities, baseline data on the socio-economic characteristics of farming communities were also studied. The relationship of soil health and the farmers' farming practices were investigated to identify the best avenues for adjustments and potential policy recommendation.

Results of the study showed that soil physical properties in the watershed are characterized by high bulk density, poor porosity and low organic matter content. In areas where slash-and-burn is practiced, soil pH remain neutral, nitrogen is low but close to optimum level in the upstream and the midstream areas, but very low in downstream farming areas. On the other hand, phosphorus is extremely high in the upstream but very low in midstream and downstream zones. Potassium remained low but close to optimum level in the entire watershed, regardless of landscape position. In areas where free grazing is practiced, soil pH remain neutral but with very low nitrogen and potassium levels in the entire watershed. In contrast, phosphorus is very high in the upstream but very low in midstream and downstream areas.

Key socio-economic factors that appear to directly influence farming practices include the farmers' big family sizes (5-8 members), low literacy levels, and very low incomes. Their source of energy also remains to be wood and therefore, firewood gathering, together with livestock-raising, are the most common alternative sources of livelihood.

Correlating the farming practices and the socio-economic variables, slash-and-burn practices exhibit the strongest positive relationship with soil degradation, while free grazing demonstrates moderate correlation. This indicates that between these two farming practices, free grazing results in fewer soil health problems than slash-and-burn methods. Hence, if the goal is to restore soil health in as fast a timeline as possible, cutting down or totally eliminating slash-and-burn farming among communities in the Raumoco Watershed must be the focus of policy recommendations. As an alternative, farmers may focus their efforts more towards raising livestock for their livelihood. This approach will, however, result in several problems. First, this will result in a food security concerns. Second, and more importantly, because raising livestock was also shown to deliver lower economic returns compared to growing crops, farmers will naturally resist a total ban on slash-and-burning farming. Therefore, policy recommendations must focus more on encouraging, enabling and providing support for traditional farmers to shift to more conservative farming practices such as the Sloping Agricultural Land Technology and other improved farming methods.

DAGOC, FRANDEL LOUIS S.

GIS-aided flood risk assessment of the low lying areas of Iponan river watershed Cagayan de Oro City, Philippines -- 2012

The January 2009 flooding event was the main reason for conducting the risk assessment in the areas surrounding Iponan River in Cagayan de Oro City with the integration of Geographic Information System (GIS). Three (3) low-lying barangays were selected for the flood risk assessment namely: Iponan, Canitoan, and Baikingon. A total of 145 respondents were randomly selected in these barangays. Basic socio-economic and household structure information was gathered and coordinates of each structure were determined using a GPS. Elements at risk of people were analyzed using descriptive statistics.

Socio-economic vulnerability of the community was moderate to high. Physical elements of risk of houses included floor materials, wall materials, number of floors and age of the household building. Combination of floor and wall materials was further analyzed for the structural vulnerability. About 12 common structural types of house buildings for the 130 houses were identified. Structural vulnerability increased with flood depth. ## Socio-economic and structural vulnerabilities were analyzed using rank sum method to obtain weights for the established classes. Socio-economic vulnerability was moderate and highly vulnerable among the three barangays. Structural vulnerability was predominantly moderately low and moderate.

The social risk of flooding was moderate and high while the structural risk was moderately low and moderate for the identified house structural types. People perceived that excessive rainfall was the main cause of the flood event. As such, they get their things out when flood level reaches knee high and they go to evacuation centers for refuge. They are still living in the flood-prone area since they have no other alternative area and livelihood. Thus, they just wait for the flood to subside, while keeping ample supply of food and other needs. The flooding event was an awakening moment among

the residents to cope with the situation, and therefore, demands a community-based flood risk management to minimize risks, vulnerability and damages to lives and properties.

DARMAWAN, PRIYO

A study of carrying capacity of an environmentally critical zone in Lesmas watershed, East Java, Indonesia -- 1992

The method of assessing the human population carrying capacity of land resource, in terms of their food production outputs, was evaluated in the Sumberbening village of East Java, Indonesia. The production potentials of (crops paddy rice, upland rice, maize and cassava) were evaluated. The production potentials were translated into their equivalent energy (calorie/carbohydrates) output. The combination of food produce giving the maximum energy output was determined. From the calories, the number of people that can be sustained under standard nutrition by the given resources of the Sumberbening Village was estimated. In Sumberbening village, the production of food crops on dry arable lands is the predominant land use system. Low productivity of food and horticultural crops, low diversity of horticultural crops, low off-farm employment activities/facilities, low productivity of livestock, shortage of technical infrastructure, and shortage of institutional infrastructure are some of the major constraints in the area.

Most land in Sumberbening village have a low suitability rating under low input level. Post-harvest processing and marketing programmes should complement the land management programmes to increase the value of the products. The development programmes of the village should be planned for every agro-ecosystem. The determination of human carrying capacity could be put into practical use by land use and environmental planners for village, sub-district, district, provincial, regional and national planning. This will enable the planners and decision-makers to determine the potentials and limitations of land and other resources of an area. It is a vital tool for anticipative research, planning, and decision-making in relation to land use and food production.

DARVIN, LOUREEDA C.

The use of water hyacinth (*Eichornia Grassipes* Mart. (Solm)) as biological indicator of chromium levels in Laguna de Bay. -- 1989

A study was conducted on the potential application of water hyacinth as biological indicator in the monitoring of chromium levels in Laguna de Bay. Water hyacinth samples were taken from 17 stations along the lake and the mouth of major tributaries in three sampling occasions from May 1987 to February 1988. Chromium concentrations in the stems and leaves of water hyacinth varied from 673 to 3350 ppb in dried samples and 114 to 467 ppb as estimated for the wet weight of the plant. Aqueous concentrations during the time of sampling ranged from 1-13 ppb. Seasonal variations in aqueous and plant tissue concentrations of chromium was significant but spatial differences were slight. The accumulation potential of water hyacinth expressed as enrichment factors or ratio between plant and aqueous concentrations varied from 118 to 848 for oven dried plants and from 20 to 144 for fresh plants. The observed enrichment factors were sufficiently high to raise chromium concentrations to levels detectable by common atomic absorption spectrophotometry.

Plant tissue concentrations however were slightly correlated with aqueous concentrations for both arithmetic ($r = 0.59737$, $P .05$) and logarithmic values (r Using estimates of the natural variability, measurement errors, and data collection costs, alternative sampling designs for monitoring of chromium using water and water hyacinth as indicators were examined. The sampling design of existing water quality monitoring programs in Laguna de Bay were found to be applicable for trend monitoring of chromium levels. Optimization suggests that monitoring of chromium levels in Laguna de Bay using water hyacinth may be equally cost effective. Plant tissue concentrations of chromium may be used as surrogate variables for aqueous values once a predictive relationship between the two variables is established. However, given the problems associated with the applications of water hyacinth as indicator, direct analyses of water is considered more reliable if a more practical and sensitive method for chemical analyses of heavy metals at trace quantities is employed.

DAVID, MA. AGNES B.

Adaptive strategies to environmental conditions at the Aeta resettlement in Dueg, San Clemente, Tarlac -- 1995

The study reveals that the settlers employed four basic adaptive strategies both in their former sites and the resettlement. They are diversification of resource areas, diversification of crops, diversification in income sources, and cultural adaptations. There are only two significant differences in the pre and post eruption conditions. One is that while the respondents enjoyed a certain degree of land abundance and exclusivity to their territory in their former sites, at the resettlement there is scarcity of land, and limitation in resource use due to increased competition with other groups in the area. Another is that while before the respondents had low political organization and mostly relied on kinship relations for social support, at the resettlement, there has been a considerable development of their political organization and a significant increase in dependence on external institutions for social support.

The minor differences between the pre and post eruption strategies are the following : 1) reduction of resource areas in the resettlement; 2) introduction of new crops and new methods at the resettlement due to external influences; 3) a livelihood shift from gathering and selling of forest products to wage labor; and 4) increased social integration. These findings underline the basic necessity of providing sufficient land for the resettlers. The study also reveals that providing a wide array of agricultural systems and income-generating activities is highly needed, as the respondents employ diverse strategies simultaneously, with their choices of alternatives dependent on their perceived needs and capabilities. Lastly, the study shows how the resettlement has facilitated the process of acculturation for the Aetas, and how this is needed in integrating themselves successfully with mainstream society.

DAVID, VIVENCIO S. JR.

Diagnostic analysis of Mt. Arayat national park -- 1996

The study aimed to do a diagnostic analysis of Mt. Arayat National Park by studying how its present conditions were brought about by the patterns of interaction among the users, the physical and technical characteristics of the Park, and the decision-making arrangements that govern its use and management. Primary and secondary data were secured by using a triangulation method which combines personal interviews, secondary data, and personal ocular inspection and verification.

Results of the study show that Mt. Arayat National Park is a degraded resource with remaining forest cover of only 21 percent, severely depleted wildlife and water supply, vast fire-prone open lands consisting of cogon, "talahib", patches of reforestation species, bare rocks and eroded stream banks. Destructive human activities have been going on unabated by the Government's laxity in enforcing Park's Laws. Patterns of interaction among the users which include kaingineros, charcoal makers, loggers, fuelwood gatherers, cogon gatherers, and hunters/trappers, are characterized by non-cooperation and limited cooperation leading to a mutually destructive competition over increasingly scarce park resources regardless of an optimal and sustainable rate of use. Reciprocity among different groups of users is almost non-existent. The nature of the Park as being fire-prone and the inappropriate technologies being utilized by the users directly cause negative consequences to the Park's integrity.

Decision-making arrangements (programs and policies) of the Department of Environment and Natural Resources or DENR proved to be incongruent with the Park's urgent problems. Millions of pesos are spent on contract reforestation with dismal results mainly because of the perennial problem of forest fires with raze the open lands annually and yet, the agency has yet to formulate and implement a comprehensive fire management program. Likewise, Park's intrusion and exploitation could have been minimized had the agency developed an effective monitoring and communication system. The establishment of an integrated social forestry model site project seemed to have reversed the trend of degradation within the ISF area but has also contributed to the increase of Park occupancy from 573 in 1989 (the year of its establishment) to 762 in 1994, an increase of about 33%. Ironically, the DENR is tasked to get rid of park occupants as prescribed by law.

Recommendations of the study include the strict enforcement of Park laws as stipulated in the NIPAS Act of 1992, the rechanneling of resources from unsuccessful contract reforestation to effective fire management and monitoring system, the awarding of certificates of stewardship contracts or CSCs with certain agreements or provisions, and the establishment of the area as a National Park and its subsequent re-establishment as a Protected Landscape.

DAYAP, NANCY A.

Impacts of Coconut Oil Mill Pollution on Tigbao River in Tacloban City -- 1998

The study focused on the assessment of the impacts of industrial wastes dumped by a coconut oil mill into Tigbao River in Tacloban City. Specific objectives were to : 1) identify the major pollutants discharged by the oil mill; 2) determine the impacts of pollution on water quality and diversity of the macroinvertebrates in the river; 3) assess the perceptions on the socio-economic impacts of pollution to the communities who use the resource; and 4) recommend mitigation measures to minimize the adverse environmental effects of the industrial wastes discharged by the oil mill. Water and macroinvertebrate samples were collected from : upstream Palanog River (Station 1), upstream Salvacion River (Station 2); before the outfall of the oil mill (Station 3), and downstream of the outfall (Station 4). Water samples were analyzed of the following physico-chemical characteristics: temperature, transparency, pH, dissolved oxygen (DO), biochemical oxygen demand (BOD), oil and grease (O and G), total suspended solids (TSS), substrate type, depth, width, and flow. Water quality values were compared to standards specified by DENR DAO 34 series of 1990. Diversity indices of the macroinvertebrate samples were computed using the Shannon-Weaver Mean Diversity formula. The survey research method and descriptive statistics were used to assess the perceptions of the socioeconomic impacts of pollution.

Based on the DENR water quality standards, waters in the two upstream stations (1 and 2) were still clean but areas near the oil mill outfall (stations 3 and 4) were already polluted. The presence of just one species of mollusk in station 3 and the absence of the river have occurred. Loss of fishing as a livelihood was also noted because of the occurrence of fish kills in the river and the nearby bay since the oil mill started its oil milling operations in the area. Perceived positive socioeconomic impacts of the oil mill include : 1) added income of residents through employment

in the oil mill; b) revenues for the city government through taxes paid by the oil mill. It is recommended that : a) DENR must work for the formal classification of Tigbao River, b) DENR must ensure that the oil mill operates its wastewater treatment facilities by conducting periodic and unannounced monitoring more often; c) DENR must see to it that oil mill activities match those specified in its permit to operate and impose penalties once it is caught violating these conditions; d) DENR should monitor all industries along Tigbao River and compel them to install waste treatment facilities; and e) government agencies working in the area should coordinate and conduct environmental education for both owners of industries and community residents regarding the proper use and conservation of the river. For the oil mill management, the suggestions are : 1) reduce solid wastes by using thoroughly dried, clean copra as raw material; 2) recycling of the soap and water used in its cleaning operations; 3) sweeping or dusting of premises/equipments prior to washing; and 4) always operate its wastewater treatment facilities

DE ASIS, ALEJANDRO M.

A GIS-Aided Soil Erosion Potential-Based Solution to UP Land Grant Land Allocation Problem -- 1998

A landuse classification system based on soil erosion potential was developed for the UP Laguna-Quezon Land Grant. The basic procedures involved the integration of the Modified Universal Soil Loss Equation (MUSLE) and Geographic Information System (GIS) to generate the soil erosion potential and evaluate the land capability of the area. The erosion-based capability was used as one of the criteria in the landuse classification in the project area. Results of the study revealed that with the present landuse system, the average soil loss from the area is 61 tons/ha/yr. or 6.1 mm/ha/yr. Fifty one percent of the total land area exhibits an acceptable level of soil erosion (2-12 tons/ha/yr), 17% with moderate (12-25 tons/ha/yr.) to severe soil erosion (50-80 tons/ha/yr.) and 32% having low rate of soil loss of less than 2 tons/ha/yr.

The land capability evaluation indicates that 58% of the area must be limited to forestry while 27 percent can be allowed for productive purposes such as agroforestry which could meet the allowable CP (cover management and conservation practice factor). Only about 17% of the area can be used for intensive such as lowland cultivation or housing. The proposed landuse classification for the UP Laguna-Quezon Land Grant consists of four major landuses : protection, production, social forestry and high intensive use zones. The protection zone covers an area of 3,171 ha or 46 percent of the entire area, 2,956 (43.7percent) for timber production, 526.6 ha (7.7%) for high intensive use zone and 110.6 ha (1.7%) or social forestry. Priority is given to protection landuse system because of high susceptibility of the area to soil erosion. The study shows that GIS, used in conjunction with the mathematical model, provides a remarkable information for the determination of soil erosion. Such a tool is useful for evaluating what landuse practices are suited for a given biophysical condition and provides, a number of options regarding landuse allocations that considers prevention of soil erosion, in particular and environmental protection, in general.

DEDICATORIA, RANELL MARTIN M.

Environmental perception and indigenous knowledge on wildlife in Mt. Data watershed, Bauko, Mt. Province, Northern Philippines -- 2010

In the Philippines, the most biologically diverse areas are occupied by indigenous peoples (IPs). Adhering to the principle that IPs are the stewards of their environment, this study examined the influence of environmental perception on sustainable management of Mt. Data watershed in Sinto, Bauko, Mt. Province. The site is a protected area (PA) and forms part of the Kabatangan Ancestral Domain, home of the Kankana-eyes. Using an exploratory case study approach, the researcher conducted key informant interviews and validated these findings with the community.

It was found from oral accounts of elders that the environmental conditions of Mt. Data watershed has drastically changed over the last 50 to 60 years. The area was once thickly forested but at present, forests have been converted into vegetable farms. Alongside this changing land use, wildlife populations also declined. Over the years, the IPs transferred elsewhere and were replaced by migrants. As such, indigenous knowledge systems and practices (IKSP), specifically those concerning wildlife, are confined to elders and have not been transferred to younger generations. There is a danger that IKSP would be lost due to rapid environmental, social, economic, and political changes. Today, although Mt. Data watershed is still considered important by the residents, the resource has become a "tragic common" commodity due to commercial farming. Ancestral domain residents focused on economic gains and seemed to have forgotten the value of forest conservation and preservation. There is a need to re-open the minds of both migrants and locals in Sinto and make them recall the goodness of a sustainably managed watershed. Their IKSP, which adheres to the principles of sustainable development, should be revived and strengthened so that the once rich ecosystem may be restored.

Results of the study emphasize the need to conserve Mt. Data watershed and bring back its goodness as remembered by elders. The researcher recommends that the Philippine PA system be reviewed. The coldspots approach which zeroes in on areas where there are many people and heavily degraded ecosystems may be useful to rehabilitate Mt. Data. As people see more clearly their reliance on the watershed, they will be more inclined conservation projects. In the long run, biodiversity will also be preserved but not at the expense of displacing the locals and/or migrants.

DEGAMO, JULIE ROSE S.

Management Effectiveness of Taguibo River Watershed Forest Reserve for Water Supply in Butuan City, Philippines. – 2016.

The management effectiveness of Taguibo River Watershed Forest Reserve (TRWFR) for water supply in Butuan City was assessed using Management Effectiveness Tracking Tool (METT). Key informant interview (KII) was conducted and secondary information was used.

The TRWFR is facing a high level of threats due to residential, commercial and road development, and geologic hazards. The METT score for TRWFR management effectiveness was low (39.59%). Input and output management component had 14.40% and 13.33% scores, respectively, which suggest very few to practically no support for effective operational/logistical needs. However, the context component has highest score (66.67%) due to its Presidential Proclamation No. 1076 which is very important in protected area (PA) management.

Environmental management system is recommended for the effective management of PA for maintenance and improvement of the water yield to sustain the needs for both domestic and irrigation water supply of Butuan City.

DE GUZMAN, ARNICA L.

An Assessment of the Conservation Behavior using Sense of Place among residents of Icadambanauan Island, Taytay, Palawan, Philippines. – 2016.

Seeking the relationship of human to their surroundings is a key factor to understand environmental problems that we currently face. This study tried to identify how human attachment to his or her environment, as measured by Sense of Place (SOP), affects his/her conservation of it, as measured through the General Ecological Behavior (GEB). With a survey design and a total enumeration in Icadambanauan Island, data were analyzed using two-stage least squares regression methods. Results showed that the island residents' SOP revealed significant relationship to their conservation behavior. Specifically, the construct Place Attachment showed positive effect to GEB while Place Identity was observed to be negatively associated. These showed how human connection to his surroundings may eventually shape up his actions back to the environment. If given the proper attention, these connections already embedded in our socio-ecological systems may help enhance management plans geared towards conservation of resources or in resolving environmental problem, especially those linked with anthropogenic activities.

DELA VEGA, JOELA MIZCHELLE A.

Valuing the Protection and Assessing the Impacts of Atulayan Bay Marine Protected Area (MPA) in Sagñay, Camarines Sur, Philippines -- 2019

The study estimated the value of protection and evaluated the impact of Atulayan Bay MPA in Sagñay, Camarines Sur, Philippines. Specifically, the study aimed to: assess the biophysical conditions of the MPA; estimate the willingness to pay (WTP) of the fisherfolks for the conservation and protection of the MPA; determine the socioeconomic factors affecting the WTP of the fisherfolks; evaluate the impact of the MPA on the welfare of the fisherfolks; and formulate policy options and recommendations for the conservation and protection of the marine ecosystem. The reef health in the MPA is considered fair. There was an observed decline of hard coral cover in 2017 compared to its baseline data in 2012. However, the fish biomass and species diversity increased between the years 2012-2017. Using the contingent valuation, the computed mean WTP for the protection and conservation of MPA were PhP142 and PhP96 per month per fisher-household for the parametric and non-parametric estimations, respectively. The results from PSM method showed that on-site fishers have higher fishing income by PhP3,135-3,929 and greater fish catch by 1.3-1.4kg compared to the off-site fishers. The study suggests that proper management of the Atulayan Bay MPA is a big advantage for its improvement.

DELA VEGA, JIOIE MURIEL A.

Recreational Benefits of Consocep Mountain Resort in Tigaon, Camarines Sur, Philippines – 2019.

The study assessed the recreational benefits of Consocep Mountain Resort. Specifically, it determined the perception and awareness of the respondents on Consocep Mountain Resort; quantified the recreational benefits of the area for the current and improve management in Consocep Mountain Resort; analyzed the management and institutional arrangement in Consocep Mountain Resort; and formulated policy recommendations and management options to improve the sustainability of the mountain resort. Only 75% of the 267 respondents personally know the area. Negative binomial model was used to analyze travel cost method data. Given current site conditions, the average consumer surplus of a single visit per tourist was PhP2,650 while for the improved conditions the average consumer surplus was PhP3,399 per visit per person. The results show that an improvement in the conditions of the mountain resort was estimated to provide mean annual marginal benefits of PhP73.8 million. These estimates were significantly

higher than the allocated budget and therefore can be used as one of the basis for payment for ecosystem services. In order to improve the institutional arrangement in the mountain resort, co-management by the stakeholders is recommended. Moreover, protection and maintenance, training and capacity building, enactment of the rules and regulation, and regular monitoring and evaluation of the area should be taken into account.

DELFINO, RAFAELA JANE P.

GIS-based watershed zoning under current and future climate in Pantabangan Carranglan Watershed, Philippines. – 2013.

A watershed zoning in Pantabangan-Carranglan Watershed (PCW) based on current and future rainfall projections was developed in this study using statistical and dynamic (results of PRECIS study of PAGASA) downscaling techniques and the geographic Information System (GIS).

With the projected rainfall changes from medium to high range emission scenarios, the estimated areal percentage of strict protection zone in PCW covers approximately 57, 65, and 72% from observed, 2020 and 2050 respectively. The areas that require protection are currently covered with grassland and brush land and fall under the municipalities of Pantabangan and Carranglan. While majority of potential production zone (which consists 41%, 34%, and 24% of the total area for observed, 2020s and 2050s, respectively) is currently under grassland and brushland mixed with some areas that are cultivated. It also includes areas that currently holds settlement and other built-up areas. Areas highly prone to landslide and floods were approximately 55 and 40% of the total area of the watershed, respectively.

The results of this study can be used in the updating of the comprehensive land use plans of the municipalities and watershed management planning in Pantabangan-Carranglan that will ultimately help improve the present watershed conditions and adapt to future climate changes.

DEL MUNDO, DANN MARIE N.

Analysis of Water Quality in Relation to Solid Waste Management Practices in Barangays Talisay and Balibago, Calatagan, Batangas, Philippines -- 2008

This study aims to seek the relationship of water quality with solid waste management practices in the coastal barangays of Talisay and Balibago, Calatagan, Batangas as possibly affected by the households' socio-economic condition, environmental awareness, knowledge, and perception. A multi-method research design comprised of structured survey, ocular inspection, water sampling, and key informant interviews was employed to meet the objectives of the study.

Socio-economic analysis revealed that both barangays belong to the lower middle class with total family income between Php 5,000.00- Php 9,999.00. Most of the respondents in Barangay Talisay only finished elementary education while majority of the respondents in Barangay Balibago finished high school. The household size of Barangay Talisay is four while the household size of Barangay Balibago is five. Hence, the estimated waste generation per capita per day is 0.53 kg and 0.47 kg for Barangays Talisay and Balibago respectively. Statistical analysis showed that total family income are negatively correlated with solid waste management practices. However, environmental knowledge and perception are positively correlated with solid waste management practices. Educational attainment and household size are negatively correlated with solid waste management practices in Barangay Talisay while these are positively correlated with solid waste management practices in Barangay Balibago. The impacts of solid waste management practices on water quality were gauged through ocular inspection and water analysis. Ocular inspection accounted the presence of piggery structures and toilets resulted to high fecal coliform load that reached 160,000 MPN/L, high biochemical oxygen demand reading 45.8 mg/L (maximum), and lowest dissolved oxygen reading of 0.5 mg/L which did not comply with the standards set by the DENR. Moreover, high total nitrogen reading of 8.24 and 27.83 degree C, respectively were within the standards set by the DENR. Except for the pH and temperature readings, results of the microbial and physico-chemical analysis signified that there is already water pollution in the creeks that might affect the health of the community and the productivity of the area. Overall, both creeks are polluted but Barangay Balibago creek has better water quality than Barangay Talisay creek. This may be influenced by the higher educational attainment, environmental knowledge, awareness, and positive environmental perception of the residents. Moreover, the greater the household size and income in Barangay Balibago did not become a limitation for the residents to practice more responsible solid waste management.

DELORINO, ROLANDO A.

An evaluation of reservoir sedimentation : The case of Macagtas water impounding project, Catarman, Northern Samar. -- 1988

The rate of sedimentation of the Macagtas reservoir was observed for one year. Stream velocity, cross-sectional area of streamflow and the sediment concentration of the water were monitored during rainfall events greater than 18 mm. The relationship between water discharge and sediment inflow for the two streams draining the watershed was analyzed

using the simple linear regression model. A direct relationship between these variables was shown; correlation coefficient (R) values of 0.99 were obtained for both streams. For the entire period of the study, the computed sediment discharge in the reservoir was about 1,702 tons. This value is higher than previous computed rates based on the estimated annual soil erosion loss rates using the Modified Universal Soil loss Equation model. Soil erosion loss rates were estimated based on three land-use maps representing the periods before project construction and during operation phases. Land-use trend, indicated various stages of watershed transformation. The estimated soil erosion loss during the period of study was 2,475 t/yr. With a reservoir sediment inflow of 1,702 t/yr, the sediment delivery ratio (SDR) was about 69 percent.

Sedimentation rates in the past and future were computed based on the above SDR value and an assumed reservoir trap efficiency of 93 percent. It is predicted that if the present rate will remain constant, the dead storage volume capacity will be filled up with sediments after 25 years (since 1976) of continuous water impoundment. The sediment inflows for the projected 30-year period under the scenarios "with" and "without" watershed management conditions are 35,348 tons (27,191 m³) and 47,672 tons (36,666 m³) respectively. The damage cost of sedimentation was determined by comparing the benefits that can be derived from the (with) and (without) watershed management options. However, benefits and costs which were difficult to quantify were not included in the analysis. At a 10 percent discount rate, the economic analysis showed that the net present value for the "with" watershed management is P29,378,845.00 and only P2,777,810.81 for "without" watershed management. The net present value of the watershed management project was tested by means of a sensitivity analysis and found to be relatively insensitive to the various assumptions made in the analysis.

DE LOS REYES, LEO-ALDO A.

Envisim: Developing and Exploring the Effectiveness of Video Games For Environmental Science Instruction of Grade 11-12 Students in the Philippines -- 2022

A game for teaching environmental science concepts, specifically Water Quality Analysis, was developed using GDevelop, a freeware, cross-platform game development engine. The game was made to explore the potential of video games in environmental science education for Grades 11 and 12 in the Philippines. The game does this by having the player assume the role of a junior environmental scientist addressing an in-game problem of water pollution. Tasked with resolving the issue, the player is guided through the process of water quality analysis from sampling to testing, and finally problem resolution. Throughout the game, the player will have access to numerous scientific instruments and are taught the methods of their use along with the significance of said instruments in the context of water quality analysis. To test the effectiveness of the game, pre-test and post-test methods were adapted along with surveys for satisfaction to measure performance and preference. Paired T-test was used to check for the effectiveness of the results.

DOTIMAS, CARMELA C.

Evaluation of Implementation of the 10-Year Solid Waste Management Plans of Selected Local Government Units in Laguna Province, Philippines. – 2021

Ten LGUs within Laguna province were assessed on their SWM implementation. One hundred fifty (150) households were surveyed to determine their knowledge, practices, and perception on SWM implementation of their respective LGUs. Male, Single, Educated, and Younger respondents have better segregation practices. Methods, means, frequency, leaders of SWM programs are not significantly correlated. Forty percent (40%) of the LGUs were not able to implement planned segregation at source, while almost all of them have implemented segregated collection. First to third-class LGUs have operationalized Central MRF. Eighty percent (80%) of the LGUs were utilizing sanitary landfills as their disposal. Based on the result of the Cost Benefit Analysis, Scenario 3 is the best strategy where the LGUs will have to implement programs on recovery of recyclable wastes, increase by 30% every 10 years the garbage/environmental fees, and collect only residual and special wastes from the HHs.

The LGUs must strictly enforce their ordinances to increase the compliance of the community to practice proper SWM. Certificate of Disposal of SW should be a mandatory document to LGUs. Further, DILG in coordination with the DENR may devise a manifest system where the SW can be tracked from the generator up to its disposal.

DOYDEE, PUVADOL

Assessment of the Mangrove forest in Ranong, Thailand for landscape biodiversity resources planning and management -- 2008

This study was conducted in Ranong, Thailand aiming to assess its mangrove forest and come up with a sustainable management plan. Geoinformatic techniques, socioeconomic survey and field inventory were used to characterize the six (6) study sites comprising seven (7) zones determined by cluster and ordination analysis. The Mueng district had the most number of mangrove patches (17). There were nineteen (19) mangrove tree species with *Rhizophora*

apiculata as the most dominant. *Scylla olivacea* and *Sardinella* sp. were the dominant species of all the twenty-seven (27) identified aquatic fauna species. The highest diversity (2.01) and equitability (1.06) indices were in Zone III. The highest concentration index (0.47) was in Zone VII. The highest species richness index (3.425) was in Zone III and IV. The satellite images and remotely sensed data showed other land use types such as fish and shrimp ponds, forest covers, urban, district, villages and tourist sites. As compared with mangroves, the fish or shrimp pond patches appeared to be smaller in size, polygon in shape with random arrangement. Mueng had the highest pond patches (25) while the lowest (2) was in Laun. The district with highest number of villages was in Kraburi (61) while the lowest (15) was in Suk Samran. There were 26 sites with tourist attractions in Ranong, Thailand. A socioeconomic instrument with 60 respondents revealed that 73percent used mangroves as a source of construction materials, 2percent depended on mangroves for fuel with 22percent who could identify at least 5 species. All respondents confirmed that they largely depended on mangroves.

Based on the Landsat images of Ranong and the results of the vegetation study, it is suggested that a biodiversity corridor be established with the dominant *Rhizophora apiculata* as the main reforestation species. A rehabilitated mangrove ecosystem can actually minimize the ill effects of tsunamis to lives and properties. Furthermore, the mangroves must be treated as a community owned area rather than as a common property when the locals treat the mangroves as their own, there is a greater chance for mangrove conservation, hence sustaining its benefits for the Ranong locals.

DUCUSIN, RIA JHOANNA C.

Climate Change Vulnerability Assessment of Rice Terraces of Barangay Batad, Banaue, Ifugao, Philippines -- 2018

This paper contains two major sections which are perception studies of the Batad community on climate change and variabilities, and vulnerability assessment of Rice Terraces of Barangay Batad, Banaue, Ifugao. Vulnerability was normally assessed as a function of exposure (E), sensitivity (S), and adaptive capacity (AC). A total of 114 respondents became part of the study. Through the reviewed, adopted and modified indices, the vulnerability rating for the study was 0.51 (E = 0.40; S = 0.65; and AC = 0.51) which indicated that Batad Rice Terraces is moderately vulnerable to climate change impacts. It was revealed that key vulnerable indicators emerged from sensitivity and adaptive capacity components. Under sensitivity, these include acidic soil pH, soil potassium deficiency, perceived increase in presence of pests, high dependence on irrigation, agricultural unsuitability, and food import dependency; and under adaptive capacity are less practice of key traditions and low number of farmers per household. The respondents ranked improved irrigation canals, planting more trees or conservation of muyongs, and water management as adaptation strategies or practices with most importance while unpredictable weather, inadequate farm labor, and limited access to agricultural extension officers were identified as the top barriers to adaptation .

DULAY, MAGDALENA C.

Environmental analysis of Talabaan River, Naawan, Misamis Oriental -- 1998

The objectives of the study were to 1) determine river water quality in relation to the various activities within its watershed through analysis of physico-chemical characteristics and aquatic biota, 2) assess the role of institution regarding, regulation of river utilization and management, 3) assess the knowledge, perceptions, and attitudes of the community residents towards river utilization and conservation, and 4) recommend possible management strategies for sustainable use of the river. Samples were collected from : the headwaters at Mahangub (Station 1); Suwa (Station 2); the site after Lubilan Creek joined Talabaan River (Station 3); above and below the diversion weir in Tagbalogo (Station 4 and 5); above and below Poultry 1 at Mapulog (Station 6 and 7); above Poultry 2 at Don Pedro (Station 8); and below Poultry 2 at BLISS (Station 9). Water physico-chemical properties analyzed were compared to national standards. Macroinvertebrate diversity indices were computed using the Shannon-Weaver mean diversity formula. Inventory of fish and other aquatic animals was done through interview with community residents. The survey research method and descriptive statistics were used to assess the knowledge, perceptions and attitudes of the people towards the resource.

Talabaan river is slightly polluted as indicated by the low mean diversity (d) values between 1-3 for all sampling stations for both sampling periods. However, the pollution sensitive groups of aquatic insects such as Ephemeroptera, Plecoptera and Trichoptera can still be found. Aquatic organisms continued to thrive in Talabaan River though lesser in number as compared to the previous years. Physico-chemical parameters measured showed values that were within national standards. Agriculture seemed to have negligible influence on the river's water quality due to : a) minimal use of agro-chemicals, and poultry wastes were not thrown into the river. The closing of the diversion weir to maintain water volume to be used for irrigation appeared to have caused the drying-up of that portion below the weir down to Mapulog during summer while intermittent tributaries were probably due to denuded forests and dried-up area around the headwaters. Some residents indicated that *Gmelina* sp. plantations may possibly be related to the aforementioned condition.

Community residents at upper reaches appeared to value the river highly as shown by the apparently clean river water condition within their communities. Communities at the lower reaches on the other hand, appeared to have less regard for the resource as the river condition along these areas appeared dirty with the presence of the garbage dumping site. The following are possible recommendation for Talabaan river's sustainable use : a) conduct of a barangay tree

planting of denuded areas; b) increase environmental awareness of residents and LGU officials, and c) plan and implement a solid waste management project for the communities found in the lower reaches of the river.

DUYA, CHERYL D.

Influence of Watershed Land-Uses on the Water Quality, Macroinvertebrate and Fish Assemblages in the Tributaries of Los Baños and bay, Laguna, Philippines. -- 2011

Six (6) subwatersheds of Mt. Makiling namely, Dampit, Anos, Callos, Molawin, Maitim and Cambantoc-Calo in Los Baños and Bay, Laguna were studied to determine assemblage. A total of 16 sampling stations comprising of the upstream, midstream and downstream sections of the creek were studied in September and November 2010 and January 2011. Biological samples were only collected in September and January. Land use of each subwatershed was obtained from DENR – Environment and research Development Bureau (ERDB).

All sections of the six creeks were hypereutrophic, had very high fecal coliform counts and they belonged to Class D except at the Dampalit Falls. The Cr (VI) in some sections of Callos, Anos, and Cambanto-Calo creeks exceeded DENR standards for freshwater. The former Los Baños open dumpsite and types of establishments in the build-up areas are the potential source of Cr pollutant.

Macroinvertebrates fauna belonging to Phylum Annelida, Arthropoda, Mollusca, and Mematomorpha were present in the six creeks. Chironomidae and Physidae are dominant in the polluted Callos and Anos creeks and their dominance is a bioindicator of highly polluted water.

Based on the computed modified Hilsenhoff's Biotic Index (HBI), Dampalit upstream water quality had very good but the midstream and downstream had poor to very poor water quality. Anos and Callos creeks had poor to very poor water quality but Anos creek had poor water quality. Molawin creek had "Fair" – "Very Poor" water quality. Maitim and Cambantoc-Calo creek had "Fairly Poor" – "Poor" water quality.

The fish assemblage consisted of 11 ichthyofaunal species: *Aguilla sp.*, *Trichogaster pectoralis*, *trichopodus trichopterus*, *Oreochromis niloticus niloticus*, *Channa striata*, *Clarias batrachus*, *giuris margaritacea*, *Glossogobius celebius*, *Hypostomus plecostomus*, *Poecilla sphenops* and *Poecilla reticulata*. Diversity (H') among all creeks was high in Molawin, Dampalit and Maitim creeks, while species richness was highest in Dampalit in January and lowest in Callos creek for September. Similarity index value for the fishes indicated that the distribution of the ichthyofaunal species in various creeks is due to migration of fishes from Laguna de Bay into the subwatersheds of Mt. Makiling.

EDRUS, ISA NAGIB

Assessment of community participation in the coastal resource rehabilitation project in Bali, Indonesia -- 2002

The main objective of this study was to assess community participation in the coastal resource rehabilitation project of Lebah hamlet, Bali, Indonesia that was implemented from 1991 to 1993. Social and field surveys were conducted in this area covering Jemeluk and Tukadse in April and July 2001. The study aimed 1) to examine the relationship between the processes and the outcomes of the project, 2) to assess the project's outcomes in terms of the biophysical conditions of coastal resource using selected indicators, and 3) to evaluate the impacts of the project on the socioeconomic conditions of the local community in the study area using selected indicators as well. The major strategies of the project implemented to rehabilitate the coastal resources included deployment of artificial reefs made of cement blocks and tires, training and formation of organization in the community, passing of fishing and environmental ordinances and formation of community-based coastal watch groups. Results showed that the project resulted in enhanced community participation and positive environmental changes. The Spearman's test (at $\alpha = 0.01$ and 0.05) for overall respondent ratings of the indicators of participation processes and perceived outcomes showed a positive correlation (at $\alpha = 0.05$) between the processes and the outcomes.

The significant results of deployment of artificial reefs and other rehabilitation strategies were the improvement in fish catch and CPUE of the two major fishing gears, and reef fish diversity and density. After the deployment of artificial reefs in 1991, an increasing trend was noted in the catch by both gears. Fish catch of hand lines and horizontal long lines doubled in 1994 to 1998 respectively. For the same period, there was a 67.5 percent increase in number of hand lines in 1994, whereas only a 37.5 percent increase was noted for horizontal long lines in 1998. For the same period, CPUE of hand lines and horizontal long lines increased 19.4 percent and 45.5 percent respectively. It is interesting to note that the increase in catch was higher than the rate of increase in the number of fishing gears during the whole period. This increasing trend in catch and CPUE of both fishing gears for the whole period that the area had improved to an extent that the fish were able to reproduce to support the fishing activities of the fishers. The deployment of artificial reefs played a major role in improving fish catch presumably by providing food and shelter to different species of fish and other marine organisms. The Wilcoxon rank sum test at level of $\alpha = 0.025$ and 0.050 indicated a significant difference of the benthic lifeform diversity for the artificial reefs between 1991 and 1994 and between 1991 and 2001. The means of diversity values for 1991, 1994 and 2001 were 0.92 ± 0.22 , 1.36 ± 0.14 and 1.95 ± 0.39 , respectively. The improvement of the artificial reef area condition may also be gauged by the abundance of Chaetodont species, an indicator organism expressed as IRDI index. The mean of IRDI gradually increased from 4.9 in 1991 to 9.8 in 1994 and to 19 in 2001. There

was a significant increase in reef fish diversity in the vicinity of the artificial reefs corresponding to the same test at level of $\alpha = 0.025$ and 0.50 , from an average of 1.74 in 1991 to 2.4 in 1994 and to 2.8 in 2001. The project outcome also generated positive impacts on the socioeconomic aspects. Chi-square test showed a significant increase in social welfare level and in income levels referring to before and after implementation of the project for both respondent groups. The test also indicated a significant increase in "access to food" and in "access to recreational activities" for both Jemeluk and Tukadse.

ENCINARES, JOHN MARK A.

Guano-dwelling Arthropod Communities of Cave Systems in Mabini, Pangasinan, Philippines, and Knowledge, Attitudes and Practices of Key Cave Users. – 2016.

The guano-dwelling arthropod communities inside Cacupangan and Santo Rosario Cave Systems in Mabini, Pangasinan have been documented for the first time. Locations inside four caves have been selected to study the taxonomic composition, density and distribution of arthropods in guano deposits. The knowledge, attitudes and practices of selected cave users were also captured through purposive interviews, and were evaluated as to what cave management interventions should be done with the local communities to better conserve the caves, especially the guano communities therein.

Several types of guano with their own unique assemblages of associated arthropods were observed. A total of 42 morpho-species were recorded, including four possible new cave-restricted species, calling for the protection of the cave sites.

Key informant interviews revealed that disturbance caused by tourism may represent the greatest threat to the guano communities in the caves. Guano collection, bat hunting and bird's nest collection were not viewed as rampant in Mabini caves. Over all, the karst landscape of Mabini experiences moderate anthropogenic disturbance.

Based on the characteristics of the guano-dwelling arthropods and the KAP of the locals about their caves, conservation management measures are hereby recommended to be added to the Municipal Cave Management Plan of Mabini.

ENGAY, KATHREENA G.

Land cover change and water yield of Silang-Santa Rosa River Subwatershed, Laguna, Philippines -- 2011

Patterns of land cover changes in the Silang-Santa Rosa River Subwatershed were documented through conduct of Participatory Rural Appraisal approaches and GIS mapping. Drivers and impacts of land cover change in the upland, mid slope and lowland barangays of the subwatershed are influenced by local socioeconomic and biophysical conditions. 1993 and 2008 land cover maps were generated from classified satellite image using ArcGIS with four identified cover classes that include perennials and coconut, cultivated or tilled areas, fallow and grassland, and built-up. Land cover patterns in the subwatershed begun from perennials to grassland to built-up, and from farmlands to idle lands then to built-up.

A GIS-based water balance model of the subwatershed that predicts water discharge was derived from PCRaster's Discharge Model with component parameters including rainfall, evapotranspiration, cover coefficient, and soil field capacity. Results of sensitivity analysis showed that the volume of water discharge changes with varying land cover coefficients. The model can be used to simulate various scenarios of land cover change and its impact to water yield. Simulation result show that increase in built-up areas resulted to increase in water yield implying reduction in groundwater recharge.

ESCARIO, JOEPAR C.

Forecasting Future Land Cover Change in a Rapidly Developing Region Focusing on Protected Areas: The Case of Davao River Basin, Philippines. – 2023.

Davao river basin in the Philippines is a rapidly developing area in the country. The main objective of the study is to forecast land cover changes based on historical and present development scenarios in the Davao River Basin, Philippines, specifically: 1) determine the extent to which each type of land cover in the Davao River Basin has changed between the years 2010, 2015, and 2020; 2) forecast the degree and trend of future land cover changes in the protected area of Davao River Basin; and recommend programs, practices, and strategies to optimize planning and policy formulation in protected areas within the DRB discovered to change rapidly in land cover. The study simulated future land cover scenarios in the Davao River Basin, Philippines, using NAMRIA 2010, 2015, and 2020 land cover maps and driving variables. The study simulated and predicted future land cover using QGIS MOLUSCE. Analysis of land cover change from 2010 to 2020 showed a 31.80% decline in wooded land and a 3x and 20x increase in area of grassland and barren land from 2010, respectively. The most extensive land conversion from 2010 to 2020 was wooded land to grassland (337.36 sq. km). The study used Artificial Neural Network (ANN) to model land cover changes and Cellular Automata (CA) to predict 2045 land cover. The ANN simulation predicts 2045 land cover with 77.40% accuracy. Predictions showed that wooded land will

decrease by 36.3% while grassland, barren, built-up, and forest will increase by 415.38%, 375.74%, 12.23%, and 3.40%, respectively. The prediction showed that cultivated and built-up areas will occupy protected and conservation areas by 4.98% and 0.13%, respectively. The MLP of the LCM IDRISI 17.0 was used to determine influential variables; population density and urban center's proximity influences built-up and cultivated area expansion, respectively. The Chi square test (5% confidence level) demonstrated that the transition between land cover classes in 2010-2020 will be the same in 2020-2045 with a business as usual scenario ($\chi^2_{comp} = 3.1876$, $\chi^2_{tabular} = 65.1556$). The methods used and the projected land cover in this study can help DRB LGUs to prepare their comprehensive land use and development plan based on the future trends of the land cover transitions.

ESCOBIN, AILEEN A.

Institutional arrangements in the rehabilitation of Binan river, Laguna, Philippines. -- 2001

This study analyzed the institutional linkages and partnership in the rehabilitation of Binan river. The objectives were to identify the major institutional stakeholders or key players and determine their roles in the rehabilitation of Binan river, to discuss the institutional processes in the planning and implementation of management programs in the rehabilitation of Binan river, to identify the gaps or problems and issues in the institutional linking process, and to recommend policy options for effective and sustained river rehabilitation. Stakeholder involvement/partnership played a significant role in the rehabilitation of Binan river. Through the initiatives of a grassroot institution, collective river rehabilitation activities that eventually involved other organizations were undertaken. Institutionalization of multisectoral partnerships through formal agreements, availability of funds, and strengthening of commitments of stakeholders were found to be crucial factors in enhancing river rehabilitation efforts. The increased participation of various groups culminated in the formation of a multisectoral partnership, the BISIG-CATA River Rehabilitation and Protection Foundation, Inc.

Such activities as community organizing through sectoral meetings and peer to peer communication, and environmental education campaigns, were effective steps for mobilizing the communities/institutions. Strong leadership of the grassroot organization was found to be a critical factor in implementing river rehabilitation projects. After five years, selected river water quality parameters indicated the progress of the rehabilitation efforts. Significant reductions in total suspended solids, oil/grease concentrations, BOD and COD levels were observed. To further strengthen the institutions, the following issues should be addressed to maintain the sustainability of the rehabilitation efforts : involvement of more communities, active participation of the industry sector, incentives for the Binan Environmental Army and other volunteers, additional funds for its activities such as environmental education information campaigns, regular river water quality monitoring, strict enforcement of environmental ordinances and anti-pollution measures, and additional financial support to the Office of the MENRO.

ERCILLA, PANCHO E.

Environmental Sustainability Assessment of an Academic Institution in Calamba City, Philippines – 2015.

Management of environmental aspects and impacts, integration of environmental concerns in instruction, research, and community extension programs of a private college in Calamba City, Laguna were evaluated to determine its environmental sustainability. Environmental audit and interview of students, faculty, and top level management about its sustainable initiatives were conducted.

Energy consumption, hazardous and solid waste generation, and material consumption were the most significant aspects of the private college. Its current environmental sustainability-related projects to address these aspects were inadequate of sustainability and progress was not monitored and evaluated. Since majority of the students and employees identified the benefits of Environmental Management System (EMS), a proposed environmental sustainability plan based on EMS template that incorporates public participation and mainstreams environmental sustainability in instruction, research, and extension program could improve its environmental performance and communication of its sustainability initiatives to the stakeholders.

ESCUADRO, FELICISIMO C. JR.

Farmer-based analysis of the Valencia community forestry project -- 1996

This study valued and analyzed the costs and benefits of the Valencia Community Forestry Project (VCFP) from the perspective of farmers and based on the equivalency concept of subjective economics. It used primary and secondary data for analysis. The former was gathered through random sampling from VCFP farmers. It was organized by descriptive statistics and then grouped into categories. Secondary data was obtained from the DENR-10 and the assisting NGO. The study site is located in Valencia, Bukidnon. Respondents were males, ages 22 to 59. The majority of them were married. Most had some elementary education. They belong to the following ethnic groups: Boholano, Cebuano, Ilonggo,

Manobo and Talaandig. The costs of the project were grouped into : land stabilization technology (LST)/contour, project supervision, and workgroup.

The benefits were classified into tangibles and intangibles. The tangible benefits included those related to : subsistence such as amenity, basic necessity, livelihood, store; production like alternative resource, animals, farm inputs, farm planning, irrigation canal, legacy, market access, silviculture, utilization, workgroup; and finance such as aid, hauling, income, loans, savings. The intangible benefits included those associated with : conservation such as upland farming technology, land stabilization technology, soil erosion, fertility conservation, consideration of soil/land as life, forest protection, wildlife habitat, watershed, airshed, soil holding capacity, grassfires, nature, and DENR policy; health and welfare such as landslide, protection from rain and wind, trail, and well-beings; and community development like Community Resource Management and Development Plan (CRMDP), Education, Information, People's Organization, Project Supervision, Resource Management Technology. The benefits of the project outnumbered the costs. The farmers believed that the project has made a positive impression on their lives and want it continue. They will support the implementation of the second phase under the management of the people's organization, popularly known as the cooperative.

ESPANOL, LYDIO M. JR.

Dynamics of human-environment relationships in Mananga watershed, Cebu City, Philippines -- 2001

The Mananga River Watershed Forest Reserve is in critical situation despite being protected under the NIPAS Act. This study was conducted to assess the interaction between human population and the watershed environment mediated by laws and policies. The trend of population growth and movement into the watershed was determined. The extent of environmental change associated with the peoples' activities in the area was assessed, policies implemented were evaluated and the relationships among demographic, socio-economic, knowledge, perceptions and attitudes of people towards selected aspects of the watershed were determined. Secondary as well as primary data were used in assessment. The result show that population growth rate in the watershed is high compared to the national figure. This was largely brought about by in-migration. The activities of the people in the watershed such as slash and burn "kaingin" method of agriculture, sand and gravel extraction in the riverbed, use of pesticides and inorganic fertilizer as agricultural inputs, construction of Ayala Heights subdivision and a golf course near the watershed, and land conversion from forest to agricultural and built-up area all resulted to loss of biodiversity, high risk of ground water contamination, land degradation, impaired hydrology and water shortage. Secondary impacts identified include declining agricultural productivity, loss of potential income and saltwater intrusion.

Analysis of the water quality revealed that the BOD and DO of Mananga River falls under Class A of water Classification. The presence of fishes and othe aquatic life in the river may suggest that the water quality is still within tolerable limit for Class A water. People in the watershed have average level of knowledge, have negative perceptions and negative attitude towards selected aspects of the watershed. It is suggested that this might have been due to insufficient information and the way regulatory measures have been implemented.

ESPEJO, ELIZABETH R.

Environmental management and rehabilitation of small-scale mining in Panganason, Kingking Pantukan, Davao Province -- 1996

This study focused on the environmental management and rehabilitation of small-scale mining in Panganason, Kingking, Pantukan, Davao province. It aimed to : 1) identify the factors that contributed to the opening of such operations to identify the forms of services and assistance necessary; 2) describe the effects/impacts of the mining and milling methods used in extracting and processing the gold mineral form the ore; 3) analyze the management schemes practiced by operators; 4) recommend environmental management and rehabilitation measures to minimize the adverse impacts of smal-scale mining; and 5) determine the roles of institutions in the conduct of small-scale mining in Panganson. The survey method of research was used in this study, and descriptive statistics were used to analyze the data. Factors which contributed to the opening of the mining operations include biophysical ones like, presence and extent of the deposit, accessibility and geologic risks involved as well as socio-economic factors like, job opportunities, method of extraction and income.

The method used in extracting the gold ore is tunnelling or underground mining, and the gold is processed using the mercury amalgamation method. Other aspects of the operations are described. The major impacts of the mining operations were identified as forest denudation due to the removal of trees for timbering tunnels, and the issue arising from operating in an the area with a mining claimant. An important finding is that neither the LGU of Pantukan, nor the environmental officer (DENR-PENRO) assigned in the area has any direct control over the operations. It is strongly recommended that the LGU and the DENR-PENRO work together to assist the small-scale miners legitimize their operation. A MOA between NADECOR and PDMA can be forged and a CENRO appointed to the LGU. Services such as a test laboratory to determine the grade of the extracted ore, price control of commodities, housing, medical assistance, schooling and those responding to other needs are also recommended.

ESPINO, MARCO RAFAEL M.

Life Cycle Assessment of the Production of Virgin Coconut (Cocos nucifera L.) Oil. -- 2017

Life cycle assessment of virgin coconut oil (VCO) production was conducted to determine the environmental burdens from gate to gate in a small-scale enterprise. Two batches of VCO production cycle using cold press method were evaluated. Four hundred fifty one (451) liters of VCO were produced out of 6.431 kg of dehusked coconuts, electricity (575 kilowatts) and water (33.11 m³) were the major inputs during the production process.

Coconut shell, coconut water, pressed coconut meal and sludge during the preextraction and extraction phase are used as raw materials in other small scale enterprises; very minimal solid waste (2.1-E-03kg solid waste/li VCO) is properly disposed. Together with solid waste generated, global warming potential (0.48 kg CO₂ e./li VCO) and eutrophication potential (9.8-E05 PO₄ e. kg /li of VCD), water footprint (0.7 li of water/li of VCO) are the environmental burdens. The wastewater treatment facility needs to be upgraded to comply with Class B water quality DENR standard.

ESPINOSA, ABIELA MARI T.

Rainwater Harvesting System as a Potential Water Security Strategy in Selected Barangays of Bay, Laguna, Philippines. – 2023.

The Municipality of Bay is a low-lying area beside Laguna de Bay hence it often experiences excessive runoff due to heavy rains brought about by extreme events. Thus, this study assessed the potential of the rainwater harvesting system as a water security strategy to compensate for water supply and reduction of runoff that focused on the Barangays of San Antonio, San Isidro, Sto Domingo, and Tagumpay. The study performed both secondary and primary data collection approaches in combination with desk research by way of gathering of other supplementary relevant records and documents. The results showed that in terms of its performance as an additional and alternative water source intended for residential non-potable uses is notable. It does not guarantee the absence of flooding, but it can provide considerable reduction of stormwater runoff depending on the number of users. However, the volume of rainwater collected is insufficient to supply rice production.

The community's attitude towards adoption and implementation of the technology was validated to be dependent on support in the form of incentives and promotion by relevant institutions. Moreover, their willingness to adopt is based on their years of residency in the municipality and marital status according to statistical analysis. The identified challenges in the implementation of a rainwater harvesting system require increased engagement and attention to improve receptivity. Hence, this offers policymakers a starting point as a basis for innovative approaches to integrated water resource management in the face of impending water scarcity.

EUGENIO, ELENA A.

An Integrated Assessment of the Impacts of Land Use Change on Ecosystem Services and Livelihood Vulnerability in Silang-Santa Rosa Subwatershed – 2018

Silang-Santa Rosa subwatershed is one of the Philippine subwatersheds at risk of degradation because of environmental changes in the past decades. To determine environmental changes, historical land use maps in the subwatershed were collected and analyzed. Households' perceptions on these changes were gathered through field survey in the upland, midland, and shoreland villages.

Complementary approaches were used to analyze the survey data; i.e. factor analysis to identify environmental degradation affecting the respondents; cluster analysis to identify the typology of livelihood vulnerabilities; and conjoint analysis to identify respondents' adaptation preferences. The identified environmental degradations that affect livelihoods include pollution, sedimentation, and high temperature. The most vulnerable livelihood to environmental degradation includes self-employment and family business. Many respondents are willing to participate in conservation, i.e. tree planting. In addition to respondent's initiative, the LGUs also have programs, projects and ordinances that contribute to conservation of the environment. The policy analysis reveals the need to improve compliance to zoning ordinance, awareness on solid waste management/waste segregation, and strategic approach to motivate communities' participation.

EVACITAS, FLORENCE C.

Impacts of whale watching on the cetaceans and coastal populations in Bais City, Philippines -- 2001

The whale watching ecotourism in Bais City, Philippines was examined for its impacts on the cetaceans and coastal populations. Impacts of cetaceans such as changes in population size and species diversity were determined by comparing secondary data from ocular surveys conducted in 1992 and 1998. A survey was conducted among households involved in fishing, whale watching ecotourism, and those who are not involved in any of these activities in barangay

Capinahan, the base of the whale watching activities, to assess impacts on the coastal populations. A survey of questionnaire was used to determine respondents' socio-demographic profile, household income, income disposition, and perception on and attitude towards the value of cetaceans and other related issues. Analysis of variance was used to determine significant difference in the income, income disposition, and perception and attitude scores among the three household groups. Correlation analysis was done to determine relationship of perception and attitude items with the socio-demographic characteristics of the respondents. Fishing households were also asked for observed changes in their fishery resources following the establishment of the whale watching ecotourism in their area.

Whale watching activities have no significant effect on the species diversity and population size of cetaceans since its establishment in 1996 to date, although this may be due to the short period of observation. However, the absence of existing whale watching guidelines may result to negative effects on the cetaceans in the long run. Whale watching activities have caused damage to fishing gears, have led to poor water quality, and consequently low fish catch in the area near the wharf. There is no significant difference in the household income among the three household groups. Tourism households, however, spend significantly more ($P < 0.05$) on recreational activities and significantly lesser ($P < 0.05$) on food and other basic necessities than the two other groups. There is no significant difference in the perception scores among household groups. The respondents' perception scores on the impacts of human activities on cetaceans are significantly ($P < 0.05$) correlated with educational level while the perception scores on the economic benefits of whale watching are significantly ($P < 0.05$) correlated with household income. Tourism households have significantly higher ($P < 0.05$) mean attitude score toward practices affecting cetaceans but significantly lower ($P < 0.05$) mean attitude score toward operation of whale watching.

FARONILLO, KENDRICK MICO L.

Cultural Ecosystem Services : Youth Perceptions and Valuation on Urban River Linear Parks – A Case of Pasig City, Philippines. – 2022.

Urban River Linear Parks (URLPs) play an important role in providing urban residents a place to appreciate various cultural ecosystem services (CES). In response to an increasing demand for public green spaces, this study examined the factors affecting the intention of youth residents in some barangays in Pasig City, Philippines to visit URLPs. Online survey was conducted with 503 respondents. Data were analyzed using Structural Equation Modeling (SEM) approach and STRATA software. Using the Travel Cost-Contingent Behavior method, there is an estimated potential increase of around 9-40 in frequency of visits and inclusion of bike rentals, as active recreational activities, and heritage sites are preferred. Results of SEM also revealed that awareness on CES had a significant positive effect on attitude, social norms and perceived behavioral control (PBC). However, only PBC was significantly associated with the behavioral intention to visit URLPs. It was also identified that there was a gap in the interactions between government officials and youth residents, which led to the youth's low awareness of environmental laws and policies. Recommendations to conduct environmental information and educational campaigns for the youth residents will lead to their improved visits on URLPs.

FLORES, MARY JOYCE L.

Analysis of the relationship of mangrove cover, sedimentation rate and total suspended solids (TSS) in Cansaga Bay, Consolacion, Cebu, Philippines -- 2001

A study on the interrelationship between the social component of the Cansaga River Watershed System, some biophysico-chemical components and state of mangrove cover along the coast of Cansaga Bay was conducted. The social component focused on the human settlement within the watershed area and its possible effects on the use of ecosystem services offered by mangroves and mangrove lands. Assessment of this sector was based on human activities, the socioeconomic status of the respondents and its effects on their level of knowledge and perception towards mangrove resource use. To know the possible interaction between the biophysico-chemical factors, the following were measured and studied: sedimentation rate (SR) and total suspended solids (TSS) in five stations in relation to type of mangrove cover and season. The interaction of the biological components was also studied by looking at the relationship of mangrove cover, fish and shellfish catch.

The interaction of the different components appears to have an effect on the present state of mangrove cover along the coast of Cansaga Bay. The high overall level of knowledge and perception of the community on mangroves seems to be a result of efforts by government agencies to reforest some mangrove areas. There is also continued information campaign done by these agencies against illegal fishing and/or cutting of mangrove trees. However, the high overall level of knowledge and perception is not reflected on how the people conduct their activities within the watershed area. Abandoned quarry sites and improper waste disposal were evident in the upland area. Meanwhile silt, mud, trash and other forms of waste, which could have been easily part of run-off from the upland down to the coast, can be seen deposited in the mangrove areas and the Bay itself. Results of the biophysico-chemical analyses showed that there is a significant relationship between type of mangrove and SR. The tree type of mangrove was able to trap the most amount of sediment. The relatively denuded area had the least amount of sediment trapped. However, there was no significant relationship between SR and season. On the other hand, analysis of the amount of TSS revealed the significant

relationship between TSS to type of mangrove cover and season. The relatively denuded area had the highest amount of TSS during both seasons. Based on the findings, a set of alternative management strategies that would help ensure the continued existence of the resource and humans was recommended.

FLORES, ZENAI DA M.

The diversity of the golden apple snail *Pomacea* sp. (Gastropoda : Prosobranchia) in the Philippines -- 2002

Multiple introductions of the golden apple snail into the Philippines, *Pomacea canaliculata*, could indicate the presence of more than one species present in the country. To determine the diversity of the *Pomacea canaliculata* in the Philippines, morphological characterization and protein profiling of golden apple snails collected from eight provinces in the Philippines were conducted. Snail samples from Bukidnon, Cebu, Davao, Isabela, Leyte, North Cotabato, Nueva Ecija, and Nueva Vizcaya were compared and analyzed to determine whether or not the golden apple snail attacking rice in the Philippines belong to only one species. Protein extracted from the foot muscles of the collected *Pomacea* sp. were subjected to sodium dodecyl sulfate - polyacrylamide gel electrophoretic (SDS-PAGE) analysis. A total of four major protein bands were resolved with estimated molecular weights (MW) of 83, 40, 35, and 29 kDa. Three protein patterns emerged on the basis of the presence of each band : 1) Pattern A has all four major protein bands; 2) Pattern B has three major protein bands with MW of 83, 40, and 35 KDa; and 3) Pattern C has two major protein bands with MW of 83 and 35 KDa. In general, the protein pattern among snail samples from the same location did not show significant difference.

However, across locations, major protein bands with MW of 83 and 35 KDa were consistently present while those with MW of 40 and 29 KDa were variable. Pattern A was manifested in snail samples from Davao; Pattern B was manifested in snail samples from Cebu, Isabela, Leyte, North Cotabato, Nueva Ecija and Nueva Vizcaya, and Pattern C was manifested in snail samples from Bukidnon. Electrophoretic fingerprints of snails belonging to one location are generally the same regardless of the variation in shell color and the prominence of the growth lines. The different protein patterns observed across locations may indicate genetic variability in the *Pomacea canaliculata* at the protein level. These proteins could be further characterized and may be used as genetic markers to come up with a more meaningful taxonomic classification of the *Pomacea canaliculata* in the Philippines.

FLORESCA, JANUEL P.

Sustainability evaluation of diversified model farms of the "redireksiyo" program of the local government of Santiago City, Philippines -- 2000

The sustainability of the high value crops farming system of the diversified model farms established by the Local Government Unit and the existing monocrop rice, monocrop corn and rice + tilapia farming systems in Santiago City were evaluated using the strengths, weaknesses, opportunities and threats (SWOT) analysis. The effects of economic, ecological, technological, socio-cultural, institutional and political viabilities on SWOT index of farming systems sustainability were assumed to be equal. The SWOT index of farming systems sustainability were assessed using two approaches : 1) analysis of strengths and weaknesses alone, and 2) analysis of strengths, opportunities, weaknesses and threats. The rice + tilapia and the high value crops farming systems were consistently the most and the least sustainable, respectively, in both approaches. The sustainability index of the monocrop corn was higher than that of the monocrop rice farming system. The index of ecological viability of high value crops farming system was higher than that of the monocrop rice farming system. The index of economic viability of monocrop rice, monocrop corn and high value crops farming systems and the index of institutional viability of rice + tilapia farming system increased when their opportunities and threats were considered.

This overall SWOT indices of sustainability of all the farming systems slightly increased when the opportunities and threats were included. In both approaches, the ranking of the farming systems sustainability did not change. The strategies needed to enhance the sustainability of the diversified model farms are : a) monitoring of prices and volume of high value vegetables at the Santiago City market to proper production timing, b) integrated pest management to reduce pesticide application and soil fertility assessment using soil test kit (STK) for proper fertilizer application, and c) on-farm trials on local seed production of some high value vegetables. A semi-quantitative assessment of SWOT index of sustainability needs to be developed to facilitate farming systems development planning and management.

FRANCISCO, VICTOR MA. A.

Social preparedness assessment of two (2) community forestry project areas in the Philippines -- 1995

This study sought to present and analyze the manner and extent of "social preparedness" in two (2) CF project sites in the Philippines. The project sites were located in Brgy. Rizal, Camarines Norte (pilot project), and Brgy. Adams, Ilocos Norte (expansion project). The study sites were selected based on the bio-physical and socio-economic conditions of the area as well as the age/experience of the contracted NGO.

Rapid Rural Systems Appraisal and the Participant Observation method; in particular the researcher took the role of a "participant-as-observer" to gather data and have a better understanding of the social conditions. An average of 50 days was spent in each of the study sites. Assessment of Social Preparedness was based on three (3) variables : the Input Variable (Organization), the Process Variable (Participation), and the Output Variable (Self-Reliance).

The study shows that while the Community Forestry Program is a very well grounded effort to advance rural development thru community-based resource management, its success mainly depends on its first stage of implementation - the Social Preparation Phase. While both areas were able to muster commendable bio-physical achievements in terms of environmental rehabilitation, both areas have failed in preparing the people to act, manage, and promote collective efforts for community or organization gain. Emphasis on the program was given to the bio-physical accomplishments as a basis for successes much to the demise of socially transforming the community members to become self-reliant. Instead, the participants viewed the program as an income generating opportunity by working on the bio-physical aspects without internalizing the long term goals of the program. In the three (3) variables used in the framework of this paper, the concept of social preparedness is nowhere near the present state of the Sta. Elena and Adams organizations.

FUCIO, ROEL L.

Assessing the Impacts of Land Use Change on the Agricultural Productivity of the City of Santa Rosa, Laguna, Philippines Using Geographic Information System. – 2017

Land use change analysis is an important approach to better understand global environmental changes. Rapid urbanization in rural areas is one of the major drivers of agricultural land conversion. The total area of agricultural lands has been declining over the years due to the demand for other land uses such as for residential, industrial, and commercial uses. Santa Rosa City in the province of Laguna, Philippines has shown distinct changes in land use towards a more urbanized environment from being agricultural. In order to understand these land use changes in Santa Rosa City, unsupervised classification of four Landsat satellite images taken in the years 1990, 2000, 2007 and 2016 were used. The study quantifies changes in agricultural areas and analyzes its impacts on agricultural productivity in the city of Santa Rosa, Laguna. Results of the study revealed that 78% of agricultural lands are converted to other uses from being the dominant land use type. Most conversions were towards residential developments that originally covered just 18% of the city in 1990 to 49% by 2016. The results of the study provide quantitative data on land use and land use changes that can serve as a guide for land use appraisal that can help avoid mitigation compensation. Based on the results of the study, Santa Rosa City's rice insufficiency can be augmented by using high yielding varieties of rice, rice importation, and by utilizing the currently idle areas as potential rice production areas.

FUERTES, MARY ANN V.

Estimation of household willingness to pay for solid waste collection and disposal service in Poblacion, Davao City -- 1998

The study aimed to estimate the household's willingness to pay (WTP) for the solid waste collection and disposal service in Poblacion, Davao City. It was estimated using contingent valuation method (CVM). Data were acquired through personal interviews with 200 randomly selected households between February and March 1998. The WTP was solicited using the dichotomous-choice iterative bidding question format. Ninety-four percent of the respondents were willing to pay for the service being valued. Tobit regression model was constructed to estimate the benefits or the peso value of the service. The expected WTP value was P62.37 per month per household. The total benefits of the service for Poblacion and for the entire Davao City residents were P21.17 M per year and 103 M per year, respectively.

The socio-economic and demographic variables that were significant in influencing WTP were age, education, household income, and perception of waste as a problem, frequency of collection and awareness of the location of the dumpsite. Except for age, these variables showed a positive direct relationship with WTP. The results of the study could help in the assessment of the economic viability of charging household for the collection and disposal of their solid waste.

GAGARIN, WESLEY S.

Valuation of Mangrove Rehabilitation for Storm Surge Protection in Upper Calauag, Quezon, Philippines. – 2018

Mangroves play an important role in protecting coastal communities from storm surges. Using market price method and double-bound contingent valuation method, the monetary value of the storm surge protective function of mangroves in Brgy. Santo Angel as well as the community's willingness to pay for the enhancement of this ecosystem's function through rehabilitation were determined. The locals' knowledge, attitude, practices, and awareness on mangroves, its protective function, and on storm surges were also assessed through structured questionnaire.

The calculated monetary value of the mangroves' storm surge protective function was amounted to Php 356, 008.00. This value was derived from the averted house damages provided by mangroves against a Haiyan-like storm surge inundation. The willingness to pay of the locals for mangrove rehabilitation project was estimated to Php 15.44/household/month with a 5-year social willingness to pay amounted to Php 341, 982. 60. The local people of Brgy. Santo Angel have a high knowledge on mangroves and its ecological importance. There is a moderate awareness in terms of the ecosystem's protective function. The respondents also showed a moderate knowledge, awareness, and preparedness toward storm surges. This implies that the mangroves in the community are undervalued as evident by the locals' low willingness to pay for its rehabilitation. This is an important consideration especially that the mangroves provides substantial protection against storm surges.

The results highlighted the monetary value of mangroves' storm surge protective function in Brgy. Santo Angel. Awareness creation on this particular mangrove role should be considered to enhance the locals' willingness to pay for the improvement of the ecosystems' coastal defense function.

GARCIA, CLLOYD JOSEPH S.

Land Cover and Water Quality Changes from 2005-2021 of the Parañaque River, Philippines: Trends, Impacts, and Recommendations—2023

Land cover changes (LCC) in Parañaque River watershed are brought by urbanization, but the study regarding these changes, and their potential impacts on the river's water quality was limited. Data on water quality from 2005-2021 was provided by DENR-EMB NCR. Satellite imageries for the years 2005, 2014, and 2021 were downloaded from Landsat 4-5 TM and 8-9 OLI. QGIS and SCP were utilized for the classification of the satellite images. Statistical tests showed minimal spatial and significant temporal variability of the river's water quality. 4 out of 7 primary parameters failed the DENR standard which is attributed to the domestic wastes in the area. Although still not within the DENR standard, phosphates, DO, BOD, fecal coliform, pH, and nitrates showed improvement from 2019 to 2021 which may be due to the intensive local and national efforts to rehabilitate Manila Bay, and the reduced human activities because of the COVID- 19 pandemic. Built-up continuously increased encroaching even the water bodies. Large areas of open lands were converted to built-ups, while vegetative covers increased because of various local and national greening initiatives. Only DO, pH, salinity, and phosphates showed significant correlation with built-up areas implying that other factors might have regulated the quality of the river. It likewise revealed the importance of vegetating the watershed to regulate river pollutants. Several policy recommendations were suggested such as the enactment of ordinances to establish Comprehensive Local Greening Program, and to incentivize establishment that would allocate space for flood mitigation programs. The success in the implementation of the policy recommendations relies on urgency and public participation.

GARCIA, KRISTINE B.

Predicting Geographic Distribution and Habitat Suitability Due to Climate Change of Selected Threatened Forest Tree Species in the Philippines.. – 2013.

Climate change is projected to alter the geographic distribution of forest ecosystems. This study aimed to evaluate the consequences of climate change on geographical distributions and habitat suitability of 14 threatened forest tree species in the Philippines. Based on the principle of maximum entropy, this study utilized a machine algorithm called Maxent to estimate a target probability distribution of the selected species.

Threatened forest tree species occurrence records and sets of biophysical and bioclimatic variables were inputted to Maxent program to predict current and future distribution of the species. The Maxent models of the threatened species were evaluated using Receiver Operating Characteristics Area Under Curve (ROC AUC) and True Skill Statistics (TSS) tests which revealed that the models generated were better than random. The Maxent models ROC AUC values of the 14 species range from 0.70 to 0.972 which is higher than 0.5 of a null model. Based on TSS criteria, Maxent models performed good in two species, very good in ten species, and excellent in two species.

Seven species (*Azelia rhomboidea*, *Koordersiodendron pinnatum*, *Mangifera altissima*, *Shorea contorta*, *Shorea palosapis*, *Shorea polysperma*, *Vitex parviflora*) were found to likely benefit from future climate due to the potential increase in their suitable habitat while the other seven species (*Agathis philippinensis*, *Celtis luzonica*, *Dipterocarpus grandiflorus*, *Shorea guiso*, *Shorea negrosensis*, *Toona calantas*, *Vatica mangachapoi*) will likely experience decline in their suitable habitat.

This study provided an initial understanding on how the distribution of threatened forest trees will be affected by climate change in the Philippines. The generated species distribution models and habitat suitability maps could be used as basis in formulating appropriate science-based adaptation policies, strategies and measures that could enhance the resilience of those threatened forest tree species and their natural ecosystems to current and future climate. In addition, these could also contribute in developing a climate proof protected area management plan.

GARCIA, MHEDA G.

Environmental Life Cycle Assessment of Corn Production with Genetically-Modified Herbicide Tolerant Maize on Sloping Arable Land. -- 2013

The grain yields of genetically-modified herbicide tolerant (GMHT) corn with manual tillage with no glyphosate application, manual tillage with two glyphosate application, and minimum tillage with three glyphosate applications were not significantly different on 18 to 36% slope Faraon clay in Mulanay, Quezon during the wet season, 2011. Soil erosion rates also did not differ significantly among the treatments but minimum tillage with three glyphosate applications had the least soil loss (8.4 tons/ha).

Environmental life cycle assessment was used to determine the potential environmental impacts of GMHT corn production from land preparation to harvesting. Identifies environmental hotspots were soil erosion, potential eutrophication, and freshwater Eco toxicity. The study recommends soil conservation-based GMHT corn production by combining herbicide tolerance technology and other erosion control techniques in sloping corn farm, use of appropriate protective gears during glyphosate application, and promotion of on-site composting of Stover for nutrient cycling.

GASAPOS, CORAZON C.

Environmental consequences of Batangas Port Expansion on Adjacent Communities -- 1997

The study was conducted to review the major environmental impacts of Batangas Port Expansion and assess the perceptions of the affected communities on the project. The unit of analysis was the port's adjacent barangays. Perception survey conducted with the residents of adjacent barangays showed that majority of the respondents perceived the project to be beneficial. On the issue of relocation, the affected families preferred nearer relocation area and higher financial assistance. In general, the EIA methodology employed by the proponent was inadequate in so far as capturing the crucial component of the EIA process which is social acceptability and participation. It is therefore recommended to incorporate public participation as early as the planning stage of the project and determine its social acceptability prior to its implementation.

GECOLEA, NORMA M.

Landscape ecological assessment for greening the tourist gateway in Roxas Boulevard, Metro Manila, Philippines -- 2002

The landscape ecological assessment for greening the tourist gateway in Roxas Boulevard, Metro Manila integrated landscape structures and functions - abiotic, biotic, socio-economic-historic-cultural features. Respondents' perceptions on the landscape quality of Roxas Boulevard and the landscape management system of Metro Manila Development Authority were also evaluated. The performance of Dona Aurora and Dona Luz hybrids and Ardisia grown on different soil media was tested in the medians of the tourist gateway. The landscape has a matrix, which is predominantly historical-cultural, institutional and recreational buildings, patches of open spaces and various plant species, road corridors, ornamental median corridors, line corridors of trees, and sidewalks. The Manila Bay enhanced the landscape visual quality. At a broad scale the landscape is a road corridor. The soils of the plant boxes on the center medians of Roxas Boulevard and side corridor along NAIA road were slightly alkaline and had very low fertility particularly nitrogen and phosphorus but high in calcium and magnesium. Trees were the most dominant plant types in the patches. Adelfa (*Nerium oleander*) is the most tolerant ornamental plant in the very warm microclimate of the raised boxes on center medians with high vehicular gaseous emission and low moisture availability during the dry season. Butterflies are present in the open spaces. *Mussaenda* hybrids such as Dona Aurora and Dona Luz and *Ardisia* (*Ardisia pyramidalis*) both indigenous ornamental plants had very high survival rate during the short term field trials on plant boxes at the median corridor of the tourist gateway despite of low water availability. *Mussaenda* had very high survival irrespective of soil treatments at NAIA side corridor for the plants were well maintained and watered. Matured *Ardisia* seedlings had better survival than younger ones. Moisture stress during the growing period masked the effect of different soil treatments on performance of these two ornamentals.

Majority of the respondents were aware of the need to improve the scenic quality, the greening program for the tourist gateway and the benefits that could be derived from this program. They were willing to cooperate in the maintenance of the area. They gave high level of importance to this program in terms of improvement of the aesthetic value of the landscape and public safety, prevention of air and noise pollution and provision of shade to the pedestrians. They also perceived that the most preferred ornamental to be planted should have colorful flowers, tolerant to air pollution and support friendly birds and insects. They were in favor of the improvement of the softscapes and hardscapes except those with a fee. Tourist spot of historical sites, strolling/walking for relaxation, and picnic area were the most important respondents' perceived potential uses of the tourist gateway. They also pointed out that the landscape aesthetic quality was badly affected by the presence of squatters, beggars and peddlers, garbage problem, and air and noise pollution. Government and private organizations assisted Metro Manila Development Authority in landscape

management and development of Roxas Boulevard. However, the latter had inadequate human resources, facilities and equipment. The proposed landscape ecological management to improve landscape quality of the tourist gateway considered citizen participation in the development of the landscape, vegetation management using indigenous plant species, human resource capability on landscape management and resources of MMDA, relocation of squatters, public safety and security and relocation of the peddlers' stands.

GENERAO, MA. EMELIE M.

An analysis of the factors causing the pollution of Parongking river, Pangasinan -- 1994

The study intended to ascertain the extent of pollution of Parongking River in Pangasinan and determine the interrelationship among the various river system components in relation to resource use and management. Results showed that the river, classified as Class C, no longer serves its intended use as a fishery resource. Fishes are no longer found in the area, especially in the upstream portion. The BOD determined in the seven sampling stations ranged from 13 to 100 mg/l as against the standard of 7-19 mg/L. Only 1 of 14 observations had DO values within the 5 mg/L required minimum. Results of the analysis of the diversity of the benthic community (ranging from 0 to 2.09) showed that the river was moderately to heavily polluted. Organisms found were all pollution indicators. The river system components appear to have contributed to its present state.

The communities were not willing to cooperate in any rehabilitation effort of the government. This, coupled with the lack of sanitary services, made the river a convenient dumping area of their garbage and other domestic wastes. Similarly, farmers and the management of the industries did not feel responsible for the pollution of the river. The study emphasized the need for the holistic approach to the analysis of pollution problems. It proved that the individual impacts of the various system components, and the interaction between them, should be studied in order to come up with sound resource rehabilitation, protection and management programs. Finally, based on findings, recommendations were given for the river's rehabilitation and proper management.

GENIO-SAMSON, JINDRA N.

Participatory interactive research on the evaluation of soil conservation options in San Migara, Malitbog, Bukidnon, Philippines -- 2002

Participatory interactive research is a way of bringing together the knowledge and experiences of researchers and farmers in determining research and development agendas. This case study in barangay San Migara, Malitbog, Bukidnon integrated the use of participatory approaches in evaluating soil conservation options using contour plow, mixed forage hedgerow and pure Setaria hedgerow technologies against current farmers' practice of vertical plowing. Results showed that in the vertical plow system, soil erosion rate averaged 59 tons/ha (660 kg/ha/day) in a single wet corn-cropping season. Contour plow reduced erosion rates by as much as 45 percent while the use of forage hedgerows reduced soil loss by 60-67 percent. Corn yields in the contour plowing system (3.41 tons/ha), pure setaria hedgerow system (2.8 tons/ha), and mixed forage hedgerow system (3.37 tons/ha), were significantly higher than the yield of vertically plowed plots (2.21 tons/ha).

The non-adoption of any soil conservation technology reduced potential crop yield by as much as 16 to 35 percent, estimated to amount from P3,528 to P7,176 per hectare. Adoption of contour plow reduced nutrient losses by as much as 40 percent, 68 percent, and 80 percent for N, P, and K respectively. Forage hedgerow systems provided better reduction of nutrient losses of about 10-20 percent more compared to contour plowing system. Although the contour plow and the two forage hedgerow systems have labor cost 9-20 percent higher than the vertical plow, farmers still can derive 47-62 percent improvement in their net income as compared to the current practice. Additional economic benefits equivalent to P2,600 and P2,421 per hectare can be derived from the fodder yield of the mixed forage hedgerows and setaria hedgerows, respectively. Among the four systems tested, mixed forage hedgerow proved to be the most promising soil conservation option, based on the joint evaluation of the researcher and the farmers. Although the production benefit of contour plow system (P6,318) was 36 percent higher than the Setaria hedgerow (P4,056) farmers still prefer the latter due to the availability of fodder and its better control of soil erosion by as much as 29 percent as compared to that of contour plow. The experience in this participatory research supports the use of this method in helping farmers evaluate means of addressing an important concern such as soil erosion problem. Its use by other researchers and extension workers in research and development works is thus recommended.

GIGANTONE, CATHERINE B.

Current Impacts of Marcopper Mining Corporation's Wastewater and Sediments on Aquatic Ecosystem of Boac and Mogpog Rivers in Marinduque, Philippines. -- 2017

MMC accidentally deposited large amounts of wastewater and sediments in Boac and Mogpog Rivers in two different incidents, affecting riparian life, community health and livelihood. Therefore, extent of heavy metals (Pb, Hg,

Cd, Ag, As, Cu, Cr, Mn, Fe, Zn, Ni, Co, Sn) pollution, river recuperation and health impacts to nearby communities were studied. Samples were gathered on July 24-25, 2015, dried and analyzed for heavy metals content using XRF (biota, sediments and hair samples) and AAS (Total Cu in water) at CASL BIOTECH. Results showed low pH (3.81) upstream of Mogpog with high Cu concentration in water (11.936 ppm) and sediment (516.84 ppm). Inverse relationship of Cu concentration in water (0.05605 to 0.68682 ppm) and sediment (503.59 to 4.617.06 ppm) was observed downstream of Mogpog River. Several biota gathered such as *Nephrolepis biserrata* (control: 34.06; Bocboc: 225.76 ppm), *Albizia saman* (Butansapa 49.12 ppm; Mangyan Mababad 49.59 ppm). *Cassia alaca* (Nangka II: 334.58 ppm) recorded high Cu concentration. *Pityrogramma calomelanos* (37.32 ppm) had high levels of As. Cu concentration in riparian water along Boac (1.8, 0.10395, 0.00043 and 0.01614 ppm) and sediments (1318.71, 1714.34, 234.05 and 444.22 ppm) were recorded with pH range 6.80-6.93. As was present in sediments of two sampling sites (Boton: 16.52; Tabigue 11.24 ppm) and several biota in Boton: *Ipomea aquatic* (18.89 ppm), *Pistia stratiotes* (26.71 ppm) and *Pomocea canaliculata* (46.67 ppm). Heavy metals in hair samples from Mogpog (Mo, Zn, Cr, Mn) and Boac (Mo, Cn. Cr, Mn) were also present.

Based from the result of the study, riparian life in Mogpog and Boac Rivers had difficulty in recuperating affected by continuous discharge of wastewater and sediments from MMC thereby affecting nearby communities health. Immediate risk assessment of MMC' infrastructures is recommended to stop continuous spread of combination prior to rehabilitation of affected areas.

GIL, ALLEN GLEN C.

Disaster Recovery Assessment of Mangrove Forests in Leyte Island, Philippines using Sentinel-2 Imagery -- 2023

Mangrove forests are crucial biologically-productive ecosystems facing global loss and widespread degradation. The Philippines is one of the top countries with the most significant mangrove loss and fragmentation rates, contributed by worsening catastrophic typhoons. This paper was conducted to assess the post-disaster recovery of the mangrove forest in Matalom and Maasin City in Leyte Island, Philippines, after Super Typhoon Odette using Sentinel-2 imagery. Specifically, it aimed to utilize the synergy of vegetation indices, biophysical variables, and landscape metrics in determining the damage extent and pattern, characterizing the recovery and resiliency profile, and analyzing the spatio-temporal trends of the typhoon-inflicted mangrove forest, and discussing their implications for mangrove management.

Based on the results, large decline was observed in all post-disaster parameters, revealing substantial damage to the mangrove forest's functional, structural, and landscape configuration characteristics. This included a negative 27.12%–62.89% change in all vegetation indices and a negative 28.58%–59.63% change in all biophysical variables. The recovery and resiliency profile displayed contrasting recovery periods of 6–8 months across all vegetation indices and 8–9 months for all biophysical variables, suggesting that past studies that only employed Normalized Difference Vegetation Index (NDVI) may have reported underestimated recovery values. Moreover, Normalized Difference Infrared Index (NDII) and Leaf Water Content (Cw) exhibited the lowest Resistance (0.37–0.40) and highest Malleability (81.27%–87.75%), indicating the high sensitivity of canopy moisture to typhoon-induced damage. Furthermore, strong agreement was observed in Resilience values between vegetation indices and biophysical variables ranging from 0.88–0.92 and 0.81–0.93, respectively. Spatio-temporal trend analysis showcased increasing trends in Number of Patches, Edge Density, Patch Density, and Mean Patch Shape Index and decreasing trends in Mean Patch Area and Percent of Like Adjacencies, revealing that the mangrove forest is moving towards a more fragmented and disaggregated configuration with the growing prevalence of many smaller patches.

Policy recommendations at the local, regional, and national levels were discussed, including the adoption of the Remote Sensing-Integrated Ecological Mangrove Restoration (RS-EMF) Framework, capacity building of mangrove resource managers, implementation of proactive 'mangrove heart attack prevention' and tiered monitoring schemes, integration of citizen science programs, and economic valuation of postdisaster mangrove damage. The findings of this paper will help develop a cloud-based monitoring system that will promote cost-effective, data-driven, and collaborative post-disaster mangrove recovery assessment and rehabilitation monitoring.

GOÑO, MARCEL M.

Possible consequences of the phaseout of ozone-depleting substances (ODs) : chloroflourocarbons (CFCs) in the Philippines -- 1994

The concern of this study was to determine the possible consequences of the phaseout of ozone depleting substances in the Philippines. Selected companies/industries primarily engaged in the manufacture of home appliances and using ODS in the production process were used as study cases. The implementation of the "Philippine Country Program on the Phaseout of Ozone Depleting Substances" has significant impacts not only to the oDS-dependent sectors but to the general public or to consumers as well. The program will lead to early retirement of equipment currently used in production to give way to the new equipment/technology that will be using non-ODSs. This means additional costs to the manufacturers which will eventually be passed to the consumers. The government estimated the social costs of

implementing the program in the amount of US\$220.1 million, based on the assumption that the prices of ODS and non-ODS substitute are constant. Therefore, in the implementation of the country program, considerations must not only be on the ODS dependent sectors, a more holistic approach in program implementation should be considered.

GORGONIO, CHERRY ANN A.

Microplastics in Sediments and Fishes of the Marilao-Meycauayan-Obando River System, Bulacan, Philippines. – 2022.

Microplastics (MPs), sized at <5mm, are considered a threat to freshwater ecosystems but investigations on MP occurrence in the country are limited, particularly in water quality management areas (WQMAs). This baseline study characterized, quantified, and compared MPs from sediments and two pond-culture fish species in the downstream Marilao-Meycauayan-Obando River System (MMORS), Bulacan, Philippines. MPs were described in terms of size, shape and color; polymers types of select MPs were also determined using Fourier-transform infrared spectroscopy (FTIR). MPs were found evident in all river and pond sediments samples, with a total of 1,585 particles extracted. The larger-sized MPs (1-5mm), mostly from river sediments, consistently outnumbered the smaller MPs (1µm<1mm). MP shapes varied from the most common fragments to fibers, film, foam, and pellets. Colored MPs were also more common. FTIR analysis revealed the presence of these polymers: polyethylene terephthalate, polyethylene, olefin fiber-polypropylene, polystyrene, and polyvinyl chloride. The guts of cultured milkfish, *Chanos chanos* and blackchin tilapia, *Sarotherodon melanotheron*, were also found to contain MPs of which the smaller sizes were most abundant. MP fibers were most numerous and colored MPs were also common. These imply that MPs have accumulated at downstream of the MMORS and river-fed aquaculture ponds, including cultured fish species. The KAP surveys showed that majority of the respondents were aware of the polluted condition of the MMORS but not so familiar with microplastics. However, they deduced on the possible fate of plastics found in the river system. Respondents also demonstrated positive attitudes and support to community-driven practices involving the MMORS, and indicated their willingness to participate in campaigns as well as endorse future guidelines and policies. Results of this study may be used in the monitoring river health (MMORS), in intensifying communication and clean-up drives, and as reference for other WQMAs in the country.

GRAN, ELIZABETH G.

People's participation in mangrove ecosystem management in Sinian, Baliangao, Misamis Occidental -- 1995

The study was conducted to analyze people's participation in mangrove ecosystem management, the people's attitudes towards it and the consequences and constraints. The selected site was Barangay Sinian, Baliangao, Misamis Occidental where the Department of Environment and Natural Resources had a mangrove rehabilitation project since 1989. Testimonies from old folks stated that the mangroves in the area used to be lush and green. With the passage of time, over-exploitation reduced the mangroves to their apparently degraded state. To reverse the situation, the DENR implemented a rehabilitation project. Fifty household heads whose main sources of income were farming and fishing, were interviewed using a interview schedule. One half of the respondents were project participants while the rest were non-participants. Key informants, including local officials and old people aged 70 years and above were also interviewed. Data were analyzed using descriptive statistics, percentages, means and ranges.

Respondents were tols of various statements to determine their level of awareness and their perception towards mangrove protection, rehabilitation and conservation. Generally, people were aware of the importance and benefits from mangroves, hence they supported the mangrove rehabilitation program. A minority, however, doubts the sincerity of the government in the rehabilitation efforts. While some 80 percent of the people - men, women and children - extended cooperation to the project in various ways, i.e. from guarding the mangrove to gathering propagules, the economic benefits of the project to the project participants were not significant. Project participants even received lowe annual income than non-participants. Nevertheless, the strong leadership of barangay captain influenced positively the good cooperation of the people. Local organizations seemed not to have mattered. A non-government organization provided participation only in making a report on monitoring and evaluation of the project. Biophysical and socio-economic conditions obtaining in the area were also described in this study.

GREGORIO, CYRILLE ELIZ C.

Zooplankton Communities as Bioindicators of Water Quality in Lake Palacpaquen and Lake Pandin, San Pablo City, Philippines. – 2018

Zooplankton communities in Lake Palacpaquen and Lake Pandin, San Pablo City, Philippines were characterized to determine the trophic status of the lakes. Spatio-temporal variations in zooplankton composition and abundances, and water quality were determined. Key informant interviews and community survey were conducted to identify lake issues. A total of 63 zooplankton taxa dominated by Rotifera was recorded in Lake Palacpaquen, while 56 taxa dominated by Copepoda was observed in Lake Pandin. Abundance of rotifers and zooplankton ratios indicated that Lake Palacpaquen is mesotrophic to eutrophic, while abundance of Calanoida copepod indicated that Lake Pandin

is oligotrophic. Canonical correspondence analyses showed the wide plasticity of rotifers while calanoids showed positive correlation with Secchi disc transparency and conductivity. Generalized linear mixed models revealed nitrate and total phosphorus as the most important predictors of the species richness of rotifers and calanoids, respectively. In terms of density, dissolved oxygen was the most important variable for rotifers and water transparency for calanoids.

Based on the key informant interview and community survey, the major issue faced by Lake Palacpaquen is the fast growth of water hyacinth and eutrophication. While in Lake Pandin, the right of way for tourists. Recommendations to address eutrophication should be formulated to help conserve and enhance the status of the lakes.

GUEVARRA, DONAVER M.

Environmental constraints to natural regeneration of Alibangbang (*Bauhinia malabarica* Roxb.) in Carranglan watershed, Nueva Ecija, Philippines. -- 2011

The study determined the causes of natural regeneration failure of Alibangbang in Carranglan Watershed in Nueva Ecija, Philippines. It also studied the biotic and anthropogenic factors that affect the low regeneration of the species, and assessed the activities of local residents in the watershed that influence low regeneration. Field experiment on insect infestation and rodent predation, nursery experiment on seed viability, interview schedule, and analysis of secondary data were done.

The larva of *Caryedon serratus* (Olivier) infested the pods and seeds of Alibangbang. The mean infestation rate on pods and seeds in the exposed branches was 78.32% and 73.23%, respectively. Other branches of similar experimental trees recorded a mean infestation rate of 75.00% on pods and 71.19% on seeds. Examinations conducted in different parts of the watershed obtained a mean infestation rate of 65.00% and 67.80% on pods and seeds, respectively. On the other hand, ripened seeds and wildlings of Alibangbang were not preferred food of rodent since no predation was recorded in the experimental site.

Only 47.50% germination was obtained in seed soaked in tap water for 24 hours. This treatment had the earliest germination period (7.75 days), longest total germination period (52 days) and highest germination value (3.32). Similarly, it recorded the highest root length (5.73cm), total length (12.34 cm) and seedling vigor index (585.62). Meanwhile, seeds alternately soaked in tap water and hot water for 30 seconds had the highest germination energy (40.75%).

Gathering of forest resources (i.e. Alibangbang shoot and leaves, fuel wood, charcoal, bamboo poles and cogon grass), upland farming, grazing and frequent grassfire affect the low regeneration of Alibangbang in the watershed. This information is vital in planning rehabilitation programs for denuded areas using Alibangbang.

GUILLERMO, MAX P.

Evaluation of assisted natural regeneration (ANR) as a strategy for reforestation : the case of the Bamban reforestation project, Bamban, Tarlac -- 1992

The study sought to evaluate the technical and economic effectiveness of Assisted Natural Regeneration (ANR) relative to the conventional approach to reforestation. ANR is a method of reforestation which takes advantage of the indigenous trees of the natural ecological succession process together with liberation cutting, enrichment planting and protection enhancement procedure. Technical effectiveness was determined by assessing the performance of the plantations in terms of the canopy development, density and diversity improvement, rate of height growth, rate of regeneration, and percentage survival rate of plantations. Economic effectiveness was evaluated in terms of the method's (ANR) effectiveness in reducing the cost of reforestation and cost-effectiveness as to the performance of the plantations. Likewise, the management and people's perceptions and attitudes toward ANR were studied. These were taken as factors influencing the effectiveness of ANR.

The observation period to assess the performance of the plantations however, was too short. Observation period was shortened by 6 months because of the eruption of Mt. Pinatubo. Hence, changes in the rate of some of the plantation performance variables in this study in conclusive and insufficient to provide categorical evaluation for ANR. Nevertheless, these data can serve as baseline information for further research in these areas. The study however showed that ANR is effective in reducing the cost of reforestation. Cost of ANR reforestation is lower by 61.84 compared to the cost of conventional reforestation. The respondents' (Aetas) perception of the characteristics or better performance of ANR-established plantations and their perceptions of the advantages of ANR over the conventional method in bringing back the cover of "pulo" (tree-dominated vegetation clumps) areas is high. Likewise, the respondents showed positive attitude as to the consideration and prioritization of ANR as the method to reforest the "pulo" areas. The administrative points that helped promote the effectiveness of the method and likewise defined the success of the project were: the high and improving competency of the project personnel, timely and adequate financial resources, the inclusion of the community development and livelihood program which attracted the participation and support of the people, the participatory approach of planning of programs and/or activities among project personnel, adequate compensation of personnel of the project, and systematic monitoring and evaluation program.

GUIMARY, MELODY MORANO

Institutional Arrangements: Its Implications on the Effective Implementation and Sustainability of the Riverbank Stabilization Project in Nasipit, Agusan del Norte, Philippines. – 2014

The study examines the impacts of institutional arrangements from the implementation of the Riverbank stabilization Project in Nasipit, Agusan del Norte, Philippines, under the Natural Resource Management (NRM) Component of the Mindanao Rural Development Program (MRDP). It draws on the tripartite or the collaborative institutional arrangements between and among concerned government agencies, local government units and the peoples' organization which promotes participatory and holistic approach in NRM. Among the key factors identified as vital to the success of the project is establishing appropriate structures in the different levels enabled by proper legal frameworks and broadening opportunities for the communities to effectively participate in the project development process. The approach helps in seizing the interests of the diverse user groups within the community that enhances networks among actors and stakeholders in the context of resource conservation and management.

The study also advocates that to achieve better community participation and positive conservation attitudes, information dissemination and advocacy campaigns must be intensified to facilitate greater awareness, values reformation and adaptation of NRM strategies. The study concludes that effective and sustainable NRM initiatives such as riverbank stabilization starts from pooling resources, joint strategy development including provision of incentives and division of labor amongst partner.

GUIRIBA, MARIA AUREA B.

Stock assessment and reproductive biology of *Atrina pectinata* (Linnaeus, 1767) in Sorsogon Bay, Philippines: input to resource management -- 2019

To address the problem on the decline of *Atrina pectinata* in Sorsogon Bay, a study to assess the stock and reproductive biology in relation to physical condition was conducted. Length-frequency of 1,200 individuals of baluko sampled for 12 months was analysed using FAO-ICLARM Statistical Analysis Tools. Gonad histology and maturation, and condition index were determined, and correlated with secondary data of temperature and salinity. Key management issues related with *A. pectinata* fisheries were evaluated.

The current exploitation level ($E_{curr} 0.51$) exceeded the optimum level ($E_{50} = 0.37$) by 37.84%, suggesting that *A. pectinata* is highly exploited. *A. pectinata* exhibits continuous maturation with peak month of spawning in September. Constant spawning all throughout the year is shown also by the gonad index values that fluctuate around 1.5 to 3.0. Generalized linear-mixed model revealed that temperature ($E = -0.04162$, $p < 0.76$) would best explain the spawning seasonality of *A. pectinata* in Sorsogon Bay. Condition index values coincide with spawning season. Seasonality of baluko, competition among resource users, pollution, high price of gasoline and weather condition were among the top issues in *A. pectinata* fisheries. A closed season from August to November during breeding season of baluko, and a reduction in number of boats operating in Sorsogon Bay to decrease fishing effort are recommended to prevent its further decline.

HERRERA, MARIA NORIZA Q.

Assessment of the Solid Waste Management System of the Local Government of San Pablo City, Laguna, Philippines. -- 2012

The solid waste management system from waste generation at the urban and rural households, public market, institutions, and commercial establishments to waste disposal at the sanitary landfill facilities was assessed. About 383 urban and rural households were interviewed on their knowledge, attitude and practices towards solid waste management. Key officials of the local government and workers at the sanitary landfill were interviewed on city solid waste management and operation of the sanitary landfill. Daily solid waste generation of the rural and urban households were monitored and characterized.

The households mean per capita waste generation was 0.35kg/day and the waste generation increase with income. The local government collection efficiency for solid waste is 49%, which is within the national standard (Medina, 1997). The unsegregated solid waste from the households, commercial establishments and public market have 52-62% biodegradable materials.

The rural households are more knowledgeable than the urban households on RA 9003. Solid waste management practices of the urban respondents are significantly correlated with age and income. However, the age of the rural respondents is significantly correlated with the knowledge and attitude towards solid waste management. The latter is significantly correlated with the income.

The established sanitary landfill is now operated like an open dumpsite. Composting of biodegradable is low due to limited supply of power. Leachate from the pond is returned to the garbage file. Repair of equipment is delay due to

lack of fund. The local government does not have ten-year solid waste management plan. Recommendations to improve the efficiency were identified.

HILVANO, NOBA F.

The After-Effects of Typhoon Haiyan a.k.a Yolana: The Resiliency of Households in Manicani Island, Guiuan, Eastern Samar, Philippines. – 2014

A survey of 114 households residing in Manicani Island on their capital assets and coping strategies was undertaken as determinants of their resiliency on typhoon Haiyan. KII, FG and Photovoice validated the survey results. Relationship between capital assets and coping strategies was determined using chi-square test and their degree of association was determined using phi coefficient and Cramer's V. results showed that; (a) the households' house condition before the typhoon and knowledge of the typhoon were moderately associated (.22 to .23) with securing houses at .05 significance level; (b) the educational attainment of household head was moderately associated (.34) with safekeeping of household assets/personal belongings at .01 significance level; (c) the condition of the house after the typhoon, length of time before house reconstruction and person in- charge in reconstruction have moderate to relatively strong association (.28 to .44) with the housing recovery of the households at .01 significance level; and (d) livestock ownership after the typhoon and person in charge in house reconstruction were weakly to moderately related (.17 to .26) with the household's income recovery at .10 and .05 significance level, respectively. This implies that capital assets are important in coping with disasters. The local government can use these results as basis in improving its disaster risk reduction and management program.

HINTURAL, DONNABEL E.

Access Value and Visitor Carrying Capacity of Nature-Based Recreational-Related Services along the Coast of Lobo, Batangas – 2023

Marine protected areas are key strategies to protect the environment and natural resources (ENR) and ensure continuous provision of ecosystem services (ES). This study estimated the access value and visitor carrying capacity of the nature-based recreational-related services along the coast of Lobo, Batangas. The individual travel cost method with double-log regression and Boullon's Carrying Capacity Mathematical Model were employed. Results revealed that the nature-based Lobo beach recreation have an estimated annual access value of PhP 100,820,362. Visitors have intended 1.31 average visits annually. Majority of the respondents (66%) are early adults (mean = 38 years old), 67% are female, and have an average annual household income of PhP 291,383. Currently, the environmental user fee at PhP 30.00 has an annual projected collection of PhP 2,214,210 for Lobo beach recreation. The estimated visitor carrying capacity for beachfront areas per day at 1,492 for Malabrigo, 882 for Lagadlarin, and 419 for Masaguitsit have not been exceeded during both peak and lean months. The recreational access value shows a good opportunity for Lobo to continue pursuing nature-based recreation while observing carrying capacity limits to protect the ENR providing the cultural ES. ENR management may lead to improved recreation experience and higher recreational value.

HOANG HA ANH

Vulnerability Assessment of Rice Farming Provinces to Climate Change in Mekong River Delta and Red River Delta in Vietnam—2014

Mekong River delta and Red river delta are the two largest agricultural production regions of Vietnam which contribute more than 66% of the rice production in Vietnam. However, the projected changes in climate are considered to cause adverse impacts in the rice production of provinces within the deltas. This study assessed the vulnerability of rice farming provinces in Mekong river delta and Red river delta to provide information for decision-makers to design appropriate adaptation and mitigation plan for the deltas.

The results of the vulnerability index in Mekong River Delta showed that paddy farming in Ca Mau and Tra Vinh are most vulnerable to climate change. Provinces that have medium vulnerabilities are Bac Lieu, Soc Trang and Ben Tre. All provinces that have high vulnerability are located at coastal zones.

In Red river delta, tice farming in Quang Ninh is the provinces that has lowest vulnerability. There are three provinces have low medium which are Ha Nam, Vinh Phuc, and Ninh Binh. Thai Binh, Hai Phong, Nam Dinh, Bac Nich, Hai Duong, Hung Yen have medium vulnerabilities, most of these provinces are located in coastal zones. Ha Noi is the one that has highest vulnerability. The results for the simulation model of paddy yield under different scenarios showed decreases in the paddy yield in Mekong river delta. Specifically, the yield of spring paddy decreases 6%, Autumn paddy decreases 2%, Winter paddy decreases 4% and Autumn-Winter paddy decreases 4% in 2050. In Red river delta, there are great increases of paddy yield in Spring season (18%) and 4% decreases in Winter season. The Impacts of changes in temperature and rainfall can only be seen clearly during months of Winter when the temperature

and rainfall are low, then the changes in climate conditions would cause stresses on crop cycle which will reduce the paddy yield.

HOLONGBAYAN, JOHN LEO E. (PM TMEM)

Suitability, Sensitivity and Susceptibility Assessment of the Zambales Marine Protected Area Network (ZaMPAN), Philippines. – 2018

The first tier of the proposed Suitability, Sensitivity and Susceptibility (SSS)–Governance and Social Integrated System (GSIS) conceptual framework was used to analyze the appropriateness for protection and conservation (suitability), sensitivity to climate change, and the threats to human activities (susceptibility) of MPAs and coral reef ecosystems in member municipalities of the Zambales Marine Protected Area Network (ZaMPAN). For each municipality and under each SSS component, the ecological, social, and governance attributes of the social-ecological system (SES) were scored, pooled scores were ranked, and then ranks were combined to determine the municipality's SSS index. The SSS indices of the ZaMPAN member municipalities ranked between low, medium, and high—a low SSS index was obtained for Subic, which emerged as the most sensitive to climate change impacts and most susceptible to threats of human activities. The medium SSS indices obtained by the centrally-located municipalities of Palauig, Botolan, Cabangan, and San Felipe appeared with moderate suitability, sensitivity to climate change and susceptibility to human activities. The high SSS indices of Sta. Cruz, Candelaria, Masinloc, and San Antonio were accounted for by the combined high scores of suitability attributes, and intermediate scores for both sensitivity and susceptibility attributes.

As a network, the ZaMPAN seemed faced by various threats such as sedimentation, coastal development, and pollution that may hinder its functionality and performance. Subsequently, the ZaMPAN needs to identify appropriate approaches and measures to improve the SES status of each municipality, particularly with reference to the management of their existing MPAs, coral reef ecosystems and associated habitats, and coastal and marine environments overall. General recommendations are listed to jumpstart and facilitate the second tier of the proposed conceptual framework or the GSIS.

HUELGAS, SUZIE M.

Feeding ecology of Pangasianodon hypophthalmus (Sauvage) and its impacts on Taal lake ecosystem, Philippines. -- 2012

Another introduced species of unknown character was found in Taal Lake hence its feeding ecology was examined using a new method for stomach content analysis in order to verify its impacts on the lake ecosystem. Twenty nine wild caught adult samples of *Pangasianodon hypophthalmus* were collected in different landing centers around the lake from March 2011 to July 2011 to know its food preference. The adequacy of collected samples for stomach content analysis was determined through a Cumulative Prey Curve. The spatial distribution of the species in the lake was also established using secondary data from eleven major landing centers. Likewise, water quality of the lake where the species were caught was also determined. Structured interview with fishermen who had caught *P. hypophthalmus* was undertaken to know their perceptions about its introduction in the lake.

Phytoplankton was the most predominant food of the adult fish. Macrophytes and zooplankton ranked second and third respectively. The least preferred food items were crustaceans, commercial fish feeds and fish. Apparently, *P. hypophthalmus* largely adopted the environmental conditions of the lake as it surpassed the range of temperature, pH and hardness (CaCO_3) where it was known to thrive. During the period of study, the species had been caught in different fishing grounds except in Mataas na Kahoy, Balete and Lipa City where the deep portions of the lake were located. In almost three years of existence of *P. hypophthalmus* in Taal Lake, more than half of the fishermen respondents who had caught the species earned by selling the fish but admitted difficulty in marketing the initial catch in the lake for it was then an unknown food fish in the area. Majority of them believed that the fish had no harsh effects on the lake ecosystem despite being an introduced species.

HUU XUAN NGUYEN

Willingness To Pay Of Households For The Solid Waste Management (Swm) Improvement In Tu Ky Town, Hai Duong City, Vietnam – 2016.

Willingness to pay of households (WTP) contributes a huge amount in budget to improve the environmental services. By applying Contingent Valuation Method (CVM), 200 households in Tu Ky town were interviewed level of the household's willingness to pay for SWM improvement, and the factors affecting the level of willingness to pay to propose policy measures in the management. They are willing to pay \$0.48- 2.86 more than the current fee per month and \$0.86 in average. Regression analysis resulted there are three factors that have significant impact to WTP value: Household income (HINC), the level of positive participation in local movements, activities (JOIN), and the time that

households have lived there (LIV). HINC and JOIN has strong impact on WTP at 95% confident, R^2 (adj) = 43.2% and LIV is significant at 90% of confident. The JOIN variable has the strongest impact on WTP than the other. these results are helpful with the managers and environmental policies, especially in charging for SWM improvement. The level of fee should not exceed \$2.86 in comparing with the current fee level. The best way to increase the WTP for SWM improvement that is improving social activities, propaganda, encourages the households by the groups, organization in the local area. As well as, developing social works, improving local honor that will create trust for the local people on the social development tasks.

IDIO, ANALYN S.

Characterization and management of solid wastes and its influence on the water quality of Hundred Island National Park, Pangasinan, Philippines -- 2010

The waste disposal system in Hundred Islands National Park was investigated to assess its influence to water quality. To evaluate the characteristics and management of solid waste; wastewater generation and disposal practices by the coastal communities and tourism activities and its influence in the water quality in HINP; and recommend waste management interventions to be implemented by the City Government of Alaminos. A multi-method research design comprised of structured surveys, key informant interviews, ocular inspections, water quality analysis, and waste analysis and characterization surveys.

Most of solid wastes generated were biodegradable and unclassified wastes which are being burned or/and collected by the city dump truck while recyclables are sold at the junkshops. Wastewater generated was disposed in the canals directing to the sea. Water quality parameters measured were temperature, salinity, pH, dissolved oxygen, total coliform count and E.coli count. The presence of E.coli and high total coliform count indicates possible contamination. Interventions on wastes management stipulated in Ecological Solid Waste Management Act are highly recommended to be implemented by the government of Alaminos City.

INCIONG, GILLIAN KATHERINE L.

Vulnerability Assessment of Households to Water Level Rise in Laguna de Bay: Micro Level Analysis of Brgy. Tadalac, Los Baños, Laguna, Philippines. -- 2013

The study assessed the settlement vulnerability of Barangay Tadalac, Los baños, Laguna to the rise of water level along Laguna de bay using GIS and participatory methods. Specifically, vulnerability assessment was analyzed through a micro level analysis. The three vulnerability indicators (exposure, sensitivity, and adaptive capacity) were first mapped separately then overlaid and analyzed.

Barangay Tadalac is moderately vulnerable to water level rise. About 256 households in the barangay are highly exposed to water level rise of Laguna Lake because they are located in low elevation areas (1-9 masl0. A total of 250 households are moderately sensitive to changes because their income is not enough from their current livelihood. Given the parameter for the adaptive capacity (shelter, education, and health), 628 households in the barangay have moderate adaptive capacity. As the barangay is the 'battlefront' in climate change adaptation and disaster risk reduction, vulnerability must be understood in a micro level to generate better prescriptions for local coping strategies. The method to assess vulnerability to water level rise developed in this study may be used as a tool for local level planning to achieve community resilience.

INDAB, ANABETH L.

The economic impact of soil erosion on hydroelectric power and irrigation facilities operating in the Philippines -- 1999

The study examined the off-site cost of soil erosion in the Philippines, focusing on foregone benefits from hydroelectric power and irrigation services provided by the major reservoirs in the country. The study also estimated the cost of dredging as a tool to maintain the designed lifespan of the reservoir. There were 12 watershed selected, three of which were chosen for an in-depth off-site estimation. These are the watersheds of Magat, Pantabangan and Ambuklao. Data used were provided by National Irrigation Administration (NIA), National Power Corporation (NPC) and Bureau of Soil and Water Management (BSWM).

The result demonstrates that a 50 to 100 percent increase of actual sedimentation rate over the predicted rate used in the design of a typical reservoir like Magat and Ambuklao would lead to a 40 percent - 60 percent reduction in the economic life of the reservoir. It means that an excess of 2 to 4 MCM over the predicted sedimentation rate used in the design stage would mean a one-year reduction in the life of the reservoir for generating power. The result further illustrates that given an annual average rate of sedimentation of 5.55 to 8.27 MCM and a 50 percent sediment deposition in the live storage, three (3) MCM, on the average, of the live storage capacity would be displaced annually. The estimated damage of each cubic meter of sediment that enters into the reservoir translates to a foregone value for power

generation ranging from a loss of P0.30 in terms of irrigation benefit. To avoid the foregone potential benefit from power generation, dredging is necessary. It was calculated that dredging activities are worth undertaking. On the average, a one-hectare of reservoir would provide P114,845 worth of power generation benefit. To maintain the power generation service, P49,106 should be invested in dredging per hectare of the reservoir.

INZON, ANNIE MAE I.

Sediment retention ecosystem service valuation in San Cristobal River, Philippines – 2021.

The San Cristobal Watershed (SCW) belongs to the south basin of the four basins of Laguna Lake. It has a drainage area of 14,065.93 ha. The study aimed to determine the economic value of sediment retention service in the upper part of the San Cristobal Watershed and the willingness to pay of the households in the lower stream of the watershed for improved flood mitigation benefits.

Three land cover scenarios were generated to acquire sediment retention services: business-as-usual scenario, greening scenario, and development scenario. Results show that the greening scenario has the highest retention service (674.15 tons/ha/yr) among the three scenarios. It also yielded the lowest sediment export (30.63 tons/ha/yr).

For the demand side, the study used Willingness to Pay (WTP) through contingent valuation method, conducted online with 288 respondents. It was revealed that only around 35.03% of the respondents were willing to pay because of unaffordability. The study was conducted during the COVID-19 pandemic, so most respondents lost their jobs and their sources of income. Another reason is their distrust of the government officials who would manage the fund. Results of the logistic regression analysis showed that the respondent's WTP was significantly influenced by bid amount, income, and sex variables. The mean WTP was estimated to be PHP 113.68 per month. Based on the estimated 2015 household population, the total annual WTP was about PHP 145,490,912.00. This amount can serve as basis in budget allocation for improving SCW management.

The following policy implications and recommendations that can be drawn based on the findings of the study are: (1) Update the existing technicalities of creating the land use plan in the watershed incorporating the ecological, social, and economic factors; (2) Create a Watershed Management Plan for SCW; (3) Strengthen and update the existing national policy (RA 1216) to include Urban and Peri-Urban Forestry and Greening (UPFG) programs; (4) Strengthen the Information, Education, and Communication Campaign of the SCW; and (5) Establish a payment for ecosystem service mechanism for SCW

INZON, MARIA ROWENA BEATRIZ Q.

Environmental Sustainability Analysis of Charcoal Production in Mulanay, Quezon, Philippines. -- 2013

This study analyzed and assessed the environmental sustainability of charcoal production in the municipality of Mulanay, Quezon Province. Household survey, focus group discussions and key informant interviews were conducted between May 2011 and November 2012. A purposive sampling of charcoal producers was conducted in three barangays. The results show a marked increase in charcoal producers since the year 2008 due to an increase in the trade of charcoal from the Bondoc Peninsula. Charcoal producers employ an old but simple production technique called "binulkan" which could last from few days to couple of weeks. The efficiency rate of the said technique is 7.7% by weight. The study concludes that, at present, the charcoal industry in Mulanay is still environmentally sustainable at the municipal level although its viability as a livelihood is diminished for those producers who are confined to a limited production area. Further study is recommended to assess the feasibility of establishing wood plantations for charcoal production.

ISORENA, SALVADOR V.

Survival strategies of upland farmers to environmental conditions in Solong, San Miguel, Catanduanes. -- 1990

The study attempted to explore the survival strategies of upland farmers to environmental conditions obtaining in the area. It also studied the cropping patterns and conservation methods practiced by the upland farmers in Solong, San Miguel. Primary and secondary data were used in the study. Data collection methods used include social survey, key informant interview, direct observation and secondary data gathering. Descriptive statistical tools such as frequency, percentage, rank-order and mean were used in the analysis.

The upland farm household was the unit of analysis used. Eighty-seven upland household heads served as respondents of the study. Solong is an abaca farming community. Typhoon is the dominant environmental disturbance in the area. The upland farm households employed varied coping mechanisms or strategies in order to survive. These include diversification of agricultural activities and income sources, dependence on institutional support systems, scarcity adjustments or "belt tightening measures" and migration. The abaca farming system followed by the farm households had evolved in response to typhoons and related environmental conditions. Various cropping patterns and soil conservation methods were also employed by the farmers to sustain productivity. The survival strategies used by the farm

households resulted in both functional and dysfunctional consequences. The functional coping consequences considered were: (a) producing or earning enough for food; (b) satisfaction of basic needs; (c) preventing soil erosion; (d) accumulation of farm capital for more stable livelihood opportunity and sustained survival; and (e) enabling the upland farm family to send children to college. Dysfunctional coping conditions and consequences observed were: (a) illness; (b) undernourishment; (c) absenteeism and dropping out from school; (d) depletion of rattan and other forest products; (e) return of migrants to their place of origin; and (f) family abandonment and disorganization.

JAVIER, ABIGAIL M.

Life Cycle Assessment (LCA) of Milkfish Culture Systems in Brackishwater Ponds. -- 2015

The environmental performance of organic and conventional culture of milkfish in brackishfish fishponds were evaluated using environmental life cycle assessment. Organic milkfish culture had lower global warming potential, acidification potential and eutrophication potential than of conventional culture by 59%, 25% and 77%, respectively. This is due to restricted use of liming materials and inorganic fertilizers, as well as, lesser use of aquaculture feeds. The yield performance, however, in organic milkfish culture was lower than the conventional system resulting in higher land use for one ton of milkfish.

The addition of mangrove crab improved feed and land use efficiency of the organic milkfish culture system further decreasing environmental burdens. Polyculture had also improved profitability of the culture system. The organic polyculture of milkfish and mangrove crab was more financially viable than conventional milkfish culture. As to sensory evaluation, organic milkfish was preferred for taste and texture by most of the panelists.

Environmental management was recommended to improve environmental performance of milkfish production system. The Philippine National Standards for Organic Aquaculture should adopt LCA not only to determine carbon footprint as well as other environmental burdens of aquaculture.

JAVIER, MA. ESMYRA P.

Analysis of institutional arrangements in selected marine protected areas in the Philippines -- 2002

In recognition of the need for more research on MPAs, this study has embarked on the analysis of how institutional arrangements affect the performance of MPAs on the sites' biophysical, socioeconomic and institutional aspects. The establishment of an MPA can be an effective tool for conservation. In the country, the DENR, LGU with NGO partnerships and POs are the dominant institutions that manage MPAs. The study sites include ARMNP, TRMNP and AIMS. The main results of the study were analyzed with the use of the institutional arrangements matrix, key performance indicators and performance indices. The institutional arrangement matrix shows that all sites use economic instruments, which help manage resource use. There are also management boards in all sites, composed of members from different sectors of society. Community volunteers often aid in law enforcement and monitoring in varying degree. Multi-sector involvement with strong community participation have made conservation efforts more effective.

In terms of indicators, for biophysical, coral cover and fish catch have dwindled in all sites, largely due to adverse climatic event, El Nino, but the presence of MPA have resulted in faster recovery of most biological resources. In terms of socioeconomic, household income has not significantly changed over the years but environmental consciousness has increased in the community, thereby enabling greater participation in resource management. The provision of alternative livelihood has been introduced and made available to the fisherfolks affected, albeit, unsatisfactory. A stronger livelihood program is essential to increase the probability of success of an MPA. For the institutional, illegal fishing activities have lessened and management institutions are key factors to this success. The illegal fishing activities are often committed by nearby island communities of the PA, thus, it is vital to link up with a network of adjacent MPAs to help enforcement and monitoring activities. In determining the best MPA, the study used composite indices based on category ranking by the different management institutions of key performance indicators. Compared to situations prior to MPA establishment, the MPA was considered effective in preventing further deterioration of marine resources. Across MPAs, the LGU/NGO managed site (TRMNP) appears to be better managed. It has specifically performed well in biophysical and institutional aspects of the PA. It was able to generate a large amount of fund source from tourists, it has the least number of illegal activities and the dedication of the members of the management board, specifically the office of the governor and the staff of WWF-Philippines, enabled the effective monitoring of the recovery of biodiversity as well as of law enforcement.

JIANJUN, WU

Sustainability and profitability of the organic and inorganic based lowland rice production systems : a case study -- 1987

Studies were conducted to evaluate sustainability and profitability of organic- and inorganic-based agroecosystems in Floridablanca, Pampanga, Philippines. Sustainability was assumed in terms of nutrient balance and soil

physical and chemical properties while profitability was measured in terms of costs and returns. Concentrations of N and K in rice crop of the inorganic-based farm were higher, while that of P was lower. Positive balance of N, P, and K were observed in the organic-based farm. While there was a positive balance of N, negative balance of P and K were observed in the inorganic-based farms. Field determination showed that significant higher amount of N was lost by volatilization under area treatment than under compost treatment. Long-term practices of organic-based rice production seem to be able to reduce N loss by volatilization under field condition. Net N loss experiment in laboratory showed that there was significant difference between N losses under urea and compost treatments during the first 10 day period of incubation, but no significant difference was observed after 60 days' incubation.

Denitrification experiment in laboratory showed no significant difference between the soils from the two farms during 20 day period of incubation, with a tendency of more N lost from the inorganic-based farm. Leaching experiment in the laboratory revealed that significant higher amounts of N and K but lower amount of P were lost from the soil of inorganic-based farm. Soil analysis of the farms showed that there were significant differences between water holding capacity, CEC, pH, total N, available and total P, and total K between the farms. All the properties were better in the organic-based farm except for total P. There were no significant differences between particle density, bulk density, total porosity, exchangeable K, and OM between the farms. Costs and returns analysis that both farms were profitable at present, the organic-based farm being more profitable because 2/3 of the produced grain in the farm was sold as seeds with a higher price.

JOLEJOLE, PATRICIA CARLA B.

Economic Analysis of Coral Reef Conservation Options in Clatagan, Batangas, Philippines -- 2008

Verde Passage has been declared as the "Center of the Center of Marine Shorefish Biodiversity" by Conservational International. One of the municipalities of Batangas close to Verde Passage is Calatagan. It is a third-class municipality with one of the longest coastlines in the province of Batangas, measuring about 48 km. To be able to assess the area, rapid assessment was conducted to one sampling site. Results of the study showed that the West Bagong Silang sampling site was fair in relation to coral reef cover. The assessment was done at about 100 meters from the shoreline and MPA. It was observed that there were few fishes and a few bleached corals in the site. However, a number of healthy corals were also seen. The respondents were asked about the uses and importance of coral reefs. This was done to be able to distinguish whether the respondents are concerned with the environment or not most especially for the coral reefs. For the resort owners, the importance of coral reefs was mainly for tourist attraction and a home for the fish resources. It can be concluded that the most establishments in the area built their resort houses for business purposes and not only for private use.

Tourists view the importance of coral reefs in a different way. Most tourists stated that coral reefs are important because it supports marine life and is a part of nature. One with the lowest frequency responses for the tourists was "for tourist attraction." Willingness-to-pay was measured from the responses of the resort owners and tourists from the two options presented. For the resort owners, the mean annual WTP for Option I was Php 8,875 as a form of an annual conservation fee while Php 13,667 for Option II. Meanwhile, tourists' WTP amounted to Php 735.00 per person per trip. The results of the CBA for the two options were positive and therefore economically viable. It is the decision, however, of the resort owners or the LGU which option to adapt.

JUNAEDI, DEDI

Socio economic and environmental impacts of smallholder tea plantation project in a watershed area in West Java Province, Indonesia -- 2001

The study was conducted primarily to evaluate the socio-economic and environmental impacts of smallholder tea plantation projects, particularly the Tree Crop Sector Smallholder Project (TCSSP) in a watershed area in West Java Province. The study was focused on tea smallholders in Soreang PMU, the district of Bandung, West Java Province. The socio-economic impacts of TCSSP was analyzed using the "with" and "without" project analysis. The biophysical impact as indicated by soil erosion rate was analyzed using "before" and "after" project analysis. The analysis covered 400 smallholder tea farmers (200 participants and 200 non-participants) of TCSSP. Participant-farmers of TCSSP have a higher net farm income by 15 percent (Rp 5,101,000) than non-participant (Rp 4,439,000). Women labor utilization of participant-farmers were higher 11 percent (536.81 MD) than non-participant TCSSP (498.73 MD). TCSSP reduced the average soil erosion rate from 17.3 tons/ha/year in 1992 (before TCSSP) to 13.3 tons/ha/year in 1998 (after TCSSP).

One other benefit of the development of tea plantations is their agro-tourism potential industry wherein these impacts support effectively the management of the Citarum River watershed. Women labor has an important position in tea plantation activities and holds a major portion with 536.81 MD of the total 660.27 MD (82 percent) for participating farmers of TCSSP and 498.73 MD from total 604.73 MD (81 percent) for farmers non-participating of TCSSP on a yearly basis. Trainings and contact with FEWs was found to be a strong determinant for promoting farmer's knowledge and skills, government should promote farmer's training and accelerate the frequency meeting between tea farmers and FEWs. Distribution of inputs should be improved to insure delivery on time. The Tea Farmer Association (TFA) should be

more active in providing input and output services to the farmers. Aside from technical training, management training participated by the TFA staffs should be conducted. Additionally, there should be more women staff members. Integrated pest management (IPM) should be incorporated in tea plantation management to encourage farmer participants to control pests, diseases and weeds without using chemicals which damage the environment. Small tea processing plants should be developed, owned and operated by TFA, to better insure tea leaves marketing.

JUTARE, MARIGOLD E.

Environmental framework of mangrove restoration in Talokgangan, Banate, Iloilo, Philippines -- 2007

This study was conducted to analyze bio-physical and socio-economic factors, institutional arrangements and environmental restoration framework to enhance and sustain community participation in mangrove management. The study included ecoprofiling, water quality and soil analyses, and survey in June to August 2006. Twenty six respondents (20 per cent of the total number of fisherfolks) were interviewed. Purposive sampling survey was used for leaders and key informants and for the rest of the community, stratified random and chain referral samplings were used.

Results of the study showed that the perception of the stakeholders has changed over the years. Mangroves were viewed to bring benefits (and not as obstacle to their livelihood) such as soil erosion prevention, protection of shores from waves and storms and nursery grounds for fish. The community's willingness to participate in mangrove rehabilitation project was high and majority perceived that they would be successful in putting up this kind of project. When primary mangrove forest in Brgy. Talokgangan was converted to fishponds in the 1970's, the shorelines of Banate Bay became the mangrove rehabilitation site led by the Sangguniang Kabataan (SK) in 1996. The mangroves covered 3.05 ha in 2005. This was made possible through the inter-partnership of the three municipalities (Anilao, Banate and Barotac Nuevo) and the active training of the community through Banate Bay Resource Management Council, Inc. (BBRMCI).

Coastal resource management (CRM) was implemented by the BBRMCI, whose participatory planning approach includes data gathering, profiling and participatory rapid appraisal. The highlight for institutional development and capability building was the formation of Barangay Fisheries and Aquatic Resource Management Council (BFARMC) and for on-site CRM plans and implementation, the mangrove reforestation project through community participation. Not only did the youth play a vital role in the regeneration of mangroves, the strategies and activities of BBRMCI has positively changed the knowledge and values systems of the community. The regular information updates of the Executive Director and staff of BBRMCI with the BFARMC highlight this. The community through the three associations organized has been awarded a 25-year Certificate of Stewardship Contracts lately this 2006.

KAGAOAN, CARMENCITA V.

Development of a management strategy for red tide (*Pyrodinium bahamense* var. *compressum* Bloom) in Western Manila Bay -- 1996

The physico-chemical characteristics of western Manila Bay was described vis-a-vis the occurrence and density of *Pyrodinium bahamense* var. *compressum* cells and resting cysts. Among the water quality parameters considered, namely, water temperature, pH, salinity, P and transparency, only temperature indicated significant effect on cell population. The model however, failed to include other important factors such as growth factors which was evident based on the results of the analysis. The high temperature (28-21 C), high salinity (28 ppt), and the presence of necessary nutrients (P, N) and availability of seed source in western Manila Bay make the area suitable to red tides. To determine possible causal linkage between human activities and bloom occurrence, economic factors (industrial and agricultural practices) as well as social factors (resource awareness, indigenous resource use and management practices) in the adjacent areas were investigated.

The quality of water in the zones where wastewater from these activities/practices mix with the baywater (mixing zones) were also analyzed to determine its effect on the ecology of the bay and bloom occurrence. Results indicated piggeries and household wastes (from homesteads) as major contributors of nutrients. Two power plants (NPC and NPC-ABB) on the otherhand, were found releasing thermal effluent (+ 7 C) beyond the range allowed by the DENR. Strategies which may help minimize future blooms (by reducing the organic load of the bay) and mitigate the effects of red tides on the populace (effective monitoring, determining risk factors/conditions) were also presented.

KANNEH, ZIENU VAMBA

Sustainable Solid Waste Management in Lucena City, Quezon Province, Philippines -- 2018

The study was conducted in Lucena City, Quezon Province, Philippines, with the primary objective of examining the solid waste management system in order to recommend ways to move the system to a sustainable one.

The study utilized both quantitative and qualitative methodologies, this design corresponded with a cross-sectional study aiming to gather data from multiple cases at a given point in time so as to analyze relationship

across a number of interested variables. The usage of questionnaires and data from direct observation of residents as well as key informant interview were obtained.

Among the many factors influencing solid waste management within the study area seven key factors were identified; Non-cooperation of barangay in implementation, Mentality of people, lack of facilities, lack of appropriate budget funding, changing nature of waste, and problem of perception. Food and Kitchen waste were the most predominate generated refuses together with disposable packing of plastics, papers, bottles, and metals.

Results from the chi-square test showed that there is a relationship between education and the type of waste generated by respondents. Gender of the respondents and type of waste generated also had a relationship as shown the analysis through chi- square test, however; the analysis further indicated that no relationship existed between age group of the respondents and type of waste generated.

The total of 1,799.32kg of municipal solid waste was characterized and quantified, 75% of the waste was biodegradable, 12% plastic, and rubber was 1% and 6% were paper and plastic respectively. 60% of the average distribution of residual waste were food waste, followed by diapers/napkin/tissue with 8.4%, plastic bags 7%, paper 5% and textile 3%.

The research recommended the improvement of community based waste management, promotion of reduction, reuse and recycle, enforcement of a three stream waste system and responsible bureaucracy.

KAYASTHA, ARUN KUMAR

Indigenous community-based forest resource management system and its impact on environmental integrity in Haliap, Ifugao province, Northern Philippines -- 1995

The study aimed to assess and analyze the indigenous way of managing community-based forest resources (Ala/Muyong/Pinugo). Specifically, it tried to identify certain socio-economic factors that influenced participation in forest resource management. The indigenous Ayangan community of Haliap, a barangay of the municipality of Asipulo, Ifugao in northern Philippines, was selected as the study area because it has some environmental similarities to the hills of Nepal.

Sixty-six farm household heads were interviewed using a semi-structured and open-ended interview schedule. The forest was dominant land use in the area was forest (49 percent) followed by agriculture (23percent).

The study showed that the socio-economic factor such as education of individual household heads was significantly related to their participation in the management of their forest resources. The respondents were highly aware of environmental problems and had positive attitude and perception of forests management. However, their participation was low due to unequal distribution of forest resources and dissatisfaction with benefit-sharing from the forests. Deforestation was still ongoing due to kaingin farming, forest fires, and illegal logging. Furthermore, the local government unit's inability to control forest exploitation and the respondents' low level of awareness of proper management practices aggravated the depletion of forest resources. This resulted in decreased stream flows of water systems that affected farming and households' water consumption. The results of this study indicate that a practical way of controlling deforestation and protecting the forest resources management. This may be achieved by politically and legally entrusting the utilization and management of the forests to the local people themselves.

KEOPETH PHOUMPHON

Influence of land use change and watershed degradation on irrigation system in Nasaythong District, Vietianne Capital, Lao PDR -- 2009.

Through an interview schedule, primary data were gathered from 94 farmers in both lowland and upper watershed. The geospatial technology were used to assess land use and land use change in both lower and upper watershed area and to describe the biophysical and socio-economics drivers of change. Specifically, the study aimed: to examine the bio-physical characteristics of the study area and characterize the land use change that occurred in the watershed; to analyze the perceptions of the farmers on watershed conditions and management; to discuss and analyze the factors effecting the land use change in both upland and lowland cultivation in the irrigation systems; and to recommend improvements for sustainable watershed management.

Based on the study, about 811 ha or 11.23 percent of the upper watershed changed to other used. Lower watershed, 488 ha or 4.89 percent was changed into other land uses. The slash and burn land area increased 693 ha in the upper watershed and 394 ha in lower watershed. The rice field increased 79 ha in the watershed, while it was reduced by 192 ha in the lowland watershed. The built up land area was increased by 205 ha in lowland area and 7 ha in upper watershed area. The fish pond increased in both upper and lower watershed (8 and 52 ha respectively).

Perception of representatives from institutions that have jurisdiction over the area influence land use change in the upper watershed. While the irrigation sector has direct responsibility over the reservoir and the use of its water, the forestry and defence sectors have control over the watershed area. In addition, the financial sector has responsibility over land use through land use taxation. The varying perceptions of representatives from these sectors led to different land uses in the watershed.

The information system management in the watershed needs to be improved. Cooperation among agencies involve is the key element for sustainable watershed management. Increase community participation in watershed management should be considered. The water harvests need to be studied so that the results will be used for water resources use planning in the future.

KHATTRI, GEETA

An impact study of drinking water project in Shantipur village, Nepal -- 1987

The study sought to evaluate the impact of a piped water system project in a rural village in Nepal in terms of certain socio-economic effects, water quality, and problems in implementation. The study was conducted in the Shantipur village Pachayat of Gulmi District in Nepal. Thirty percent of the households in the project area and 59 percent of the households in the non-project area were chosen as respondents by simple random sampling technique. Descriptive statistics, frequency percentage, mean and standard deviation were employed as instruments for analysis. Chi-square, correlation test, F-test and Duncan's Multiple Range Test were used in exploring relationships and differences among the study variables.

The study revealed that the piped water project has greatly reduced the time and effort in water collection and has affected an increase in water consumption of the beneficiaries, particularly those near to the water-source. The quality of water in the project area was generally regarded as colorless, clear, and "good" which is in contrast to that of the 'without' project situation and in the non-project area. The taste quality of water and distance to its source significantly affected the total water consumption. The substantial time saved and lessened work burden of women in water collection increased their participation to both household and farm activities. However, their interaction among each other was lessened. Incidence of water-borne sickness particularly diarrhea and worm infestation was less prevalent in the project area where water quality is generally rated as 'good'. In contrast, the households in the non-project area suffered more from water-borne diseases. The project worked for the economic advantage of the beneficiaries in terms of time saved in water collection, less incidence of health disorders, cash income gains, and cost savings. Overtime, the benefits could eventually exceed the expenditures in the construction of the project. In terms of socio-cultural impact, the water system led to closer association of the lower and higher caste groups which thus minimized conflicts and discrimination among them. The study recommended the establishment of the project in all rural villages, the technical training of villagers in its maintenance, and the conduct of educational programs on water-related hygienic practices.

LABATOS, BONIFACIO V. JR.

Environmental assessment of Tikub Lake, Tiaong, Quezon, Philippines -- 2012

Biodiversity survey was conducted in Tikub Lake, a landlocked crater lake with an area of 60.61 ha nestled at the foot of Mt. Malepunyo which is shared and bordered by Barangay Ayusan I and Barangay San Pedro in Tiaong, Quezon, Philippines. There were nine species of fish belonging to seven families found in Tikub Lake, one of which is native and eight are introduced. Diversity index was 1.87. Although the study revealed that Tikub Lake hosts diverse community of fish, this is due to different introduced species as the lake is being utilized for aquaculture. Other uses of the lake include subsistence fishery, recreation, and tourism to a limited extent. Vegetation surrounding the lake is composed of one hundred sixteen (116) species from forty four (44) families of endemic, native, and introduced plants where different faunas that include Luzon endemics such as monitor lizard (*Varanus marmoratus*), kingfisher (*Alcedo cyanoptera*) and quail (*Turnix worcesteri*), and other native and migratory species seek refuge. Conservation efforts must focus on protecting Tikub Lake and its environs to serve as safe place for different wild animals especially Philippine endemic species. The survey was able to document different species of plants and animals in Tikub Lake and its environs which will serve as baseline information to determine what future changes will occur through time brought about by different anthropogenic activities.

LACERNA, INDIRA DAYANG D.

Community Perceptions and Knowledge for the Protection and Conservation of Cuatro Islas, Leyte -- 1997

The study examined and discussed the influence of community perceptions and knowledge on the environment on the protection and conservation of Cuatro Islas, Leyte. Community perceptions and knowledge are influenced by biophysical features of the island, socio-demographic and economic characteristics of the respondents and the political set-up, and leadership and institutional linkages existing in the islands. Perceptions on the environment are within the context of immediate community needs and preferences. Findings of the study revealed that the biophysical profile of the three island sites were evident to have undergone stresses brought by overfishing and overexploitation due to increasing population and destructive methods of fishing, respectively. Consequently, community perceived a decreasing fish catch and income.

The limited knowledge of the islanders on environmental issues and concerns and the lack of community building and cooperation, reflected their low concern and participation to the protection and conservation measures of the Cuatro

Islas. These constraints to community participation varied from physical, economic, social and institutional natures. Increasing community perceptions and knowledge on the environment through environmental education and awareness ensures protection and conservation of the Cuatro Islas. The rationale is that information will lead to greater awareness about environmental problems, issues and concerns, causing individuals to change their attitudes and behaviors in coping with and to the environment.

LAGOS, DEVRALIN T.

Discourse analysis of the landslide disaster in Guinsaugon, St. Bernard, Southern Leyte, Philippines. -- 2011

The Guinsaugon landslide on February 17, 2006 became one of the most challenging disaster experiences of the Philippines. The damages and fatalities caused by landslide disasters made studying and addressing landslide risks an imperative. The study examined the scientists' discourse of the landslide by examining the language used by geoscientists and experts in the 2008 International Conference-Workshop on the 2006 Guinsaugon Landslide, and the post-conference synthesis paper. The specific objectives were to : (1) describe the discourse features particularly the content, vocabulary and modalities; (2) explain its process of production and distribution; and (3) examine underlying power implications within the discourse. The study utilized discourse analysis.

The results were that the patterns of words, modalities and content allow access to discourse only for a few people and that scientists construct the landslide disaster as a natural phenomenon but with a local social context solution. The process of production and distribution has its allegiance to scientific traditions; prescribing ways of looking at landslide and persuading discourse hearers that it is "the certified truth." Finally, the discourse constructs relationships and roles of social groups and regulates people's access and control of the discourse; experts were mainly the producers while the local people were mere receivers of the landslide discourse.

The Guinsaugon landslide discourse illustrated a possibility for a more negotiated definition and explanation of phenomena.

LAMANILAO, JOEL D.

The viability of drip irrigation in Northeast Cavite : a miniassessment of an emerging technology. -- 1990

Water availability is primary to crop production and drip irrigation was designed to assure this. This study was designed to assess drip irrigation's technical and socioeconomic viability in Northeast Cavite. The technology assessment methodology i.e. ex-ante assessment was employed using quantitative and qualitative approaches employing primary and secondary data. The technology and the society are described and forecasted. The technology's potential technical, economic and social impacts are identified, analyzed and evaluated in the context of the farm and the community. Influencing and affected institutions are also described. Technically, drip irrigation technology can be used to efficiently allocate water and increase cropping intensity. Economically, the technology is quite expensive for small-scale farmers individually, but affordable to medium- to large-scale farmers.

The measures of project worth, i.e. Net Present Value (NPV), Benefit-Cost Ratio (BCR) and Internal Rate of Return (IRR), show that the use of the technology is financially feasible and significantly increases the farmer's income. Likewise, sensitivity analysis shows that the cropping systems accompanying the technology are quite stable even in the face of cost increases and decreased benefits. Socially, farmers perceive drip irrigation technology to be very beneficial but quite complicated and expensive. It is noted that the farmers are not financially capable of adopting the technology on their own. But it is only the initial capital outlay that constrains use; this therefore is seen as an entry point for potential intervention. On institutions, the government's emphasis on gravity irrigation, distributors and manufacturers of the technology, cooperativism for capitalization for small-farmers were analyzed. On implications to sustainability, due to the area's proximity to the country's political and commercial capital, agricultural land conversion to residential/industrial uses and its implications to intensification and diversification were described.

Being a pilot study and therefore exploratory in nature it is recommended that further studies, especially on the technology's effects on the biophysical environment be conducted (i.e. for the Philippine setting) and time series data be gathered for studies on sustainable agriculture. Some policy options to make the technology more accessible to the farmer and other potential users is also suggested, specifically on promotion of awareness of the technology, credit programs, training programs, technology design and manufacture based on farmer's needs and incentives for local manufacturing, among others.

LAMANO, RONALD JOHN L.

Assessment of Soil Physicochemical Properties and Soil Microbial Biodiversity of Selected Organic and Conventional Agroecosystems in Laguna, Philippines. -- 2022

Soil is an important natural resource, and its physical, chemical, and biological properties are influenced by change in farming management. This study aimed to assess how agroecosystems can potentially modify soil

physicochemical properties and microbial biodiversity. Organic farming (O1-3) and conventional farming (C1-3) areas were assessed to determine the agroecosystem's effect to soil physicochemical properties and microbial biodiversity. The data on soil physicochemical parameters and microbial biodiversity were subjected to t-test/Mann-Whitney U test, and Spearman Rank Correlation analyses. Key informant interviews were also used to assess the awareness of farm workers to soil. Significant differences for pH ($p < .001$), electrical conductivity ($p < .001$), organic matter ($p = .04$), total nitrogen ($p = .04$), total iron ($p < 0.01$), and total sulfur ($p = .01$) were observed between O₁₋₃ and C₁₋₃, while no significant differences were observed for moisture content ($p = .37$), available phosphorus ($p = .08$), and exchangeable potassium ($p = .40$). No significant differences were observed for alpha diversity indices between O₁₋₃ and C₁₋₃. Moreover, the association between the soil physicochemical properties and microbial biodiversity in two agroecosystems was not significant. Awareness relevant to the function and properties of soils are made evident by the high frequencies of "yes" responses from the respondents. In conclusion, variation in farming system was found to have influenced to varying extents the soil physicochemical composition and the soil microbial biodiversity.

LANTICAN, JHULIET ARIANNE G.

Life Cycle Assessment of Water Hyacinth (*Eichhornia crassipes* (Mart.) Solms) Handicraft Products in Los laños, Laguna, Philippines – 2019

Using the life cycle assessment, the study aimed to determine the environmental and social impacts of water hyacinth handicraft production by analyzing the types of pollutants and their respective amounts of emissions throughout the products' life cycle (cradle to gate), evaluate the raw material and products' safety for the use of workers and consumers, and compare the profit of producing select water hyacinth handicrafts to other locally produced handicrafts made of pandan (*Pandanus copelandii*) and abaca (*Musa textilis*).

The water hyacinth handicraft production was composed of 11 stages with two additional options to dye or flatten the raw material depending on the product requirements. The production system produced 360 handicraft bags and slippers and other by-products such as solid (99.9 kg) and water (74.9 m³) wastes, and greenhouse gas emissions (2,214.6 kg CO₂e) consisting of CO₂, CH₄ and N₂O.

Results of the heavy metal analysis showed that the concentration of Pb (< 3.0 mg/kg), Hg (< 0.05 mg/kg) and Cr (< 3.0 mg/kg) was lower compared to the FDA's allowable heavy metal content for cosmetic products (10 to 65 mg/kg) and children's toys (60 to 90 mg/kg). Hence, the raw material and finished products are safe for human use.

Water hyacinth bags are more profitable to produce than other bags made of pandan and abaca. However, the water hyacinth handicrafts are still unknown to the consumers unlike the other products. This requires active market promotion of water hyacinth products.

LASMARIAS, NOELA C.

Analysis of the on-site cost of soil erosion. -- 1989

A valuation of the on-site costs of soil erosion was done to analyze the technical and economic appropriateness of an indigenous technology in the Kalahan Educational Foundation, Imugan, Sta. Fe, Nueva Vizcaya. Firstly, this is significant in the light of accelerated degradation of most upland areas which is the economic base of close to 14.4 million people. Secondly, environmental problems resulting from degraded upland areas, which are in most cases part of important watersheds, have far reaching consequences in the lowlands. Hence, the analysis was made as holistic as what was possible, given the time and logistic constraints.

The study made comparative estimates of the on-site damages of soil erosion between groups of kaingins with and without the "gen-gen", an indigenous compost-terracing technique of the Ikalahan. Firstly, soil erosion rates were estimated in the two groups of parcels; those with the "gen-gen" structure and those without. Secondly, yields of the major crops were then estimated using recall data. Losses were statistically estimated using regression analysis. The rate of soil erosion were determined from cumulative soil losses estimated through topsoil depth changes from fallowed and cultivated areas. The fallowed areas were considered indices of the original topsoil thickness prior to clearing. These areas were located adjacent to the cultivated fields. The differences in topsoil depths of the fallowed and cultivated fields were considered topsoil losses through erosion.

Various length of cultivation were sampled to obtain a picture of the changes in topsoil and crop yield through time. The soil rate estimation method tested is also a significant step towards providing a simplified, yet statistical and technically acceptable alternative to the expensive and laborious erosion plot method. The rate of soil loss with the "gen-gen" was estimated to be 1.76/cm/ha per year or approximately 137.28 tons/ha per year. Without the structure, the rate of soil loss was 2.50 cm/ha per year or 195 tons/ha per year. With these estimates, the corresponding average tuber yield losses of sweet potato without the "gen-gen" were 513.75 cans/ha per year or 2.63 cans/ton of soil lost. With the "gen-gen", tuber yield losses were about 319.28 cans/ha. per year or 2.32 cans/ton soil. For gabi (*Colocasia esculenta*), without "gen-gen" 71.10 cans/ha were lost annually which was roughly equal to 0.36 cans/ton of soil lost. With the simple conservation technique, the loss was 78.26 cans/ha or 0.57 cans/ton soil. Imputing monetary values on these losses, with the use of the "gen-gen", an incremental gross revenue of P15,134.33/ha was estimated from a one-hectare swidden

planted to sweet potato and gabi. Because of very high labor expenditures, however, the long run advantage of the "gen-gen" was in the form of lower net income losses. Simulation analysis showed that a more effective soil conservation technique must be employed if the farmer intends to plant a parcel of land continuously for ten years.

Technical innovation is one of the answers to the problems of the Ikalahan. Any innovation introduced in the area must satisfy these concerns: resource protection, adaptability to the socioeconomic and cultural characteristics of the area, and improvement in the income status of the farmers. This can take the form of yield-increasing technical innovations combined with an intensive agro-forestry scheme. Ways to improve and maintain soil fertility in the cultivated and fallowed areas are also important in light of the shortening swidden cycle. In addition, support services (economic, technical and research) must be provided including some form of institutional control in the adoption process.

LEGASPI, RICHELLE MARIE BALBUENA

Economic Valuation of Improved Water Yield for Irrigation through Catchment Management in Sta. Cruz River Watershed, Laguna, Philippines. -- 2023

Unsustainable land use practices can negatively impact the ecosystem and its provision of water ecosystem service. Simultaneously, lack of market value (signified by the underappreciation of such service), promotes the aggravation of the degraded ecosystem that supports the service production, further leading to unreliable irrigation supply to connected agroecosystem. Such linkage is similarly experienced by the Sta. Cruz River Watershed, given the deforestation, and quarrying in the upstream area, causing distress to the current limited state of irrigation supply to the downstream rice farms. Establishing a basis for sustainable land use decisions through Catchment Management would be vital for ensuring the sustainable water ecosystem service supply to rice production therein. With this, the study estimated the economic value of improved water ecosystem service by means of: quantifying the mean relative contribution by the land cover and scenarios using the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) Water Yield Models; and determining the raw price of water based on its source (Resource rent method), and its marginal contribution to the rice production (Production function approach).

Considering the baseflow as the water ecosystem service produced, the closed forest, brush/shrubs, and open forest were found to be the highest contributory classes across scenarios. This relates to the higher volume of service production by Catchment Management scenarios (140,116,037 m³ to 138,668,810 m³) than the Increased Development scenario (119,238,838 m³). On the other hand, positive prices of water in terms of the resource rent (Php 1,962 per m³) and marginal value product (Php 175 per m³) imply the capability of the watershed to correspondingly continue contributing to water's value (representing the accessibility), and to the increased rice output. Economic value of water ecosystem service exhibited to be higher in the Catchment Management scenarios, across price bases. Analyzed cash flows (rate at 10%, for 10 years) of the scenarios likewise verified that Catchment Management scenarios are feasible and have higher net social benefits. Grounding from these, Catchment Management can thereby improve the water ecosystem service delivery to agroecosystem. This study can serve as a baseline for plausible source of payments for the water ecosystem service providers, applying such sustainable land use management, and a prelude to Natural Capital Accounting and payments for ecosystem services.

LE VAN DU

Environmental performance of the mangrove-aquaculture farming system in the buffer zone of Ca Mau National park, Ca Mau Province, Vietnam -- 2007

In response to the rapid destruction of mangrove forestry for shrimp culture during 1980 - 1995 in Ca Mau Province of Vietnam, several policies and regulations have been issued and implemented by the Vietnamese government to reforest and protect the mangroves. The integrated mangrove-shrimp farming system which is carried out in the buffer zone of Ca National Park (Decision No.64/QD-UB), was promoted by the government to ensure both mangrove conservation and income generation. The system was designed based on area but this resulted to several technical and socio-economic problems such as mangrove destruction and human migration.

This study was designed to assess the status of mangrove-shrimp farming system with different scales of mangrove area and shrimp pond area (Type I 3 ha : 60 mangrove, 40 shrimp pond; and Type II 3 ha : 70 mangrove, 30 shrimp pond). Household data were obtained through a random survey and water quality data were measured at the shrimp ponds. There were no significant differences in socio-demographic characteristics such as educational attainment, household size, age and farming experience between the two types of farming system. Household size, highest education attainment, farming experience, age of respondents had no relationship with farm production and profitability. pH, salinity, temperature, EC, TSS, DO, COD, Ammonium ions of water did not significantly vary among two the farming systems. However, these factors had no relationship to shrimp yields.

The mangrove forest area had no correlation with shrimp production. There were significantly differences between the average density stocking and the stocking frequency of the two farming systems (P<0.05). The average productivity of Type I and Type II was 314.42+42.161 kg/ha/yr and 263.56+38.255 ka/ha/yr. Shrimp stocking frequency cost of production were positively correlated with shrimp production. The density of shrimp per month was negatively

correlated with shrimp production. The cost of production of Type I was higher than of Type II farming while the average net profit per hectare of Type I was lower than those of Type II farming. There was significant difference about average net profit between the two types of farming system $P < 0.005$. The implications of the integrated mangrove-shrimp farming system on its sustainability are discussed and appropriate recommendations are suggested.

LEONES, JONAS R.

Comparative analysis of a government-initiated non-government initiated community based forestry management (CBFM) project using a Marxian theory. -- 2000

Two types of community-based forestry project, namely the Low-Income Upland Communities Project (LIUCP) and Kalahan Educational Foundation (KEF), were analyzed comparatively with regards to the approaches and methodologies employed in implementing the project activities. Interviews, using semi-structured questionnaires, were conducted with project participants and CBFM personnel who were involved in project operations. A comparison was made between the two projects with regards to actual costing and income distribution in their activities. The parameter measured in the analysis was the rate of rent-seeking (rates of unpaid labor and paid living labor) based on Marxian Theory of labor exploitation, where actual development cost was reconstructed to derive the embodied labor cost (fixed inputs) and living labor (paid and unpaid) cost. Results have shown that the rate of rent-seeking of KEF was 5.06 while for LIUCP, it was 4.39, with an average of 4.72. This simply means that for every peso spent for direct labor, 4.72 was retained by KEF and LIUCP as a source of rent payments for the serviced needed.

KEF posted a higher rate of rent-seeking than LIUCP since the latter provided more pump-priming activities than the former. The higher rate obtained by KEF could be attributed to the fact that its services, by design, were founded to assist in preparing the Ikalahans to be more independent managers. Thus, it is less productive in the sense that little ground work was actually undertaken in area development. Finding have shown, however, that KEF's activities were less exploitative, obtaining a rate of 0.11, while for LIUCP, it was 2.50. Rent-seeking is said to be exploitative if the rate payments failed to satisfy the just compensation test and if they were spent for activities which are not authorized and have no direct relevance to the project activities. One recommendation cited to minimize the occurrence of exploitative rent-seeking in CBFM programs is the adoption of a guideline prescribing the nature of facilitation, the period of undertaking, and the standard costing in CBFM program implementation.

LEONOR, ROWENA L.

Environmental resource management of two mangrove projects in the province of Aklan -- 1995

This study determined the most appropriate management technique on the mangrove resources as employed by two implementing agencies : a people's organization and a local government unit. No specific management approach on mangrove reforestation projects can make them successful. Factors as the involvement and commitment of the people and project staff and the full support of institutions guaranteed the successful implementation of the mangrove reforestation project as shown in the Bataan and Kalibo projects. The perception of the people on the rehabilitation and conservation of the mangroves regardless of their age, sex, income, and educational attainment was positive. The extent and manner of resource use in the study sites can lead to no further mangrove degradation and destruction. Both projects create employment opportunities although insufficient.

The higher biodiversity in the Bataan project may guarantee resource sustainability in the long run than the Kalibo projects are limited to the members of the organization. Majority of the people in the community were very eager to participate in the reforestation of the mangroves even though not all of them were members of the mangrove organization. Government agencies and some non-government organizations actively participated in the project. As a conclusion, there is no specific management approach to guarantee successful implementation of a mangrove reforestation project. As long as the above mentioned factors are considered, then, a greater possibility that mangrove reforestation projects may succeed.

LEYTE, JAMES ELWYN D.

Environmental Performance of Cacao (*Theobroma cacao* L.) Production and primary processing in Calinan, Davao City – 2014.

This study is an attributional life cycle assessment (LCA) which aims at providing a comprehensive picture of the environmental burdens associated with cacao production and primary processing. The study was conducted in an 18-hectare diversified Cacap farm located in Calinan, Davao City, Philippines. The analysis considered the entire system, from agricultural operations in the field until storage of the dried beans, required to produce and process one ton of dried cacao beans.

The inputs include fertilizer, pesticides, diesel, electricity and biodegradable plastics while the outputs include the dried beans, emissions of lambda-cyhalothrin, mancozeb, CO₂, SO₂, CH₄, N₂O, Nox and CO, and solid wastes.

The following impacts were found to be associated with the production of one ton dried cacao beans – 0.163 kg 1,4-DB-eq (human toxicity), 0.180kg 1,4-DB-eq. (terrestrial ecotoxicity), 0.796kg SO₂ eq. (atmospheric acidification) and 629.93 kg CO₂ eq. (Climate change). Transportation and harvesting, pest management and nutrient management were found to contribute mostly to the environmental impact categories considered in the study.

Reduction of fossil fuel consumption and judicious application of fertilizers and pesticides to minimize the adverse environmental impacts of cacao production and primary processing are recommended.

LIBRERO, AL-FRANCIS D.

Environmental planning for greenway corridors in Calamba City, Philippines -- 2007

The study was conducted in Calamba City to analyze its rate of urbanization, with population and built-up space as the main parameters. In order to determine this rate, a geographic information system (GIS) was used to derive the amount of built-up space during 1993 and 2002. Keeping in mind that the distances of rural areas to highways, the South Luzon Expressway (SLEX), rivers, industrial centers, and all the other areas that are already classified as urban, a multi-agent system (MAS) was used to create a model in order to simulate urbanization in the city and generate a map showing the predicted amount of change to urban by the year 2012.

During the course of the regression analysis and correspondence with the Calamba City Planning and Development Office, it was deemed that while it may have had some other influence by itself, the distance from SLEX has no significant effect as a driving factor for the urbanization of adjacent areas. The model was then revised by removing the SLEX in the equation. The model, assessed as having an overall accuracy of 75.2 percent, predicted a 30 percent change to urban from 1993 to 2002 among the 68,564 pixels designated as non-urban areas outside the exclusion zones. A second prediction indicates an urbanization rate of 39.12 percent for the remaining non-urban areas by 2012. With this information in tow, integrating an urban agriculture program with the overall development plan was suggested to the city officials. A robust program would provide several benefits.

With Calamba City becoming a trading post for produce between Metro Manila and the towns to the south, growing crops within the city would further eliminate transportation costs and the incidental energy consumption and pollution it entails. This would also provide additional employment opportunities in the city. An urban agriculture program can also be part of the city's solid waste management as organic waste can be used as fertilizer for crops. The several patches of land allotted for growing crops will start a greening effect on the city, providing a means to curtail urban sprawl and the entailing urban heat island effect.

With new alternate routes for vehicular traffic, an established agricultural trading center, solid waste material recovery and processing plant, eco-tourism and recreational sites, urban and peri-urban agriculture, and industrial estates as the main drivers of its economy, Calamba could wed industry, agriculture, and environmental protection in a move toward the sustainable cities of the future.

LICERA, TRINY GRACE LORET L. .

Flood Modeling and Impact Analysis for the Calumpang Watershed, Batangas City, Philippines – 2017.

Calumpang Watershed in Batangas City, Philippines has had repeated flooding along its main river channel. Some of these occurrences have led to huge infrastructural damages that have resulted to significant negative economic impacts, mostly to Batangas City. Uncertainties with the changing climate necessitate a more calibrated approach to managing this river system to ensure that developments in region are protected from future flooding damages. As with most watersheds in the Philippines, the Calumpang is ungauged. This study employed the use of Hydrologic Engineering Center – Geospatial Hydrologic Modeling Extension (HEC-GeoHMS) and Hydrologic Engineering Center – Geospatial River Analysis System Extension (HEC-GeoRAS) to simulate flood depth and extent. HEC-HMS was calibrated by comparing the stream flows of the major tributaries in the watershed. Flood zones were generated for 2, 5, 10, 25, 50 and 100-year storm return periods. Interview results based on the July 2014 flooding due to Typhoon 'Glenda' were used to evaluate and monetize the impacts of flooding in residential areas. Valuation methods comprised of replacement costs, cleanup-costs, and loss of income from other sources were used to estimate the physical and economic costs of that flooding event to the affected residents, estimated at approximately Php498,460.00.

Results of this study show the combined use of HEC-HMS and HEC-RAS can produce reliable results even for ungauged watersheds. This can become an important tool for local government units (LGU) in climate-proofing their development plans. At a wider scale, it provides a framework by which development planners can hazard-proof their plans with a holistic mechanism, fortified by physical and socio-economic considerations that should make the plans more inclusive and future-ready.

Population pressure, migration and fishing effort in coastal areas of Camarines Sur. -- 1989

This study was conducted to determine and relate demographic pressure with fishery exploitation in coastal areas characterized by open access in Camarines Sur. It also tried to investigate factors which likely affect migration, a primary factor in population pressure. Furthermore, it sought a relevant relationship between the probability of the fishermen to migrate or not given some indigenous and exogenous variables. Since coastal areas of Camarines Sur were not clearly defined and identified, the study attempted to make its own definition and was able to come up with 13 coastal municipalities. Using descriptive analysis, evaluation of demographic pressure was made possible.

Results revealed that increasing population primarily brought about by in-migration exerted pressure on the limited resources of coastal areas. This is compounded by the open-access nature of the fishery resource which resulted in uncontrolled entry of outside fishermen. Consequently, this increase led to intensive utilization of existing agricultural and fishery resources and technical change in fishery (change in fishing method, intensification and expansion). The latter suggests over-exploitation of the resources as indicated by the disappearance of some fish species, low catch, conflicts among users of the resource, low income and others. The logit model was used to determine the factors affecting perception of utility hence, probability of migration. Variables which significantly affected migration decision were household size, ownership of fishing gear, presence of other sources of income, education, skill of fishermen, and civil status. These were proxy variables related to individual's personality characteristics, perception of situation and perceived characteristics of origin and destination areas. Of the variables, the probability of the fishermen's to migrate most sensitively responded to ownership of fishing gear, a form of security.

Results implied enforcement of policies which would alleviate socio-economic condition of small-scale fishermen, reduce pressure on the fishery resource, and inhibits out-migration of local people. These include : banning the catching of fast disappearing and juvenile fish species, illegal fishing and formal sanction in case of violation; provision of alternative or supplementary sources of income as a response to the need of providing local employment and promoting equitable distribution of benefits; organization of fishermen into a cooperative or association to oversee conceived livelihood; assignment of fishing right to a group of fishermen to counter open access nature of the resource and acts as an incentive to manage the resource; redirection of present education system to suit the local needs; and intensive campaign for small household size. Recommendations were also made for the procurement of aerial photographs or its substitute to estimate coastal population (a target beneficiaries); for further examination of the kinship, distance, population density at origin area roles in migration decision; and lastly, for the concerned government authority to closely and constantly monitor the gathering of data or they be reliable updated and properly filed for public use.

Effect of water salinity on rice production in Bang Nara River Basin, Narathiwat Province, Thailand -- 1989

The study was conducted to evaluate the effect of water salinity on rice production in Bang Nara River Basin, Narathiwat Province, Thailand. The results of the comparative analysis revealed that low saline farms (1,297 kg/ha) had significantly higher rice yield than those in high saline farms (1,010 kg/ha). Fertilizer use in high saline farms are significantly greater than those in low saline farms indicating the potential damages on the soil from salinity intrusion. However, the empirical results of the yield response function analysis showed that productivity did not differ significantly between low and high saline farms as the effects of salinity did not occur during the plantation period which is most sensitive to soil changes. The proxy measures of salinity indicate, on the other hand, that location or proximity to the source of saline intrusion has a large effect on yield. In terms of rice profitability, the results of the cost and returns analysis indicated that both low and high saline farms and negative net returns to land, own land and management. Policies can be recommended as follows: a) without salinity control projects, since traditional seed variety has low responsiveness to fertilizer. Over-fertilizer application in unfavorable condition, poor soil permeability, results rice depression. Therefore, if the farmers keep using traditional variety, extension service involving knowledge of fertilizer use should be improved. In addition, the farmers paid large share of landlord though there were some of them.

Landlord sharing system should ne adjusted. b) With salinity control projects all farmers will have water supply to increase their income assuming that they all have access to the resource. Low saline farms will obtain higher marginal benefit while high saline farms will get more change in benefit. To obtain greater productivity, high yielding variety (HYV) is normally recommended. Since HYV is responsive to fertilizer application, government should somehow support fertilizer supply and also improve extension service in the area. Moreover, landlord sharing should also be improved through some form of tenure reform on the land.

Impacts of Land-Uses on Groundwater Quality of Shallow Aquifers in Santa Rosa City, Laguna, Philippines – 2016.

Groundwater quality assessment in relation to land use is critical in establishing connection between these two variables. For Santa Rosa City, this is crucial as groundwater is its foremost water source. Predominant land uses in the

city are agricultural, residential and industrial. Groundwater samples were drawn from wells tapping the shallow aquifers network through three seasons from 2013-2014. Surveys and key informant interviews were conducted to assess environmental knowledge, awareness and practices of stakeholders. Results of water quality assessment show signs of contamination of shallow aquifer: high NO₃ concentration in industrial and residential areas during wet season; high Pb levels in residential areas; coliform contamination in majority of sampled wells across all land uses; and high EC readings in industrial areas during dry season. In particular, activities related to the residential areas have the most significant relationship with the evaluated parameters. Thus, information education campaign must be conducted to increase the awareness of the local population on the correlation of domestic practices and groundwater pollution. City government must recognize and understand the present condition of their aquifer system. It is also critical that the government development and implement policies and ordinances to address groundwater pollution.

LIT, JOSE MARI C.

Preliminary Water Quality Assessment of Calumpang River in Batangas City, Philippines Using UAV-Based Remote Sensing and Surface Water Analysis. -- 2018

Water bodies in our planet include rivers, which provide various ecosystem services. Monitoring water quality is essential for assessment of current conditions and progress of rehabilitation efforts of water bodies. Calumpang River in Batangas City, Philippines, holds large potential for ecosystem services but is hindered by degraded water quality at present.

This study aimed to develop an initial method for water quality assessment through interpolation of imagery from an unmanned aerial vehicle (UAV), and surface water quality data (chlorophyll-a and CDOM) measured from in-situ water sampling on reference points on the Calumpang River, with considerations for temporal variations (dry vs. wet season). Surface water quality data for each season and UAV imagery collected from the dry season serve as preliminary results. Analyses indicated higher chlorophyll-a concentrations during the dry season, and CDOM concentrations were higher during the wet season. This is attributed to observed increased amount of detritus in the river accumulated through runoff and loading. The method of interpolating UAV imagery and water quality data can serve and be further improved as a means for rapid assessment of the water quality in water bodies in the future, and aid in the evaluation, monitoring, and management of water resources.

LIZABA, MA. ALEXIE DLS.

Development of a protocol for rapid assessment and monitoring of compliance by LGUs to RA 9003 (Ecological Solid Waste Management Act of 2000) -- 2006

The enactment of RA 9003 (Ecological Solid Waste Management Act of 2000) strengthened the commitment to make waste management an issue that needs to be seriously addressed. However, compliance has to be assured. Hence, we attempted to develop a protocol to rapidly assess and monitor the compliance of local government units. It was meant to identify the level of compliance based on a set of criteria specified in each indicator.

However, compliance level is affected by different factors affecting its implementation. These include physical features, administrative/political setting, economic/financial capability, socio-cultural characteristics, and IEC (Information, Education, Communication) campaign strategies. Identification of these factors would aid in the enhancement of compliance.

Another means of enhancing compliance is the utilization of biodegradable wastes into organic fertilizer through composting. However, financial factors and its benefits are the important considerations that affect compost production and utilization. Continuous enhancement of compliance is essential not just for the conservation of the environment such as through lake rehabilitation, but most of all for public welfare.

LLANZA, MAE BELEN C.

Potential of Payment for Environmental Services (PES) for the conservation of the Layawan Watershed in Upland Communities in Misamis Occidental, Philippines. -- 2014

The study analyzes the perceptions and attitudes of the upland dwellers towards conservation and protections of Layawan Watershed, being one of the major rivers emanating from Mt. Malindang supporting Oroquieta City and nearby towns. Upland communities' participation was assessed through household survey with the use of contingent valuation method (CVM). Opportunity costs were also captured and willingness to accept (WTA) was elicited through an open-ended question. The study covered six upland barangays of Oroquieta City: Sebuca, Mialen, Toliyok, Bunga, Dullan Norte and Victoria.

Three assumptions were used in the study; first upland communities are mostly poor. They often produce goods for their own subsistence. They are driven by short-term economic interest that might result on farmers being hesitant on engaging themselves to conservation programs and activities towards sustainable provision of watershed

services. Second, the limited participation and involvement of farmers on the conservation programs is due to lack of financial incentives. Thus, giving rewards to upland dwellers might positively affect their perception on participating and engaging themselves in the conservation and protection of the Lawayan Watershed. Lastly, the amount that upland dwellers are willing to accept (WTA) for participating and adapting the conservation programs are greatly affected by the cultural, demographic, economic and ecological factors.

The results of the study showed that upland communities' are very willing to participate (99%) in the Layawan Watershed Conservation and Management Program (LWCMP). This is despite the fact that their land will be subjected to a permanent conservation easement. The total average willingness to accept (Php 3,050.00/month) revealed in the survey is higher by 56% (Php 1,716.20) compared to the total average farm income (Php 1,333.80/month) computed. Furthermore, WTA elicited is higher by 5% compared to the total average households' income (Php 2,887.00) captured in the survey. Thus, reveals an approximate difference and strengthens the elicited minimum value of WTA still realistic and valid though captured through an open-ended question.

LLEVA, EMMANUEL M.

The contributions of women in an upland rich-based ecosystem in Kiangon, Ifugao. -- 1989

This study evaluates the positive contributions of women to rice yield. The results of the sample survey and labor production model confirm the traditional role that women in Ifugao terraced rice systems have played for centuries. Women's labor contribution in the productivity of the Ifugao rice paddy system is measured and evaluated for all phases of the rice production system.

Women works contribute largely towards conservation during the land clearing and land preparation phase. Despite the absence of fertilizer inputs, an average farm size of 0.55 hectares yielded a high 1.6 tons. The multiple log-linear regression function was used to determine the significant association of women labor and selected environmental and socioeconomic parameters with rice yield. Approximately fifty-five percent of the variation in output (rice yield) can be explained by the following explanatory variables: total labor, total conservation labor, cost of seeds, elevation and site.

A cost and return analysis per farm has also shown that upland rice terrace farms are profitable with a net return to management of P2,779.00. As gender and age issues, in particular, the role of women in upland rice production have transcended the "sensitizing" phase, a major contribution of this study lies in quantifying actual woman labor contributions within a farm production \square cum \square household framework. As women labor contribute significantly to yield improvements, the recent adoption of plow and machines (i.e. hard tractor) in the low elevation areas, for example, has served to decrease total demand for women labor. However, in high elevation areas women labor is expected to predominate since the plow, hand tractor and other machineries are not suited for steep slopes and narrow irregular pond field configurations.

LOBO, GELLA PATRIA G.

Development of an agricultural environmental management system for swine and poultry enterprises of Lipa City, Philippines -- 2003

The environmental performance of swine and poultry farms in Lipa City was evaluated to formulate an agricultural environmental management system. The existing environmental management programs of the local government unit of Lipa City for these enterprises, which included the environmental policies and programs, and the institutional linkages among local government offices and the private animal enterprises were assessed. Survey, direct observation, key informant interview, focus group discussion and review of documents were used.

The swine and poultry manure pollutes the land and rivers. Spoiled/spilled feeds, empty feed sacks, empty medicine vials, and dead animals were the major solid wastes. Wastewater contributed to surface water pollution and possibly to groundwater contamination. Air emission coming from these farms added to air pollution problems of the city. However, both swine and poultry enterprises applied farm management practices, such as constructing waste treatment facilities, selling chicken dung, installing nipple drinker, using power-sprayer, re-using waste materials, spraying chemicals and others, to minimize their wastes and lighten their impacts to the environment.

The present rate of water consumption of the semi-commercial and commercial swine growers and the commercial poultry enterprises could contribute to the depletion of groundwater resource of the city. The procurement of available agricultural inputs in the city of swine and poultry enterprises was both economically and environmentally advantageous because of lesser transportation cost and lesser air pollution. The existing environmental management program being implemented by the local government of Lipa City for swine and poultry enterprises was inadequate. It did not address the environmental problems generated from the operation of swine and poultry enterprises. The city government did not have specific environmental program for swine and poultry enterprises.

The environmental policies of the proposed agricultural EMS aim to continuously improve the environmental performance by adopting efficient resource utilization, waste minimization, and pollution prevention. In addition, the organization (the LGU and the swine and poultry enterprises) is also committed to comply with relevant legislation and regulations, and document, implement and maintain and communicate the EMS to all parties involved. Guidelines for the LGU to develop the proposed EMS were provided.

In order to best implement the proposed EMS, a strong linkage, accountability and transparency among the LGU, private enterprises and the communities should be established. The EMS should also be approved by the stakeholders and be institutionalized by adopting it as city ordinance.

LOSLOSO, JEFFREY ANDREW L.

Assessment of the Use and Economic Value of Weather and Seasonal Climate Forecasts for Maize-based Production Systems in Bulalacao, Oriental Mindoro, Philippines – 2020.

Recognizing the value of access and use of weather and seasonal climate information in improving farm management decisions and productivity is vital in achieving sustainable and climate-smart agriculture. The study employed mixed methods including statistical regression, decision tree analysis, and rapid climate decision analysis (RCDA) on randomly collected data from 200 maize-farming households, focus group discussions, and key informant interviews in Bulalacao, Oriental Mindoro. to assess the attributes influencing the use of forecast information and estimate the value of this information in farming. The fractional response regression analysis suggested that the usefulness and reliability of forecast information explained most of the variation of its use, with an increased likelihood in forecast use by 14% and 19%, respectively. Farmers' sex, farm parcel size, and risk attitude are also positively associated with information use, while age and reliability of traditional forecasts negatively influenced its use. Using decision tree analysis, the value of weather information on fertilizer application was estimated at PhP 990 per hectare or an aggregated value of PhP 412,168 for the whole maize farming area in the municipality. RCDA was used to get the value of seasonal climate forecasts (SCFs) in two key farming decisions, the selection of crop choice and crop variety. The tool revealed that there is no shift in the decision to plant traditional maize variety over hybrid, or hybrid maize over hybrid rice during the wet season with the use of SCFs. Although RCDA showed no significant value in processing SCFs in the selection of crop choice and variety, the results still suggest that it is more efficient to plant hybrid maize over hybrid rice at extreme occasions of drier conditions. Overall, the study recommends effective policies to improve access and use of forecast information through the delivery of timely and accurate information which are tailor-fitted to the needs of the farmers. Effective and efficient use of forecast information also require better access to farm resources to sustainably manage climate risks.

LUDOVICE, KIMBHIERLY M.

Chemical Speciation, Spatial Distribution and Risk Assessment of Trace Metals in the Sediments of Laguna de Bay, Philippines – 2019.

Laguna de Bay is a dynamic urban lake resource within an active volcanic field in the Philippines. The continuous uncontrolled economic development in its watershed has resulted to sedimentation and trace metal pollution in the lake. Trace metals can be deposited to the sediments and can still be remobilized in the water at certain physicochemical conditions. The goal of the study is to assess the sediment quality at the South Bay by characterizing the trace metal species through ultrasonic-assisted sequential extraction, principal component analysis, and ecological risk assessment. Increased total trace metal concentrations are found in sites nearest the coastal lake areas of Calamba and Los Baños. The trace metals at the South Bay are 17.48ppm chromium, 15.51ppm nickel, 123.94ppm zinc, 109.49ppm copper, 0.22ppm cadmium, and 18.20ppm lead, which have increased in over a decade, especially for copper and zinc. Cadmium has a high-risk level for potential ecological toxicity and primarily a by-product of human activities. Chromium and nickel were mostly bound within the minerals and primarily released through natural weathering, while the presence of copper, zinc, and lead are influenced by both lithogenic and anthropogenic processes. South Bay sediments have a moderate to considerable level for trace metal contamination.

LUIS, JOSE M.

Bioaccumulation of cadmium (Cd) in *Geloina coaxans* (Gmelin 1791) in the mangroves of Marinduque, Philippines – 2003

This study was conducted to determine the major sources of cadmium pollution in the coastal areas of Marinduque and determine the cadmium bioaccumulation of *Geloina coaxans* (Gmelin 1791) in mangrove sediments adjacent to or near the major sources of cadmium. Total cadmium content of the sediments and the flesh of *G. coaxans* (Gmelin, 1791) was determined by induced coupled plasma spectrophotometry (ICPS).

The identified major sources of cadmium in the coastal areas were Marinduque Mining Corporation (MMC) Causeway in Calancan Bay, Sta. Cruz, Consolidated Mining Incorporated (CMI) Causeway and tailing piles in Pili, Ino, Capayang, Mogpog, Mogpog River and Boac River. These major sources have sediment quality criterion for Cd, 0.07 mg/kg. Adjacent mangrove areas were also contaminated with cadmium. These mangrove areas in Kamandugan, Ipil, Nangka II, abigue, Layalay and Salomague Island were the stations for the bioaccumulation study. The latter was the contro and source of *G. coaxans* (Gmelin, 1791). The Cd bioaccumulation factor of *G. coaxans* (Gmelin, 1791) in

sediments with high Cd content was as high as 0.023 but in sediments with low Cd content, reached a high of 0.06 The Cd content of *G. coxans* (Gmelin, 1791) poses a threat to human health through the process of biomagnification.

LUNA, DONALD A.

Environmental Assessment of Mangrove Forest in Cagbalete Island, Mauban, Quezon, Philippines--2013

The study assessed the mangrove forest area of Cagbalete Island, Mauban, in Quezon Province, using various methods such as: quadrat sampling for mangrove biodiversity, transect walk for avian fauna identification, actual field observations for other fauna, and household surveys and key informant interviews for social data.

Samplings for mangrove biodiversity was guided by 9 transect lines placed perpendicularly towards the sea and river. From the 27 sampling plots, there were 17 species from 12 genera under 9 families recorded. The species *Nypa fruticans* (Thunb). Wurmb was also included in the analysis. Two out of the 20 avian fauna species were endemic to the Philippines. About 92% of the respondents expressed awareness about mangroves.

The computed PAI values showed that only 15% of the mangrove area, which were located along the river, has a "Very High" classification value. However, about 51% of the mangrove area reflected a "Low" and "Very Low" classification.

It is recommended that the mangrove forest be classified into 3 types, namely: Conservation, Utilization and Rehabilitation Areas and that the community be made active partners in safeguarding the mangrove resources.

LWIN, ZIN MAR

Floating Garden Tomato Production, Water Quality Degradation and Sustainable Livelihood in Inle Lake, Shan State, Myanmar. -- 2013

The study was conducted in Inle Lake in Nyaung Shwe Township, in the southern Shan State of Myanmar. The study aimed to determine the impacts of floating garden tomato production on the water quality of the lake. The biophysical and socio-economic characteristics of the floating garden tomato cultivation practices were analyzed. The basic structure of floating gardens and physicochemical conditions of the lake water were described. The total amount, application frequency and the potential hazards of agrochemicals such as fertilizers and pesticides, including plant growth regulator were described.

The economic return per hectare of tomato floating garden cultivation is the main motivation for the tomato growers. However, concomitant with high economic returns is the high usage of agrochemical resulting to environmental contamination and pollution by toxic and persistent chemicals. The high concentrations of total nitrogen and phosphate of the lake water show that the lake water quality is in the direction of gradual degradation, particularly eutrophication.

There were more than seven kinds of insecticides, six kinds of fungicides and/or bactericides sprayed alternately by the respondents. They were either sprayed singly or mixed in various combinations. The highly water soluble pesticides such as Alpha- Cypermethrim and Aldrin move with water in surface runoff or move through the soil in water and could readily reach non-target area. In order to reduce the use of this chemical, the neem seed extract oil and cake (Azadirachtin) can be used as an alternative control measure. However, all pesticides have potential to pose risk to non-target organisms and environment.

The properties of pesticides are used as basic information to determine the environmental fate and knowledge of transformation rates of the products and toxicity of transformation as a key to assessing ecological risk. The role of institutions for environmental education is urgently needed for sustainable livelihood of local communities. However, a more detailed study for toxic chemical analysis and monitoring for agrochemicals application are needed.

MABILANGAN, BLESSIE MAE S.

Effects of farming inputs, climatic factors, and greenhouse gases on agricultural production among asean member countries using panel data. – 2021

This study analyzed the effects of farming inputs, climatic factors, and greenhouse gases (GHGs) to the agricultural production of ASEAN member countries from 1961 to 2019. The variables included in the model were employment in agriculture, fertilizer consumption, annual precipitation, temperature, CO₂ emissions, N₂O emissions and CH₄ emissions. Panel data was used to correlate the factors to the agricultural production. Results showed that 80.11% of the variation in agricultural production can be explained by the variations in the explanatory variables included in the model. Employment in agriculture, fertilizer consumption, CO₂ emissions and N₂O emissions have significant relationships with agricultural production. A 1% increase of fertilizer consumption, CO₂ emission and N₂O leads to an increase of 0.0585%, 0.4674% and 0.1979% in agricultural production. On the other hand, a 1% increase in employment in agriculture leads to a decrease of 0.3296% in agricultural production.

MACALAM, FRANCIS JHUN T.

Groundwater Quality and Vulnerability Assessment using Modified Hydrological DRASTIC Model in Meycauayan City, Bulacan, Philippines – 2019

DRASTIC System coupled with a geologic software was used in this study to determine the location of potential areas in Meycauayan City where groundwater is susceptible to pollution. The state of groundwater pollution is a critical issue with increasing population and industrial development in Meycauayan City. The main objective of the study was to show areas of highest potential for groundwater pollution based on hydro-geological condition and human impacts. Eight major hydro-geological factors (Depth to water table, net Recharge, Aquifer media, Soil media, Topography, Impact to Vadose zone and hydraulic Conductivity) adding Land Cover as the last parameter incorporated into modified DRASTIC model and geographical information system (GIS) to create a groundwater vulnerability map by overlaying the available hydro-geological data. The result showed that the groundwater resources of Meycauayan City were found to be low potential vulnerable to contamination having vulnerability index of 80 using DRASTIC MODEL. On the other hand, the water quality assessment result showed that Barangay Bayugo from the rest of the selected barangay exceeds the Philippine National Standard for Drinking Water 2017 in terms of pH, total dissolved solids (TDS), electrical conductivity (EC) nitrate and choride concentration. Respondent's perceived improper solid waste disposal as the source of water pollution while inadequate water supply as the main issue on groundwater resources. Respondent's practice water conservation by collecting rainwater for domestic use. Meanwhile, lack of funding budget is the main reason for not practicing water conservation. For groundwater management, the generated maps could be used as a tool for decision making in by the Local Government units (LGU) in their Comprehensive Land Use Plan (CLUP) where they can identify where the development will take place. This could be used to assist in the formulation of policies related to groundwater resource management and protection in Meycauayan City.

MACALINAO, CONSTANCE AURELLE M.

Environmental Factors Leading to Parasite Contamination in Selected Vegetable Farms in Laguna, Philippines – 2020

Fresh vegetables are an important part of a healthy diet and can be agent of transmission of intestinal parasites. This study aimed to assess the parasite incidence of contamination of freshly harvested vegetables and its possible source of contamination by assessing the soil and water samples from selected farms in Laguna. A total of 168 vegetable, 55 soil, and 15 water samples collected from four selected farms and a reference farm were processed through various standard parasitological techniques. Of these, 17.3% of vegetables, 47.3% soil, and 73.3% water samples were found contaminated with parasites. Moreover, leafy vegetables, such as lettuce showed to be more contaminated. Results showed that strongylids/hookworms had the highest recovery from soil (38.2%) and vegetable (13.1%); other parasites were also recovered such as *Toxocara*, *Ascaris*, *Trichiuris*, *Trichostrongylus*, and *Balantidium*. No helminth parasites were detected from water samples; however, *Cryptosporidium* sp. and *Giardia* sp. were observed in all samples. Remarkably, all parasites recovered in the farms were of animal in origin indicating open defecation of pets and farm animals as source of contamination. Furthermore, results revealed that some farming practices such as the use of animal manure as fertilizers, unhygienic practice of farmers, and sanitation issues were factors that contribute to parasite contamination in the farms. These findings have implications on food safety that could pose risk to the farmers and consumers. Recommendations were discussed in the study for control and prevention of parasite contamination at the farm level.

MACUROY, JONATHAN T.

Estimation and Comparative Analysis of Various Z-R Relations Using Optical Parsivel Disdrometer and Its Implications on the SWAT Hydrological Model--2019

The limited availability of accurate and robust precipitation data from rain gauges is a major limitation in hydrologic modeling in the Philippines. In such a country that is prone to flooding, model-based Early Warning Systems (EWS) are only as useful and accurate as the meteorological data available to the model. One of the more comprehensive alternatives is the generation of Quantitative Precipitation Estimates (QPEs) from Doppler radars through the use of Z-R relationship algorithm. This study attempted to derive robust and calibrated Z-R relationships using the Raindrop Size Distribution measured by the Parsivel disdrometer using two methods (A and B) and four time-integration steps (1-, 2-, 5-, & 10-min) that can provide acceptable agreement with reference gauge data for the wet season in the Philippines. The QPEs generated by the Tagaytay C-Band radar from these developed Z-R relations were then utilized to model discharge using the Soil and Water Assessment Tool (SWAT). The resulting QPEs and discharge models were evaluated for the Tropical Storm Yagi (YEM) event of August 10-11 2018 using six statistics: Pearson's correlation coefficient (r); mean error (ME), percent bias (pBIAS), Nash-Sutcliffe Efficiency (NSE), mean absolute error (MAE), and root-mean-square-error (RMSE). Results showed a prominent consistent pattern observed wherein the Z-R relations using finer time steps (1-min and 2-min) generally performed better than longer ones. Another consistent trend is that the Z-R relations derived from datasets using the whole wet season outperformed those using only data

from YEM, which is also surprising since the dataset from YEM should have, in theory, performed better because the validation period is YEM itself. Nevertheless, the result might be attributed to the fact that the Z-R relations from the wet season has successfully captured the overall DSD climatology of the whole period and in this case, has derived better Z-R relations for YEM than the data from YEM itself. The two conclusions above held true for both QPE and discharge validation. Moreover, Method A dominated Method B in their performances for discharge and QPE. As expected, Method B outperformed Method A in terms of r (as Method B itself is derived through linear fit) for discharge but worse in terms of error statistics. To conclude, the four best Z-R relations derived from this study with consideration for both QPE and discharge validation are A1 ($Z = 339R1.19$), A2 ($Z = 361R1.20$), Y1 ($Z = 363R1.19$), and Y2 ($Z = 384R1.20$).

MADID, CASSIOPHIEA M.

Soil and forest influences on ecological stability in rehabilitated nickel minesite in Bataraza, Palawan, Philippines – 2001

The influence of soil and forest properties on the ecological stability of a rehabilitated nickel minesite in Bataraza, Palawan, Philippines were studied. Nitrogen, phosphorus, potassium, pH and organic matter content were analyzed as well as plant structure, diversity and density. Further, the role of management subsidies provided by the firm and the role of external factors on the present and future ecological stability of rehabilitated mines sites were also investigated. Soil analysis revealed that there are low levels of nitrogen, phosphorus, potassium and organic matter in all rehabilitated minesites. However, soil pH is within the range where there will be favorable plant growth and development. On the first two years of rehabilitation, the study notes a low density of plants colonizing the rehabilitation areas, however, as the rehabilitation species grow normally, a favorable microclimate for successional species is created. Rehabilitation sites ages three and four years yield at least eleven species of woody perennials. Moreover, the study indicates that there are faunal species movements within the reconstructed ecosystem and there is a high potential that the rehabilitated minesites will assume the role of natural ecosystem as habitat to native faunal and floral species. *Acacia mangium* showed high economic potential as rehabilitation species.

The results of the study suggest that the management subsidies provided by Rio Tuba Nickel Mining Corporation have been promising in creating favorable environment for regeneration of native floral species which will eventually lead to ecological stability of the reconstructed ecosystem. At present, the result of the study suggest that the rehabilitation program of RTNMC is promising, however the guaranteed success of rehabilitation efforts would be dependent on the management subsidies provided by the mining firms in general. Hence, it is necessary that the goals and objectives of the rehabilitation program be made clear prior to any reconstruction process. It is therefore recommended that : 1) the list of explicit goals and objectives should be the basis for setting the criteria for the evaluation of the rehabilitation program; 2) the rehabilitation plan should clearly state the end result of the rehabilitation including its potential and future intended uses; and, importantly, 3) the firms should employ a planning and management strategy that would accommodate the local community.

MAGADIA BERNADETTE T.

Water Footprint Assessment of Bioethanol Production in Negros Occidental, Philippines -- 2020

Water footprint assessment of three bioethanol production cases in Negros Occidental namely, Case 1 – sugarcane bioethanol, Case 2 - molasses bioethanol, and Case 3 -50% sugarcane and 50% molasses bioethanol, was conducted to evaluate the sustainability of bioethanol production water footprint (WF), and the geographic sustainability of Region VI. Results of this study showed that Case 2 (3,574 L L-1) has the lowest bioethanol WF, followed by Case 3 (3,935 L L-1) and Case 1 (4,293 L L-1). Green WF constitutes to 64.8% of the total WF, while grey and blue WF share about 33.8% and 1.3%, respectively. Majority (99%) of the total WF comes from plantation, and varying the sugarcane yield resulted to about 8,027 L L-1 and 2,816 L L-1 bioethanol for a 40 t ha-1 and 115 t ha-1 sugarcane yield, respectively. Total WF of bioethanol production in Negros Occidental is about 560 MCM y-1 . Moreover, sustainability assessment suggests that WF of bioethanol production in the province can be minimized and its contribution to the total water demand of the region is minimal. Geographic sustainability, on the other hand, revealed that at present, Region VI or the region where Negros Occidental is situated, is categorized as having severe blue water scarcity at 41% water scarcity threshold and is projected to imminently increase in the coming years if water footprint response strategies are not in place.

MAG-ASO, JENNET R.

Valuation of Flood Impacts of Typhoon “Crising” in Kabacan, North Cotabato, Philippines.—2014

Flooding is one of the most common environmental hazards that pose alarming concern in the Philippines. In Kabacan, North Cotabato- a major rice-producing municipality in Mindanao, the increasing flooding incidents have

been documented in recent years particularly during rainy season and extreme climatic events. However, detailed statistics regarding the physical and socio-economic losses of affected households are very limited as the generation of good field data remains a challenge. This study assessed and monetized the physical, social and economic impacts which include cost of illness/disease and damage to farm house structures and contents amounted to P386, 916. 68 and P 160, 169.00, respectively. The total economic costs comprised of damage to rice production, loss of income from other sources, clean-up costs and government expenditure amounted to P20, 451, 247. 49. The total costs of flooding impacts amounting to P 20, 998,333.17 reveals that flood is a costly problem in Kabacan with a wide-ranging impacts particularly in rice farming communities and to the local government's fiscal budget. Thus, to address the flooding problem in the area, a long term and planned flood-mitigating program to be invested by the local government units is clearly required.

MAGDALERA, JOSEPH J.

Drinking Water Treatment using Hybrid Biosand Filter with Locally Produced Coconut Shell Carbon for Brgy. San Juan, Kalayaan, Laguna, Philippines -- 2019

The community in Brgy. San Juan, Kalayaan, Laguna consumes water from unprotected sources. Treatment of drinking water is necessary to prevent the spread of water-borne diseases. The Hybrid Biosand Filter (HBF) was designed and fabricated for this purpose. Evaluation of four filter systems revealed that the filter with 75% v/v sand and 25% v/v carbon was the best version which removed 100% of thermotolerant coliform, 100% of turbidity, and 92% to 95% of color from the untreated water. The carbon in HBF was soaked with 50% NaCl solution improving its characteristics and adsorptive capacity. The social acceptability of the community for the use, fabrication, and maintenance of the HBF for treatment of the community's drinking water was also determined. The survey on the respondents revealed that 66% of them would accept using the HBF and majority are willing to fabricate and maintain their own HBF. Through logistic regression, it was found that the respondents' willingness to pay for drinking water treatment is Php 0.77 per liter of water filtered. The payback period of the recommended HBF was computed at 11.91 months. Based on the results, it is recommended that the community could use the HBF for drinking water quality improvement.

MAGISTRADO, MYLEEN L.

Assessing the Factors Affecting Participation of Small-Scale Fisherfolk in the Padre Burgos Mariculture Zone, Quezon, Philippines. – 2019.

The establishment of mariculture parks in the Philippines provides opportunity for marginalized fishing communities as an alternative source of income however, the high cost of mariculture operation has prevented local fisherfolk from participating in mariculture as investor-operators. This study determined the factors that significantly influenced the participation of local fisherfolk in Padre Burgos Mariculture Zone (PBMZ). Socio-economic characteristics, access to skills and training, access to capital and credit facilities, and membership in fisherfolk association were the independent variables used in the analysis. A total of 313 fisherfolk households were interviewed in four (4) barangays in the municipality of Padre Burgos, Quezon. Two types of survey were conducted, the fisherfolk survey and cooperator survey. With a total of ten (10) investors currently operating in the PBMZ, only 2 are local investor, a fisherfolk organization and a multi-purpose cooperative. Less than 5% of the local fishing household members were employed since the establishment of mariculture zone.

This study adopted the logistic regression model and results showed that the decision to participate in mariculture zone is a function of age, gender, education, number of household members, access to training and access to credit. Cost-benefit analysis showed the profitability of mariculture operation in the municipality.

MAGISTRADO, ARIANNE MAE L.

Heavy Metal Contamination Monitoring of Sediments from Laguna de Bay, Philippines Using Magnetic and Electrical Properties as Proxies – 2020

In recent years, Laguna de Bay is being threatened by increasing pollution in its water and sediments due to the continued release of pollutants in nearby areas and its watersheds. The most common pollutants of concern in bodies of water are heavy metals because of their toxicity and bioaccumulative nature. At present, studies on sediments in our country are still limited and there is a lack of standard protocol for sediment analysis. This study sought to use magnetic and electrical parameters as proxies for the initial assessment of heavy metal pollution in suspected areas. Core sediments were taken in six different sites in the South Bay of Laguna de Bay. The parameters, Magnetic Susceptibility (X) and Saturation Isothermal Remanent Magnetization (SIRM) are both sensitive to the presence of ferrimagnetic minerals (magnetite). The increasing trends in values from the bottom up to the surface of the core sediments for these two parameters indicate the abundance of magnetite in surface sediments. Pearson's correlation analysis showed significant

correlations of X and SIRM with heavy metals cobalt (Co), nickel (Ni), lead (Pb), antimony (Sb), and zinc (Zn). The electrical conductivities were also measured for each core and a similar increasing trend as the magnetic parameters were observed from the bottom to the topmost layer of sediments. The highest values for these parameters were obtained from the site in Calamba City near the vicinity of industrial parks which may be attributed to the elevated pollution in the area than in other sites. The strong correlation between magnetic parameters and heavy metals shows the potential of magnetic measurements as simple and fast proxy methods for heavy metal pollution monitoring. X-ray diffraction and microscopy confirmed the presence of magnetite and revealed other minerals present in the sediments.

MAGNAYE, GEMMALYN E.

Modeling Land Use Change: A Case Study in Santa Rosa City, Laguna, Philippines. -- 2014

The study aimed to model the land use conversion to built-up areas in Santa Rosa City, Laguna, Philippines. Using GIS and remote sensing, five land uses were classified: bare soil, built-up, grassland, and ricefield based on landsat TM images for 1992 and 2006. The land use change analysis revealed that most of the built-up areas in 2006 were originally ricefields. The protection of the land use change for 2020 was carried out using roads (primary, secondary, SLEX) distance to infrastructures (colleges, hospitals, activity centers), and distance to existing urban areas. The results revealed that by 2020, most of built-up areas will be grasslands, and the barangay with the largest built-up areas will still be Brgy. Don Jose. Validation using a 2013 landsat OLI image showed an accuracy of 84.32%. By computing the Relative Shannon's entropy, patterns of urban sprawl were identified. The entropy on 1996 was 0.93, 2006 was 0.96, and in 2020 will be 1.00. This suggests that the distribution of built-up areas will be highly dispersed. Assuming the annual population growth rate of the city at 4.37% will be constant until 2020, the population growth rate of the city from 2006 to 2020 will be 38.86% while the built-up growth rate from 2006 to 2020 will be 65.82%.

MAGPANTAY, ANGELICA TORRES.

Rainfall and Land Use and Land Cover (LULC) Changes Impact Assessment in the Hydrology of Santa Cruz Watershed, Philippines. --2019.

Watershed provides a wide range of ecosystem services and part of the provisioning services is the quantity, distribution and timing of water supply in the system. The state of water resources is affected, among others, by rainfall, LULC and population changes. This study aimed to detect and project the separate and combined impact of rainfall and LULC changes in the hydrology of the Santa Cruz Watershed. The study was able to identify five precipitation models to account for the impact of change in rainfall volume and was also able to develop a projected LULC 2040 map using Markov chain model. These outputs were used to simulate its impacts on the surface and subsurface water using HEC-HMS software.

On the extreme (flood) event perspective, combined impacts are projected to increase peak discharge, total instantaneous volume and time of peak earlier. For the long-term simulation, under RCP 8.5, more rainfall during wet season while under RCP 4.5 more rainfall during dry season can be expected. Adding population impact, deficits are only present during dry season and consumption play significant role in its occurrence. Results of the study can serve as additional baseline information in the formulation of local development and conservation plans.

MAGPANTAY, JUNSER P.

Effects of Landscape Change on Surface Water Quality of Northern Taal Watershed, Philippines. 2017

Landscape pattern analysis was done to examine the effects of landscape change on surface water quality of Northern Taal Watershed (NTW). A 30-m ASTER GDEM image was used for the watershed boundary delineation. Multi-spatiotemporal LANDSAT® imageries of 2002, 2007, and 2014 were used in the evaluation of land use change processed in ArcMap 10.3 and Envi 5.1 FRAGSTATS 4.2 was used to determine the change in landscape patterns. Secondary information on socio-economic drivers in landscape change and surface water quality of the different tributaries was used.

NTW has an area of 11,273.13 ha. In 2002-2004, forest cover decreased by 45.03 percent while agriculture and built up areas increased by 6.49 and 307.69 percent, respectively. It was brought by increased in human population and urbanization. Forest was fragmented into smaller patches caused by built up development. Agriculture and Clumpiness of the three land uses did not markedly change. Some of the landscape metrics were significantly correlated with surface water quality in both dry and wet seasons. As a result, agriculture and built up had negative effects on surface water quality both in dry and wet seasons, whereas forest had only positive effects on surface water quality. This showed that NTW is facing serious surface water pollution due to landscape fragmentation, which aggravate soil erosion vulnerability that worsen surface water quality.

MAGSINO, ANNIELYN O.

Environmental audit of vegetable farming practices in selected upland areas in Nagcarlan, Laguna, Philippines -- 2000

An environmental audit of selected tomato farms was conducted to determine the environmental impacts of vegetable farming practices in rainfed tomato production in three sitios (Suayan, Landing and Biraulya) on the slopes of Mt. San Cristobal in Barangay San Francisco, Nagcarlan, Laguna. Farm review for soil and crop management of Ontario Environmental Farm Plan of Canada was used. Agroecosystem characterization of the study sites and interviews with farmers on farm input handling, storage, management, farming practices, and their environmental perceptions on farming practices, and marketing of farm produce were done. Intensification of tomato production threatens landscape ecological services on physically and chemically suitable rooting zones for vegetable production, biodiversity and soil fertility. The modified farm review on soils and crop management of the Ontario Environmental Farm Plan was applicable to the rainfed tomato production in the study sites.

The environmental risk of pesticide pollution to farmers' health and safety of tomato fruits for consumers are very high in most farms. Pesticide handling during transport, keeping of records of pests and disease control measures, use of protective gear, and time of pesticide application had fair to poor rating. Rill and gully soil erosion risk of sloping tomato farms in Sitio Biraulya was high. Sheet erosion risk was fair to high in other farms. Soil test was not used as a basis for fertilizer management. The recommended environmental management options including the conduct of training for the farmers to protect human and ecosystem health and ensure safety of tomatoes for human consumption were proposed. Further studies had been proposed to improve the environmental audit for small scale and rainfed tomato farms.

MALENAB, MA. CHARISMA T.

Analysis on the Influence of Climate Variability on the Occurrence of Dengue Fever in Los Baños - Makiling Microwatershed, Laguna, Philippines. – 2011

The province of Laguna experienced a drastic increase in the number of individuals affected with dengue fever last 2010. Moreover, a five-fold increase in the annual count of recorded dengue cases from 2001 to 2007, as reported by the Provincial Health Office (PHO), served as a warning of the possible health risk that may be faced by the residents of Laguna. This study sought to understand if climate variability in terms of total monthly rainfall, monthly average relative humidity, monthly average minimum temperature and monthly average maximum temperature influenced the occurrence of dengue fever in the Los Baños - Makiling Microwatershed, which encompasses the municipalities of bay, Los Baños and city of Calamba. In addition, this research sought to contribute to science through the mixed quantitative and qualitative methods employed.

In this study, the climatic variable from 2001 to 2009, which were obtained from National Agromet Station (NAS-PAGASA), were correlated with the corresponding monthly number of recorded dengue fever cases from PHO using Pearson product moment correlation analysis. Results show that the occurrence of dengue fever is linearly correlated with rainfall, relative humidity and maximum temperature in the three study site. The occurrence of dengue fever in Los Baños is significantly associated with rainfall (0.720^* in January and with relative humidity (0.845^* and maximum temperature (-0.796^*) in April. On the other hand, the occurrence of dengue fever in Calamba in the months of September and October are associated with rainfall (0.678^*) and maximum temperature (-0.679^*), respectively. Also, the dengue fever cases in bay in April and August are correlated with the maximum temperature (-0.804^*) and rainfall (0.896^{**}), respectively. The occurrence of dengue fever is directly associated with rainfall for the three sites. The study concludes that as the volume of rainfall increases, so does the number of dengue fever cases. In contrast, the occurrence of dengue fever is inversely associated with the maximum temperature, to a certain threshold. Thus, as temperature increases, the number of dengue fever cases decreases.

The three populations were observed to be aware of the possible and potential risk posed by an increasing frequency of dengue fever cases in the midst of variability in climate, based on the conducted household survey, focus group discussion and key informant interviews, thus the adaptation practices in the three populations. The most predominant practice is cleaning (100%) while the two least dominant practices are used of chemicals (64.9%) and lastly, use of biological control (7.8%).

In general, it is recommended that the households should rely less on the use of chemicals because of their harmful effect on the environment. Instead, they should rely more on practices that are considered environmentally safe. These recommended practices are proposed to the LGUs and barangay officials to be promoted as part of the strategies that may be implemented in each study site to prevent the occurrence of dengue fever.

MALOLOS, GRACE ANNE S.

The Role of Risk Perception in the Conduct of Disaster Risk Assessment and Risk Communication in Population and Built-Up Priority Decision Areas: The Case of River Flooding in Calauan, Laguna – 2020

Risk management is found to be ineffective if the community underestimates or overestimates the risk brought by disasters. Incorrect risk appraisal is even considered as an indicator of disaster vulnerability. Considering this issue, risk perception of households exposed to flooding was integrated as a sensitivity indicator in the conduct of Disaster Risk Assessment (DRA) in the Climate and Disaster Risk Assessment (CDRA) that is being institutionalized in the Philippines. In recent findings, risk communication with a comprehensive understanding of the factors affecting the risk perception of the community can serve as an intervention. So, research gaps in the assessment of the factors associated with the perceived risk were assessed through key informant interviews and regression models. Results of the analyses were used to propose a strategic design of a communication plan. The research particularly studied the risk perception of residents living in population and residential priority decision areas with moderate and high levels of flood risk, respectively. Keywords: disaster risk assessment, risk perception, sensitivity indicator,

MAMARIL, ROSALILY J.

A systems evaluation of the performance and impact of selected Integrated Social Forestry Projects in Iloilo -- 1991

Three selected Integrated Social Forestry projects in Iloilo were studied to determine the following : 1) extent of participation of project participants and the factors affecting such participation; 2) extent of participation and assistance of CDA's and the factors influencing their performance; 3) rate of survival of agroforestry crops and the biophysical factors influencing it; 4) increase in income of participants; and 5) impact of project performance on sustainability, productivity and equity. Two hundred thirty-four participants and eight CDAs were interviewed while data on survival and soil properties were recorded from nine randomly selected agroforestry farms.

Some information were taken from secondary sources. Descriptive statistics, correlation and regression, chi-square and percentage difference were used in data analysis. Based on the findings of the study, Nazuni ISF Project (Ps) performed best among the three projects based on the four indicators of performance. The factors which significantly affected the extent of participation were income, education, age, sex and occupation. Landsize and household size were not significantly related to the extent of participation. Survival of agroforestry crops was significantly affected by the amount of nitrogen and phosphorus in the soil. Rainfall variation partly explains variation in survival percentages. Species richness had no significant effect on survival of agroforestry crops. The factors found to have significant effect on CDAs' extent of participation and assistance were knowledge of the program skills in program implementation, and motivation. The increase in income of the respondents was found to be greatest in the Tiolas ISF Project (P1). However, this was not brought about by the increase in income from CSC farm and by other livelihood activities of the project. Only the Nazuni ISF Project (P2) showed that the increase in income was brought about by the increase in income from the CSC farm. Ecological sustainability indicated by extent of SWC showed that P2 was more ecologically sustainable than P1 and P2. Regarding the impact on productivity, there was an increase in terms of income from agroforestry farms and P2 had the highest increase. Based on Gini ratios, equity in income distribution was found to have improved in all sites.

MANAIG, ELENA M.

A study of IBS rapid composting technology and its adoption by Laguna farmers -- 1993

The study was conducted to investigate the effects of continuous compost application on some components of lowland rice agroecosystem and its possible environmental impacts. The study also aimed to determine the factors that affect the level of adoption of rapid composting technology by Laguna farmers. A study farm was selected for observation on the effects of compost application on soil, pests and crop and for comparison of compost-based and chemical-fertilizer-based cropping in terms of yield and income.

A total of 36 lowland rice farmers in Laguna to whom rapid composting was first introduced were personally interviewed. Fifteen of them were with high level of adoption while twenty-one were with low level of adoption of the technology. Treatment means were used to describe compost-based and chemical-fertilizer-based cropping in terms of soils, crop protection, agronomic, yield and income parameters. Means, ranges, frequencies and percentages were used in summarizing and describing data on the factors affecting adoption of rapid composting technology. T-test, analysis of variance and chi square test were the statistical tools used in the tests of hypotheses. It was found that continuous application of compost for several successive seasons had favorable effects on the soil. The soil in the compost-based paddies had significantly higher content of organic matter, N, P and K before and after the wet season cropping in 1993 than the chemical-fertilizer-based paddied. Crops grown in compost-based paddy soil had significantly greater P and K uptake. The amounts of the three major elements stored in straw were also significantly greater. There were less amounts of N and P loss from compost-based paddy soil than from chemical-fertilizer-based paddy soil through run-off. Amounts of K loss was greater in the former type of soil. Compost-based paddy soil retained more N (determined as ammonia)

from fertilizer broadcasted on soil water for a longer period of time than the chemical-fertilizer-based soil. There were also greater amounts of net gain of N, P, and K after wet season cropping than urea-fertilized soil.

Yield and net return were significantly greater in compost-based crops. Labor costs were significantly higher in compost-based crop due to additional labor inputs in composting and spreading of compost. However, these additional labor costs were compensated by the reduced cost of chemical fertilizer and increased yield. Golden snail population was significantly reduced in compost-based paddies, therefore, damage on tillers and leaves were less. Among the demographic and socioeconomic characteristics, only organizational affiliation and income were found to have significant relationship with level of adoption. The higher the organizational affiliation and the lower the income of the farmers the more they were likely to adopt rapid composting technology. Adoption was also shown to be dependent on continuity of receiving information about the technology. Other demographic characteristics like age, educational attainment, household size, farming experience, tenurial status and farm size, biophysical factors like irrigation problems, soil properties and cropping patterns, extension exposure and perceptions about change agents and technology had no significant influence on adoption. Adoption of rapid composting technology, therefore, can increase farm productivity at the same time make production sustainable. Such adoption can be encouraged by an effective technology extension such as starting with farmers with high organizational affiliation and low income and by continuously supplying information to farmers.

MANAIG, LIZETTE ANN G.

Environment Assessment and Compliance of Resort and Private Pools in Brgy. Pansol, Calamba City, Laguna, Philippines . -- 2019

The main focus of the study was on environmental assessment and compliance of the resorts and private pools in Brgy. Pansol, Calamba City. From that, quadrat method was used to represent the distribution of resorts and private pool wherein their set boundaries may contribute to their compliance and current water quality and/or vice versa. Results of the analysis showed that the resorts and private pools did not comply with the GSTC criteria because they were not strictly implemented. Criteria were subdivided into three aspects such as sustainable management plan, socio-economic aspect and environmental aspects. Among these aspects, overall compliance showed that the environmental aspect has the most complied criteria while the sustainable management plan has the least complied criteria. The reason for compliance was that it was part of business requirement or under the barangay ordinance. On the other hand, the reasons for non-compliance were: (1) lack of awareness on the aspect of sustainability, (2) it would be an addition expense for the resort/private pool, (3) often only the care-takers/pool operators are being responsible in managing the resort/private pool, and lastly (4) because most guests disobey the rules and regulation of the resort even if some of the resort/private pool have the waiver to sign prior of entering the resort. Fecal coliform, pH, and residual chlorine were recommended as important parameters in managing pool water specifically TDS which had been significant on both off-peak and peak season. Hence, this has to be included in the environmental management plan. Use of filter and alternative source of energy is encouraged. The use of filter may also contribute in conserving water resources while at the same time, providing safe water quality by avoiding the occurrence of fecal coliform in pool water. Also, this should be accompanied by enough cleaning schedule that would allow pool operators to scrub and vacuum the pool because limited cleaning schedules leave residues in pool water. Since odor was ranked the highest in describing safe water quality during scheduled interview with the local and visitor, further study is suggested. Lastly, further study on potential impacts of wastewater is suggested since owners and operators did not consider treating their wastewater.

MANALIGOD, RODOLFO L.

Potential Nutrient Contributions of a lakeshore rice-based agroecosystem in Barangay San Antonio, Bay, Laguna to Laguna de Bay, Philippines -- 1996

The study was conducted to determine the flow of nutrients, particularly nitrogen (N), phosphorus (P) and potassium (K) in a lakeshore rice-based agroecosystem in Barangay San Antonio Bay. It also aimed to identify the factors that influences NPK inputs and outputs in the agroecosystem. The flow of NPK to and from the paddy fields and the biophysical and socio-economic environments was determined for the 1994-1995 cropping year using mass-balance approach. The biophysical components of the agroecosystem were represented by natural processes were linked with the natural hydrologic cycle which include rainfall, runoff, leaching and flooding. On the otherhand, the socioeconomic components of the agroecosystem were represented by fertilizer application, irrigation, and cropping practices common in the barangay. Data showed a large part of annual nutrient inputs to the rice fields came from chemical fertilizers which consisted of 135 kg N/ha, 21 kg P/ha and 14 kg K/ha. These amounts accounted for 55 percent of N, 64 percent of P and 5 percent of K of the total inputs. Ratio of dry weights of harvested grain and straw was 1:2.5. This ratio implied an excess supply of NPK in the soil that resulted to the production of more straws than grains to the detriment of farmer's grain yield. The amount of NPK in the drainage waters of the agroecosystem which flowed directly to the lake were the potential nutrient contributions of the agroecosystem to the lake. Based on this study, a total of 35 kg N/ha, 9 kg P/ha and 66 kg K/ha per cropping year were contributed by the paddy fields to the lake via the flow of drainage waters. High volume of

water which carried the excess nutrients from the paddy fields were discharged to the lake during heavy rains. More nutrient enrichment of the lake took place during the rainy season. These nutrients which drained from the agroecosystem potentially contributed to the nutrient enrichment of the lake.

Previous study showed there are about 5,700 ha ricelands in the lakeshore of Laguna de Bay. If all farmers practiced the same fertilizer application as those farmers in Brgy. San Antonio, and assuming a 100 percent delivery ratio of drainage water from agroecosystem to the lake, then the potential NPK nutrient contributions of these paddy fields to Laguna de Bay would be about 199,500 kg N, 51,300 kg P and 376,200 kg K per cropping year. This translates to about 3,990 bags of urea fertilizer, about 7,524 bags of potash fertilizer and 1,026 bags of ammophos fertilizer all drained to the lake. Under current commercial prices a 50 kg bag of complete fertilizer costs P360.00 or P7.20 /kg. Since complete fertilizers contain 14 percent each of N, P, and K would each cost P1.00. Multiplying the amount of NPK lost through drainage by P1.00 meant a cost of P35.0, P9.00, and P66.00 for N, P, and K per ha were lost through drainage waters which flowed to the lake assuming a 100 percent delivery ratio. If there are about 5,700 ha of ricelands in the lakeshores of Laguna de Bay and if all farmers practice the same fertilizer application as those farmers in Brgy. San Antonio, Bay, then the cost of money lost through drainage of N, P, and K would be P199,500.00, P51,300.00 and P376,200.00 respectively or a total of P627,000.00. The lake on the other hand, provided nutrient inputs to the agroecosystem. This was due to inundation of the paddy fields by lakewater during typhoons. In this study it was shown that flooding provided about 1 percent of the total amount of NPK inputs to the agroecosystem. The total NPK content of the grains harvested were 97 kg N/ha, 11 kg P/ha and 23 kg K/ha. About 4 percent of the harvested grains were consumed by the farmer's families and the rest were sold. Thus the grains consumed amounted to 4 kg N/ha, 1 kg P/ha and 1 kg K/ha. Grains harvested that were sold and exported to other communities represented about 93 kg N/ha, 10 kg P/ha and 22 kg K/ha. For the whole barangay, these add up to about 7.3 tons of N, 0.8 tons of P and 1.7 tons of K.

MANAOG, MELANIE D.

Development of a family-level biotic index for environmental monitoring of nickel mining affected streams in Bataraza, Palawan, Philippines -- 2003

A biotic index (BI) was developed based on the changes in the benthic macroinvertebrate community structure of streams, which are affected by nickel ore mining in Bataraza, Palawan. The BI was developed to supplement the water quality data during the assessment of environmental conditions. AAWater, sediment and biological samples were collected from five stations in Okayan and Togpon Creeks in Bataraza, Palawan. The station in Okayan Creek, a stream outside of the impact zone, was used as the reference station, whereas the stations in Togpon Creek represented those that were affected by mining. Total heavy metals (Cr, Co, Fe, Ni and Zn) in the water and sediment, and other water quality parameters (DO, temperature, pH, TSS, TDS and discharge rates) were correlated with the insect and mollusk families present in the natural and artificial substrates (gravel, sand and silt, and leaf litter) used in the biological assessment.

Nickel (2.47 - 5.02 mg/L) and iron (11.46 - 76.54 mg/L) were the only heavy metals in water that exceeded the DAO standards (0.01 mg/L for both). In sediment samples collected from some stations in Togpon Creek, only Cr (139.76 - 588.02 mg/kg) and Ni (171.5 - 875.9 mg/kg) concentrations exceeded the Dutch Intervention Values of Cr (380 mg/Kg) and Ni (210 mg/Kg).

The macroinvertebrates observed at the different stations belong to 20 Orders of Class Insecta (8) and Class Gastropoda (2). A total of 30 insect families were observed in the Orders : Coleoptera (8); Diptera (5); Ephemeroptera (6); Hemiptera (4); Lepidoptera (2); Odonata (2); Plecoptera (1) and Trichoptera (2). Two mollusk families were observed. Families Megastropoda and Neritinea. As expected, the reference stations had the highest diversity index (3.37) and more macroinvertebrate families (28) than the impacted areas. No macroinvertebrates were collected from the station directly after the tailings pond. From about 50 m downstream of this station to about 680 m, the benthic macroinvertebrate community structure improved with the appearance of sensitive families such as Families, Ephemeralidae and Leptophlebiidae.

By classifying the families into intolerant, tolerant and persistent, a biotic index was developed by giving a biotic value from 1 to 5 to each insect and mollusk family. The intolerant families (e.g Ephemeralidae and Psephenidae) were given a 5, the tolerant families (e.g. Ryacophilidae and Calopterygidae) a 3 and the persistent families a 1 (e.g Hydropsychidae and Dysticidae). Intermediate values of 4 and 2 were given to families which were less intolerant or less persistent. By estimating the biotic index from the sum of the biotic values of the insects and mollusks observed in a station and dividing the sum by the number of families considered, the biotic index derived can be compared to a range of values. When applied to the stations studied and compared to the Biological Working Monitoring Party, the biotic index developed was able to show differences in the quality of the environmental conditions.

MANCEBO, FAY F.

Application of Remote Sensing and Geographic Information System Technologies in the Monitoring and Assessment of the Water Quality of Laguna de Bay -- 1997

This study is the first attempt to apply remote sensing (RS) and geographic information system (GIS) in monitoring and assessment of the water quality of Laguna de Bay, the largest lake in the country. The study determined the correlation between the 1992-93 data (total suspended solids (TSS), total dissolved solids (TDS), total solids (TS), turbidity, Secchi disc transparency, chloride, and depth) of the Laguna Lake Development Authority (LLDA) and UPLB Institute of Chemistry, and reflectance (bands, 1,2,3,4,5,7) in Landsat TM of National Mapping Resource Information Agency (NAMRIA). Based on this analysis, reclassified maps, interpolated water quality data and Thiessen polygons were generated. Results showed that no correlation for 1992 data was noted, presumably due to the influence of meteorological conditions (e.g. cloud and wind velocity). In 1993 TSS, depth and TDS were significantly correlated to the reflectance of bands 2, 3 and 4, respectively. No correlation between TS and reflectance was found.

Utilizing band 2 the blue areas showing high TSS and reflectance coincided. These areas are predominant in the West Bay found adjacent to urbanized and industrialized zones. Likewise, in band 3 the blue areas correspond to both high reflectance and depth range - 3.1-3.4 m. On the contrary, TDS and band 4 were found to be negatively correlated. The yellow polygon in South Bay where TDS was lowest matched with the red areas in band 4 where reflectance was high. In West and Central Bays the blue polygon indicating high TDS corresponded to the black areas having low reflectance.

Additional information (areas where water hyacinths, muddy areas and ricefields are located) were generated by using bands 2 and 3. This information was verified through ground truthing. Based on these results the integrated RS/GIS technologies can be used to monitor changes in TSS, TDS and depth of the lake with some limitations. However, strengthening the coordination between LLDA and NAMRIA may be necessary before these technologies can be applied. If applied, it is recommended that coordinated sampling of the lake and satellite passes be undertaken so that a real time data analysis can be done. Based on these data a TSS -Reference index can be derived. Other technologies such as Compact Airborne Spectrographic Imager (CASI), Radio Detection and Ranging (RADAR) and aerial photography may be explored for monitoring purposes.

MANIKHAM, DETHSACKDA

Community participation in the environmental management of limestone (Hin NamNo) National Protected Area in Boulapha District, Khammouane Province, Lao PDR. -- 2010

Community participation in the sustainable management of Limestone (Hin NamNo) National Protection Area project in Boulapha district, Khammouane province, Lao PDR was evaluated the natural resources use of the respondents in the communities.

Two types of questionnaires were developed for different groups of respondents to seek their perception and involvement in community. The results of the statistical analysis among the key informant and respondent were agreed.

The Lao PDR government implemented the land allocation and promoted community participation in the three communities in 2002. Each community has their own land use types include construction, cultural, agricultural, and forest lands. Forest lands are divided into conservation, protected, production, and rehabilitation forest.

About 85 percent of the respondents participated in various activities of natural resources management in planning, implementation, decision-making, monitoring and evaluation and sharing personal property. #Water and forests are used properly and limited conflicts, both among the villagers and other nearby villages. However, wildlife population is decreasing and some of endangered species have reportedly disappeared in the area. About 60% of the harvesting of non-timber forest products (NTFPs) and wildlife hunting were traded. As for fishing, some local people indicated that some fishers catch fish within the fishery conservation area.

MANILA-FAJARDO, ANALINDA C.

Performance of honey bees *Apis mellifera* Linnaeus in three ecosystems in Laguna, Philippines -- 2002

The population growth rates, life table budget, pollen spectra and honey produced in managed and unmanaged colonies of *A. mellifera* were compared in three ecosystems in Laguna. Experiments were conducted in Canlubang Industrial Estate, Bay and in Makiling Forest Reserves representing the industrial, agricultural and forest environment, respectively, from August 30, 2000 to May, 2002. The bees exhibited Type 3 survivorship curve both in managed and unmanaged colonies. Egg mortality may be due to extreme temperature and non-viability of the eggs. Larval mortality was due to infection of chalk brood. The population growth of *Apis mellifera* in agroecosystem was significantly higher than those of the industrial and forest environments. The abundance of melliferous plants in the agroecosystem enhanced the population build-up of *A. mellifera*. The native species, *Apis cerana* and *Apis dorsata* negatively affected the growth of *Apis mellifera* colonies in the forest ecosystem by aggression and robbing of stores. Mites, *Varroa destructor*, chalk brood disease and bird predators were observed in all sites.

Traces amount of cadmium, lead and chromium were detected in pollen samples from the industrial ecosystem. Deltametrin and cypermetrin pesticides were absent in the honey and pollen samples from the agroecosystem. Fifty-one pollen types were identified from the samples. There was no predominant pollen source. Seven secondary pollen sources were identified: *Hygrophila lancea*, Acanthaceae type, Convolvulaceae types, *Mimosa invisa*, *Mimosa pudica*, Leguminosae types and Palmae types. Family Leguminosae represented most of the pollen types observed. There was an overlap in the pollen types identified from industrial and agroecosystem. Among the three environments studies, the bees performed best in the agroecosystem in terms of population growth and honey production. In spite of diversity in a forest ecosystem, the exotic species *A. mellifera* failed to exploit the nectar and pollen sources of most plant species. This indicates that *A. mellifera* has not indeed adapted to natural forest conditions in the tropics.

MANILAY, JASON ALESSANDRO C.

Environmental Assessment of Macrofungi and their Habitat in the Permanent Biodiversity Monitoring Area for Conservation of Mount Makiling Forest Reserve – 2016.

An environmental assessment of macrofungi and their habitat at the Permanent Biodiversity Monitoring Area (PBMA), Bagong Silang in Mount Makiling Forest Reserve (MMFR) was done in this study to support PBMA objectives on food security and contribute to the limited science-base biodiversity conservation and management concerning fungi. Fungal specimens were collected, identified and classified from August 2013 to May 2014 from 27 monitoring plots with the PBMA. Sixteen fungal species were analyzed for their composition and mineral content. Ninety-six respondents were interviewed to determine their knowledge and perception regarding fungi and their uses. Results showed that fungal diversity was high ($H' = 3.025$) and evenly distributed ($e = 0.0676$) resembling a healthy fungal ecosystem, comprising of 3,051 individuals belonging to 37 genera and 88 species. The diversity and occurrence of fungal species were directly proportional ($p < 0.01$) to substrate but inversely proportional ($p < 0.05$) to tree population. This indicates a habitat which is carbon-rich and dominated by *Celtis luzonica* and *Coffea arabica*. whereby substrate were wood > plant litter > soil. Compositional analysis of the selected fungi revealed high carbohydrate ($35.49\% \pm 8.75$) and protein ($4.75\% \pm 1.83$) values for all species (*Schizophyllum* sp., *Auricularia polytrica*, *Auricularia delicate*, *Ganoderma* sp.) signifying their potential as a food source. These were validated by the community perception (77% of population) of the importance of macrofungi as food. Moreover, the presence of minerals (K, Ca, Fe, Cu, Mn, Zn, Mo, Pb, Cr, Zr, Sr, Rb, V, Ti) revealed their potential for bioremediation, pharmaceutical and biofertilizers. Overall, considering their ecological and economic values, macrofungi should be considered as a major component in biodiversity conservation and management planning, with the local community as key actors.

MANLOSA, AISA O.

Environmental benefits and costs of conserving Layawan watershed for sustainable domestic water supply in Oroquieta City, Philippines. -- 2011

The sustainability of domestic water supply from the Layawan Watershed in Oroquieta City critically depends on the past and present conservation activities and the availability of funds from such stakeholders as households, communities, and government. This study determined the willingness to pay (WTP) of households in Oroquieta City to finance conservation projects in Layawan Watershed to ensure the sustainability of their domestic water supply. A household survey of randomly selected 278 respondents was conducted using the dichotomous choice referendum format.

The results of the Heckman's two-stage analysis for the parametric estimation of mean WTP yielded the values of P4.00; P6.00 and P7.00 per month for mandatory, voluntary and pooled data sets, respectively. The value of P4 per month for the mandatory scheme indicates that each household is willing to pay this amount if all users are required to pay. The higher value of P6 per month for the voluntary payment means that the respondents favor this monthly payment scheme if the users contribute voluntarily. The pooled value of P7 per month is the combined figure from both mandatory and voluntary schemes.

The households (as users of domestic water) are willing to contribute funds for conserving Layawan Watershed as supported by the total WTP of Oroquieta City's population that ranges from P117,845 to P471,380 in five years, discounted at 6%.

Variables that significantly affected the WTP of the respondents are bid level, income, educational attainment, religion, agreement to payment vehicle, civil status, age, membership to an environmental organization experience in making donations, and environmental awareness.

MANRIQUE, AMALIA S.

Simple productivity indices for lake ecosystems: the case of Sampaloc Lake. -- 1988

Sampaloc Lake's productivity was estimated through the use of the Morphoedaphic Index (MEI). The MEI, derived from measures of total dissolved solids (or conductivity) and mean depth, provides the simplest and most general approach to the problem of initial estimates of potential yield in lakes and reservoirs in North America and Africa. Sampaloc Lake's annual MEI value for 1986 to 1987 was found to be 8.99 umho/cm/m, while fish production (captured fisheries only) was estimated to be at 428 kg/ha.

These results were compared to the regression line for 17 African lakes. At the fish cage level, an exploratory analysis was undertaken to determine the significant association of selected environmental and socio-economic parameters with cage productivity. In using a multiple linear regression and a multiple log-linear regression function, it was found that the latter gave the best fit. Sixty-seven percent of the variation in output (i.e. *Tilapia nilotica* yield) can be explained by the following explanatory variables: stocking rate, fish size at harvest, production cycle, education or years of schooling of the operator, depth, and harvesting system. Fish culture experience of the operator was also significant in the first model.

MANUTA, JESSIE

Tenurial arrangements and forest resource management in Haliap, Kiangon, Ifugao, Northern Philippines -- 1993

The study aimed to determine the impact of market economy, population pressure, and the imposition of statutory law and policies on the Ifugao tenurial arrangements and forest resource management system in Haliap, Kiangon, Ifugao in northern Philippines. Results indicate that there are two conflicting tenurial arrangements operating in the village, namely: the statutory and the customary. The syncretic co-existence of the two is manifested in the manner by which different users (state, Haliap residents, non-Haliap residents, and speculators/outside) of village forest resources enforce their claim/exclude other users. At the village level, the customary laws, procedure and processes continue to operate. In dealing with non-Haliap users, the people utilize tax declarations issued by the state to protect their claim and property rights to resources.

Certainty of the observance of property rights and the implementation and enforcement of state laws are however not clear as far as the speculators are concerned. The inability of the villagers to enforce their customary claims and the inability of the local government to protect the indigenous communities nor to enforce the laws led to the eventual breakdown of institutions that govern the utilization of forest resources in the village. This results to institutional limbo which undermines the assurance and protection of their access and property rights thus eroding motivations to protect and maintain their agroforestry system (muyong/pinusio). The lack of market, infrastructure, credit and technical assistance further lessens the economic/ecological viability of the indigenous agroforestry system.

MARASIGAN, JAMES MICHAEL V.

Responsive Resource Management Using Interactive Visualization and Analysis: The Case of Los Baños, Philippines. -- 2017

A visualization and analysis framework was created to help decision makers in knowing flood affected locations keeping in mind the end goal to aid responsive resource management. The structure made was in a type of QGIS module instrument that was based on Inasafe and was utilized for visualizing and analyzing flood scenario of Los Baños, Laguna municipality. Using visualization to express abstract ideas such as number of flood affected communities and structures instead of just expressing them in forms of words a straightforward manner is preferable since visualization uses, maps, graphs, and charts in order to describe an idea. After getting the plausible number of individuals and structures influenced by flood hazard, association (e.g. the municipal government) could decide how much relief items would be accommodated by the general population affected by flooding. With that information gathered from visualizing and analyzing the number of populations and buildings affected by flooding. Accordingly, appropriate plans can be defined with specific end goal of supplying the individuals who are in need of financial assistance for damaged building structures.

MARECHAL, BRECHJE

Sustainable Natural Resource Management through Clay Amendments in the Rainfed Lowland Rice Agroecosystem in Savannakhet and Pakse, Lao PDR. -- 2012

Sustainable management of natural resources in Lao PDR's lowland rice Agroecosystem combined with the required increase in production could be realized through clay amendments because soils in the area where most rainfed lowland rice is produced are predominantly poor and drought-prone with low moisture and nutrient retention capacities. To verify this, experiments with different rates of Bentonite clay were established in Savannakhet and Pakse. At one tonne clay ha⁻¹, a 95% rice yield was achieved at Savannakhet.

The biodiversity assessment showed the presence of a wide variety of beneficial insects and negative effects of the clay treatments on biodiversity were considered unlikely. At Savannekhet, estimated water lost through percolation has been reduced as more was used for transpiration to produce the additional biomass while at the same time reducing pollution from nutrient leaching. Clay applied at a rate of one tonne ha⁻¹ in Savannekhet resulted in a profit from the second year onwards. But without a subsidy scheme it is difficult for farmers to adopt clay amendments due to the high initial investment costs.

The on-site conditions of Thasano Research Station were used to assess the potential of the method across Savannekhet province through extrapolations using GIS. Overlays of soil texture, land use, elevation, temperature and rainfall show a potential rice production increase of 8.4% at one Bentonite ha⁻¹ on 18% of the provincial rice area.

MARTINEZ, IMELDA B.

"Lukan" *Geloina coaxans* (Gmelin, 1791) as biodindicator of copper in mangrove areas in Marinduque, Philippines – 2003

The usefulness of "Lukan" *Geloina coaxans* (Gmelin, 1791) as biodindicator of copper in Marinduque, Philippines was evaluated. The copper content of the sediments and bivalves from selected mangroves were determined. The bivalve species which had a potential for bioaccumulation were studied in different sites in Marinduque. The bioaccumulation factor (BAF) of copper in *G. coaxans* was also determined and the possible strategies on the use of *G. coaxans* as biodindicator were recommended. The sediment samples collected from different mangrove areas in Marinduque had copper content ranging from 51 to 1548 mg/kg. These values exceeded the standard in Canada for clay and US Sediment Quality Guidelines (SQG) which are 45 and 100 mg/kg copper, respectively. The high copper contents of sediments in these mangrove areas were associated with their proximity to Calancan causeway, Mogpog River and Boac River, which were identified as the major point sources of copper contamination in the province. On the other hand, mangrove sediments in Barangay Maligaya had the highest (1547.62 mg/kg) while those from Salomague Is. had the lowest (25.58 mg/kg) copper content.

The copper content of all the bivalve samples of different species collected were above the US Health Guideline of 0.0007 mg/kg. This is attributed to the higher copper content in the sediments in the mangrove areas where the bivalves acquired food. Samples of "Punaw" *Lucinoma annulata* collected in Balogo, Boac had the highest copper content of 58.78 mg/kg. However, "Lukan" *Geloina coaxans*, (Gmelin, 1791) and "Dangkalan" *Anadara maculosa* collected from Salomague Is. had the lowest copper content of 0.32 and 0.17 mg/kg, respectively. *G. coaxans* showed the widest distribution in the wild and most preferred alternative food in the community. The bioaccumulation experiment using *G. coaxans* was conducted in different experimental sites for two-week (T1), one-month (T2) and two-month (T3) periods. Tabigue (station III-A) had the highest copper contents in the sediments (674 to 3020 mg/kg) and the copper contents of *G. coaxans* were 14 to 103 mg/kg in all sampling periods. On the other hand, Kamandugan (station I-A) had the lowest copper content in the sediment (16 to 24 mg/kg) while in Salomague Is. (control site) had the lowest copper content of *G. coaxans* (2.19 - 3.25 mg/g). The low copper content of *G. coaxans* in this control station was attributed to its far distance from any of the identified sources of copper contamination. Moreover, the sediments in all sampling stations except in the control were acidic.

MARTINEZ, MYLENE R.

Coastal Environmental Dynamics of Manamoc Island, Cuyo, Palawan, Philippines. – 2018.

Manamoc Island was among the small islands in the Philippines experiencing coastal retreat. With the threats of hydrometeorological hazards, coastal retreat could get worse. It is therefore, imperative to enhance the resilience of Manamoc Island to hydrometeorological hazards through enhancing coping mechanisms. To do so, this study sought the following: 1) describe the coastal dynamics around Manamoc Island; 2) evaluate the suitability and possibility of mangroves as mitigating measures for coastal retreat; and 3) enhance the community resiliency to withstand hydrometeorological hazards. In describing the coastal dynamics of Manamoc Island, the following were done: time-series analysis of shoreline change, longshore drift experiment, beach profiling and key informant interview (KII). Results have shown an average of 38 – 64.5m coastal retreat from 1989 – 2016. Apparently, it was due to the compounding effect of both natural factors such as monsoons, typhoons, and storm surge and anthropogenic factors such as livelihood activities, physical development (infrastructures), lack of policy addressing coastal retreat, and weak enforcement of environmental laws.

Mangrove was one of the viable mitigating measures to apprehend the negative impacts of physical or natural factors triggering coastal retreat hence this study assessed the distribution, physiognomy and the factors affecting the distribution of mangroves in the island through vegetation sampling using plot method. Results have shown that among the 11 species found in Manamoc Island, *Rhizophora mucronata* was the dominant species. *Rhizophora* species are good land stabilizers because of their complex root system adaptation. Moreover, this genus is resilient to typhoons. Cluster analysis of mangroves resulted to 5 clusters: Cluster I – *Avicennia marina* (Forsk.) Vierh.; Cluster II – *Bruguiera sexangula* (Lour.) Poir.; Cluster III – *Rhizophora apiculata* Blume and *Rhizophora mucronata* Lam.; Cluster IV –

R. mucronata Lam; and Cluster V – *Sonneratia alba* J. Smith. Clustering followed the zonation of mangroves: landward, middleward, and seaward. The distribution of mangrove vegetation was greatly influenced by soil pH, soil texture and Nitrogen as evidenced by the Canonical Correspondence Analysis (CCA).

Systems analysis of Manamoc Island in the context of coastal retreat recommended enhancing coping mechanisms to hydrometeorological hazards through: establishment of mangrove corridors; reforestation and planting of local beach forest species along the coastline; polishing of local ordinances and empowering local enforcers; and education at all levels to let the community understand that their activities negatively affected the natural barriers against hydrometeorological hazards.

MARTINEZ, OPHELIA Y.

The impacts of coastal tourism in Maribagao, Lapulapu City -- 1997

Identification of the beneficial and negative impacts of coastal tourism on the marine, socio-economic, and the institutional environments is the focus of the study concentrating on Barangay Maribago, where most of the beach resorts in Lapulapu City are located. Similar to other beaches, its corals have been destroyed by illegal fishing (e.g. dynamite). Providing protection to corals in their beach fronts (generally accepted as within their jurisdiction) from further destruction is one of the major impacts of the presence of resorts. Their operations discourage illegal fishing, thus providing the chance for corals to rejuvenate. To thrive and grow, the industry is dependent on a clean and healthy marine environment. Scuba diving, a major water recreational activity, did not seem to cause significant physical damage to corals, which could be partly explained by strategies like the provision of mooring buoys by resorts, and high perception/attitude and high level of knowledge of the users (tourists, resort operators and employees) towards conserving marine resources.

DO and BOD levels in the two sampling stations obtained before and after the peak tourist season were within the standards for the Class SA Water Classification for Tourism Zones and Marine Parks. The total coliform (TC) count which, before the peak season was almost two times higher, then shoot up to over 18 times than the standards of 70 MPN/100 ml immediately after the peak season. This finding is significant considering that tourism is identified as a "smokeless" industry.

In general, the community perceived tourism as economically beneficial but its presence could encourage some social ills such as prostitution and transmission of STDs.

Financially, it seems that only the resort operators and employees and "sari-sari" store owners profited from the industry. Displacement of local tourists from the beach areas which they used to frequent before, is a major negative social impact which confronts the present management as well as the future development of the industry. Although specified in the Local Government Code that the city government is responsible, the management of the industry appears to be inadequate even with the support of the DOT, DENR and academe. The laxity in management provided an opportunity for the resorts to construct illegal structures on their foreshore and off-shore areas. It appears that there is a strong need for strengthening the capability of the LGUs as well as the linkages among these institutions. Although the industry is considered as a major source of revenue, the only clear contribution of tourism to the city is through the payment of annual real estate taxes. In view of the city government's plan to develop two additional tourism zones on the island, some of the major recommended strategies are: (1) inclusion of a sustainable Tourism Plan in the City's Master Plan, and (2) conduct of EIA of the proposed reclamation projects.

MARZA, MA. CECILIA C.

Ecosystem Services of Rubber Plantations in Mount Makiling Forest Reserve Philippines. -- 2017

The general objective of the study is to assess the supporting and regulating services of the two rubber plantations in Mt. Makiling Forest reserve. The two plantations studied were the old rubber plantation inside the Molawin-Dapalit subwatershed and the young stand located in MMFR Buffer Zone near the boundaries of PCC and DTRI. The methodologies to attain the objective are: 1) field reconnaissance survey, plot establishment and data collection; 2) assessment and comparison of the two sites in terms of their soil fertility, coverage of vegetative mats, amount of litter and above and below ground carbon stock of vegetation, and soil organic carbon at 50 cm depth; and 3) literature review.

In terms of supporting service through soil fertility, the old stand was found fertile in terms of the available amount of phosphorus, sufficient amount of exchangeable potassium and amount of nitrogen than the young stand. In terms of the amount of soil organic matter in the surface soil (0-20cm), the young stand had significant higher amount at 5.84% than 4.46% in the old stand while in the sub-soil reaction in the surface soil was also significantly higher in the young stand at pH 5.95 than in the old stand at pH 5.10 and their sub-surface soil pH were not significantly different.

In terms of regulatory services through erosion regulation, the two stand were not significantly different in function, although vegetation mats composition were very different between the young and the old stand. Another regulatory service was climate regulation through carbon storage and it was found out that the estimated stored carbon of the old stand was 375.69 tons/ha significantly higher against the young stand at 131.62 tons/ha.

The ecosystem services of the young and old stands differed primarily due to their age gap, species composition and management scheme.

MASAGNAY, VIOLETA P.

Cooperative formation and development in community forestry program in Penablanca, Cagayan -- 1996

The general objective of the study is to analyze the existing conditions in Community Forestry Program area in Penablanca, Cagayan with cooperative as a conduct to forest protection and management. The study revealed that majority of the respondents gave a rating of average to high on the provision of cooperative. In general, the respondents have favorable perception/attitudes as to the degree of support of their cooperative in related cooperative activities/CFP implementation activities. There is a weak agreement in the rankings on the priorities of their cooperative with regards to cooperative factors/functions. This indicates that they have different expectations as to what their cooperative should prioritize and the general direction of the cooperative.

Significant relationships were observed between the organizational characteristics and cooperative factors/functions. These were : sex vs. socio-economic functions; sex vs. socio-political functions; position in the cooperative vs. socio-economic functions; position in the cooperative vs. value formation/orientation functions; and household size vs. value formation/orientation functions. Four important areas of concerns were identified to effectively implement CFP in the area. These are the resources, organization/organizational factors/functions, cooperative environment and the relationship existing among the components and environment of the cooperative.

MAUNG, MYO WIN

Climate Change Awareness and Farm Level Adaptation of Rainfed Farmers (Central Dry Zone) in Monywa Township, Sagaing Region, Myanmar – 2014.

Primary data were gathered from the Monywa Township, Sagaing Region in Myanmar. Using geographical stratification, 50 respondents each from up-stream, mid-stream and down-stream strata were randomly selected having a total of 150 study respondents. The study aimed to 1) determine the factors influencing climate change awareness of rainfed-farmers; 2) determine the perceived effects of climate change among farmers growing four major crops such as pigeon pea, chick pea (pulses) and onion and garlic (culinary crops); 3) identify the methods of farm level adaptation practiced by farmers in coping climate variation and other factors; 4) study the relationship between awareness of climate change and farm level adaptation of rainfed-farmers in Monywa Township, Sagaing Region, Myanmar; and 5) provide key recommendations to the concerned stakeholders to promote sustainable agriculture in area.

Majority of the respondents are men who are likely to have access to information, skills and knowledge to adapt to climate change. Institutional factors that influence awareness of climate change include farm input costs, provision of farm machinery by either the private sector or the DoA, and agricultural support programs. Over 43% of total respondents altered agriculture activities depending on input costs and 29% changed their farming system based on agricultural support of private or government sector due to the lack of access to capital/finance, water and agricultural inputs without due consideration of climate change.

Perceived effects of climate change include negative effects to agriculture as the sown area was reduced due to pests and diseases infestation, insufficient availability of rainfall or heavy rainfall, shorter growing season, and increased erratic rainfall pattern. Among the four major crops in the study area, pigeon pea was heavily affected by variation in rainfall during the winter season according to cropping pattern. In terms of farm level adaptation, 72% of total respondents used mono-cropping as traditional; framing although mono-cropping choices can make farmers extremely vulnerable to climate-induced shocks.

The study showed that awareness of climate change is related to farm level adaptation. About 28% of the respondents changed cropping system from mono-cropping to other practices which include intercropping, mix-cropping, crop rotation and multiple cropping to minimize the risk of climate change in the dry zone area.

Effective strategies to promote community resilience in the dry zone area must include building the capacity of individuals as well as communities to sustain agricultural productivity and household incomes. Human capacity development should be a priority to ensure effective farm level adaptation to climate change.

MAYO, RASMIAH DG.

Utilizing local knowledge system in the identification of priority areas for conservation of non protected areas in Sibuyan island, Romblon, Philippines. -- 2005

Using participatory environmental methodologies, the local knowledge system among Sibuyanons in Sibuyan Island, Romblon was examined, revealing a wider understanding on the endemic and threatened faunal species and their habitats outside Mt. Guiting-Guiting Natural Park (MGGNP). These and the ecosystem values and services they provide

the locals were also known. The 33 endemic and threatened wildlife species have high ecological (predator to pest and pollinator) and economic (source of protein, medicine, pet and trade) values to Sibuyanons. Areas around the Protected Area (PA) provide the Sibuyanons with various ecosystem products and services such as : venue for tourism (39 percent); source of forest products (33 percent); shelter for wildlife (11 percent) and water source (9 percent). Survey results indicate high occurrence and wide distribution of endemic and threatened faunal species in areas outside the boundaries of MGGNP. Sibuyanons have identified 7.086 occurrence points outside the PA for the 33 endemic and threatened species studied. These plotted observations described areas beyond formerly known habitat ranges of a number of specific fauna studied here, and have not been included in available scientific publications before.

Though Sibuyanons have shown high preference (88 percent) to applying some form of conservation to biodiversified areas outside the PA boundary, the following factors were identified to hinder success in conservation efforts, most of which are anthropogenic in nature: poverty, lack of alternative livelihood opportunities, habitat destruction, insufficient laws and weak environmental ethics. Conservation maps presented in six habitat types were generated using species distribution against community conservation preferences.

MAYOR, AERON D.

Population Characteristics and Fishery of the Freshwater Clam, *Batissa violacea* (Lamarck, 1818) (bivalvia) in Cagayan River, Northern Philippines.—2014

Freshwater mollusks are among the most diverse and imperiled groups of animals around the world experiencing severe population decline for the last decades as these are typically not assessed and mostly remain to be unregulated and not covered by legal protection. In the Philippines, the *Batissa violacea* (Lamarck, 1818), an indigenous freshwater clam in Cagayan River has been identified as a threatened species by the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) in 2013. Hence, this study assessed the population of *B. violacea* in relation to the ecological condition in Cagayan River in support to its conservation and management as well as to secure public health.

The abundance of *B. violacea* in Cagayan River were found to be determined by the condition of water quality and soil substrate particularly in terms of soil pH ($r=0.560$; $P<0.01$), water pH ($r=0.380$; $P<0.05$) and total suspended solids ($r=0.256$; $P<0.01$). The *B. violacea* is gonochoristic with sex ratio of 1:0.66 and a diet composed of 80-90% sediments/detritus and 10-20% food items. Majority of the bivalves in Cagayan River belong to size Class A (<25.4 mm). The total coliform (TC) and *E. coli* (>8MPN/100ml) of riverine is within the Philippines Class C water classification for fisheries activities and microbiological quality standards for shellfish water areas by other countries. In contrast, TC and *E.coli* (>1,100 MPN/g) of *B. violacea* meat exceeded the criteria limit set by the Philippine Food and Drug Administration (FDA) (16MPN/g *E.coli*).

With a computed CPUE of 2.04 kg/hr./boat. Majority of the fishermen agree that while current volume of bivalve catch tend to be increasing as compared to harvest five to ten years ago, the sizes of the caught bivalves has been decreasing, which clearly indicates some resource pressure. In response, it is recommended that an ordinance regulating the harvesting of *B. violacea* to a size limit of >25-49 mm SL to secure its current population in Cagayan River and must be complemented with enhanced information and education campaigns among the locals. Likewise, results of this study could be utilized in the formulation of the general management plan of the Cabibi sanctuary located in Lallo, Cagayan, as well as the selection of additional sanctuaries across the Cagayan River.

MÉDIATRICE, NTABUGI KIKONGO M.

Sources of Pollution, and Resistance of Selected Bacteria to Heavy Metal, and Antibiotics in San Cristobal River, Laguna De Bay Basin, Philippines – 2016.

The research assessed the pollution of the San Cristobal River (SCR) with heavy metals (HMs) and bacteria. To achieve this goal, a survey on anthropogenic activities in the watershed was performed in the catchment to show the general use of the river. Bacteria isolation showed that the sediment and water were contaminated by *Escherichia coli*, *Salmonella typhi*, *Salmonella paratyphi* and *Vibrio cholerae*. The HMs concentration in water was within the limits set by the DENR for class C water. However, the HMs recorded in the sediment were higher than the limits set by the USEPA of 0.6mg/L for cadmium and 40mg/L for lead (Salah *et al.*, 2012). The BOD recorded was within the limit of DENR except in Site 2 where it was 22.1mg/L. Unexpectedly, the DO recorded was low in all the sites. The isolates were tolerant to Cd and Pb, the MIC ranged between 800 and 1000mg/L for Cd, and 2000 and 2300 mg/L for Pb which is beyond 100 times the standards set by the DENR. These bacteria also showed resistance to antibiotics; which was high against ampicillin and low against ciprofloxacin. The presence of antibiotic resistant and HMs tolerant bacteria in the SCR shows serious public health and environmental implications.

MENDOZA, BRYAN D.

Developing a participatory ecological solid waste management program for Don Bosco College, Incorporated, Calamba City, Philippines -- 2003

Participatory ecological solid waste management planning for Don Bosco College, Incorporated (DBCI), Calamba City was conducted. This study had five phases : (1) formation of a technical working group (TWG); (2) round-table discussion on ISWM; (3) symposium on solid waste management; (4) baseline information gathering; and (5) strategic solid waste management training workshop. The development of solid waste management was assessed using key informant interview, survey questionnaire and waste appraisal. The entire process of developing a participatory ecological solid waste management (PESWM) program for DBCI was documented. The technology of participation (ToP) techniques was used to draw the strategic action plan. Source reduction strategies alone (Option 1) and combination of source reduction and recycling strategies (Option 2) were evaluated. Extended benefit cost analysis of the current and alternative options of waste management scheme was done.

The major sources of solid wastes in DBCI are the Pavilion (canteen), the kitchen area, and the parks. The least waste generator is the electrical shop. Seventy-two percent of the solid wastes generated are biodegradable. Eight percent of the solid wastes are sold to junkshop operators as recyclable wastes, while the rest are hauled to dumpsites as residual wastes. Per capita waste generation of student's and employees is 166 g of waste daily while the entire school produces a total of 141 kg solid wastes in a day.

Option 1 and Option 2 schemes could reduce the projected wastes generation by as much as 15 percent. These could reduce annual waste generation by as much as 5 tons. With Option 1 alone, a little more than 3 tons of waste would still be hauled to the municipal dumpsite. If source reduction and recycling strategies are implemented, none will be brought to the municipal dumpsite.

The current waste management scheme and the Option 1 scheme are not economically viable. The former has a profitability index of only 0.18, while the latter only has 0.07. Option 2 has positive economic benefits of PhP 246,841 in five years. It has 7 times more benefits than costs compared to the other alternatives. It also has an internal rate of return of 162percent which is way beyond the discount of 12percent. This indicates that the Option 2 scheme is the only viable scheme.

MENDOZA, RAISA A.

Environmental Determinants of Waterborne Pathogen Contamination in Freshwater Ecosystems: The Case of *Blastocystis* sp. In the Seven Lakes of San Pablo, Laguna, Philippines – 2022.

Several studies in the past recent years have revealed the common occurrence *Blastocystis* sp. in human and animal fecal samples. Despite the increasing attention on this parasite, only a few studies have been conducted in the Philippines to determine the extent of *Blastocystis* sp. contamination in the environment. This study reports the occurrence of *Blastocystis* sp. in the surface waters of the seven lakes in San Pablo, Laguna and assess the environmental determinants of parasite contamination in the lakes. Five sampling points per lake were selected based on the different lake and uses. A total of 105 surface water samples were collected to assess the extent of parasite contamination in the lakes. Detection of *Blastocystis* sp. was done through *in vitro* cultivation method and were detected in the water samples from all the seven lakes with an overall prevalence of 19% (N=105). Highest detection (33%) was observed near the residential areas of Bunot lake which could imply possible contamination from the nearby communities brought about by an increase in the number of settlements and associated activities in the lake. Lowest detection (13%) was observed in Lakes Pandin, Yambo, and Sampaloc where tourism and recreational activities take place. Results of correlation analysis between parasite prevalence and water quality parameters (i.e. dissolved oxygen, temperature, and pH) showed low to moderate positive correlation and suggests that other factors such as sanitation and hygiene practices should be considered. Data on spatial distribution of *Blastocystis* sp. contamination in the lakes were mapped using QGIS version 3.16.10. Molecular analysis of *Blastocystis* was done to further characterize parasite isolates and showed that *Blastocystis* isolates fall under subtype 5 (ST5) which can originate from humans and animals. The detection of *Blastocystis* sp. in the seven lakes provides information and enhances our understanding on pathogen interaction with the environment. It may also be an indication that this protozoan parasite could potentially be acquired by humans and animals through waterborne transmission. Parasite detection in the environment can help improve water quality and protect the integrity of the water resources.

MENESES, ANNA BLESILDA T.

Assessment of stakeholders participation in the management of Sumilon island Marine sanctuary, Cebu, Philippines -- 2006

Sumilon Island is an important traditional fishing ground located south of Cebu. Efforts to manage it started in 1974 to become the first Municipal-declared marine protected area (MPA) in the country through the establishment of the Sumilon Island Marine Reserve (SIMR). However, by late 1970's, violations were rampant, and by early 1980's,

management started to collapse. Fortunately, in the year 2000, the Municipality of Oslob expressed its intention to fully revive the management of SIMR.

Obtaining multi-stakeholder support in management is considered as one of the "best practices" in MPA implementation. The overall objective of this study therefore was to assess stakeholders participation in SIMR management and identify opportunities to improve resource conservation through effective participatory management. The specific objectives of this study were: (1) to present an overview of the ecological status of SIMR; (2) to analyze the roles, influences, benefits, and impacts of the key stakeholders of SIMR; (3) to identify management accomplishments and priorities for action of the implementing body - the Municipal Government; and (4) to draw recommendations to encourage participatory management process in MPA implementation.

For the ecological status, secondary coral data using point-intercept method and fish data using fish visual census method were collated and presented. These reef data provided the background for the importance of SIMR.

For the social aspect, a stakeholders analysis was conducted which focused on two types of stakeholders: the strategic stakeholders who can affect or influence the achievement of a certain objective, and; the moral stakeholders who are affected by the change required to achieve project goals.

The Municipal Government is the main SIMR governing body. Selected strategic (DENR, Barangay Government and the Bluewater Resort) and moral (fishers and residents or non-fishers) stakeholders were given focus for this study. A closer look on the moral stakeholders was accomplished through a perception survey.

The governance of SIMR was rated level three using the MPA Management Rating System which indicates the attainment of the enforced phase. Although enforcement system is said to be operational, it appears that existing enforcement activities are not enough. Thus, a long-term program on local capacity development and information dissemination is needed to support law enforcement.

Participatory management facilitates good governance and limits conflicts through strong leadership that invites meaningful citizen participation and incorporates the community's collective opinion in decision-making. Participatory management for SIMR still has areas for improvement. The following initial steps are proposed: Creation of a multi-sectoral SIMR Management Body through the leadership of the Municipal Government; Formation of committees within the Management Body and delegation of tasks, and; Development of a long-term Social Management Program as part of the overall Coastal Resource Management Program of the Municipal Government.

MERCENE, MA. THERESA C.

Assessment of local government's implementation of open access policy in Taal Lake, Philippines : its effects on aquatic resource conservation and management -- 1996

The effects of local government's implementation of the current national policy on open access in municipal fisheries are assessed in terms of their impact on the fishery resources of Taal Lake in the Philippines. The lake is the third largest lake in the country and has high economic value for its fisheries and eco-tourism potentials. Local officials and fisherfolks were interviewed and their responses were analyzed for trends in perceptions on how local open access policies affect fishing practices and productivity in the lake. A policy matrix containing certain areas of concern of local governments related to sound decision-making on lake fishery was designed.

A SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis was conducted to serve as basis for recommendations to improve the sustainability of fisheries in the lake. The study shows that local government implementation of open access policies in Taal Lake tend to have negative effects on the lake's fisheries. Open access allows for the unregulated entry of fishing practices like fishcage culture which tend to increase the pollution load on the lake. Pollution due to fishcaging seems to even exceed loads from domestic wastes and agricultural run-off. The incomes of small fisherfolks unable to afford fishcages have declined because of dwindling catch from capture fishery; this while fishcages flourished in the lake.

It is recommended that national government agencies (e.g. DA, BFAR, DENR) should forge an agreement with local governments for a continuing assessment of fishery resources in Taal. This needs to be coupled with technical assistance to undertake sustained efforts to improve the conservation, productivity and management of the lake's aquatic resources. There is also a need to increase the budgetary allocations for a new research and extension activities to address problems and issues of the fishery sector in the lake and for upgrading the capability of local and sectoral policy and decision makers on the lake's fisheries.

MERENCILLO, RITCHEL M.

Analysis of Water Quality and Risk Assessment of Cadmium, Chromium, and Lead in Nile Tilapia *Oreochromis niloticus* (Linnaeus, 1758) from Pulangi Lake, Bukidnon, Philippines. – 2021

Monitoring of Pulangi Lake, an artificial Lake in Bukidnon, Philippines has not been established yet by the local authorities and regulatory bodies. In the present study, the water and fish samples were collected once during the dry season in April 2021. The overall physico-chemical analysis in the surface water revealed no heavy metal contamination by cadmium (Cd), chromium (Cr), and lead (Pb) and the rest of the selected water quality parameters from the

Department of Environment and Natural Resources (DENR), except for total coliform and fecal coliform, indicating contamination of fecal matter in the lake. The heavy metal concentrations in the edible portion of tilapia fish revealed high concentration of Cr above the permissible limit set by FAO/WHO, while low concentrations of Cd and Pb were observed. The risk assessment of these individual heavy metals and its combined impacts showed no potential non-carcinogenic effects based from the estimated target hazard quotient (THQ < 1) and hazard index (HI < 1), respectively. However, significant cancer risk is evident for Cd and Cr. Hence, tilapia fish from Pulangi Lake are not fit for human consumption mainly from Cd and Cr contamination. Risk management must be conducted. Keywords: water quality, cadmium, chromium, lead, risk assessment, N

MICOSA, MARIESON V.

Geospatial Analysis and Carrying Capacity Assessment of Maniwaya Island, Santa Cruz, Marinduque Province, Philippines. – 2023.

Tourists usually visit Marinduque to witness the colorful and religious event known as the Moriones Festival, but aside from that, it is also a coastal province known to have beautiful beaches. When in the municipality of Santa Cruz, Maniwaya Island – a geographically isolated barangay, is the most visited of tourists from nearby towns and provinces. As it is being promoted as one of the prime tourism destinations of the province, it steadily becomes discoverable to many sightseers, and further establishments have opened to create more opportunities on the island. However, a high concentration of pressure from tourism development and linear urbanization of the local population in a relatively small and remote destination like Maniwaya Island may tremendously develop impending negative impacts, albeit with localized consequences. Hence, this research is performed to conduct an assessment of carrying capacity in terms of the local population, tourism growth, and physical structures with respect to the characteristics and specific land uses of the study area. The methods used were the SAFE Model Approach and Modified-Boullon's Formula which were enhanced through the use of a Geographic Information System application along with field observations, key informant interviews, and desk reviews of secondary data. Furthermore, an evaluation of the local environment regarding water supply sources and availability, as well as their sewerage systems and solid waste management schemes, is also included to provide an overview of the existing conditions and forecast the requirements at the computed carrying capacity that would be entailed in urbanization and tourism development. Based on the calculations, the current local population and tourism development of the island has not yet exceeded the carrying capacity if spatial attributes, specifically the land cover and land use allocations, were solely considered. Nevertheless, the result may be enhanced or can degrade depending on other indicators that can also be taken into account, particularly the limited resources available on the island (e.g., water supply) and the insufficient management schemes and technologies (e.g., sewage treatment facility, solid waste hauling). Thus, the findings of this assessment can serve as a planning guide but would require responses from the decision-makers and stakeholders to modify the extent and reduce the magnitude of pressures that influences the capacity and state of the environment.

MIEL-SOLIGUIN, JACQUELINE T.

Assessment of Spatio-Temporal Dynamics of Flooding in the Santa Cruz SubWatershed, Laguna, Philippines. -- 2019

The spatial and temporal dimensions of flooding in 1988, 2003, 2010, and 2015 (present land cover), were analyzed using the rainfall-runoff relationship in three study areas of the Santa Cruz Sub-watershed. Study Area 1 covered the upland areas of Liliw, Majayjay, Rizal, San Pablo, and Nagcarlan; Study Area 2 included portions of Magdalena, Nagcarlan, and Pila; and Study Area 3 cut across areas of Santa Cruz, Lumban, and Pagsanjan. In the estimation of runoff, the study applied the unit hydrograph (UH) approach, which represented hydrograph resulting from one inch of direct runoff from a given rainfall event. To determine the effects of land cover changes on peak flow, the UH ordinates were estimated by deriving the geomorphometric and hydrological parameters. These data inputs coupled with documentation on land cover changes over time were applied to compute the excess rainfall, time of concentration, time to peak, and peak flow in the three study areas in the watershed for the different periods. The application of discrete convolution to derive runoff hydrographs reveals that it was in 2010 that the highest total direct runoff (90,606 cfs in Study Area 1; 15,750 cfs in Study Area 2; and 25,059 cfs in Study Area 3) was observed. Noting the land cover change matrices, it was also in 2010 when significant establishment and expansion of artificial surfaces and built up areas especially in the municipalities of Magdalena, Nagcarlan, Liliw, San Pablo City, and Santa Cruz became evident, thereby influencing the retention capacity of the area. Similarly, the overall spatial distribution of forests, increasing human settlements in the uplands, and the area's inherent landscape characteristics of having steeper slopes and predominantly clay loam soil composition that generate low infiltration rates, resulted in the watershed's lower capacity to attenuate runoff. Lastly, results showed that if flooding with a return period of 100 years was to occur today (at probability exceedance of 0.01 or 1%), the potentially affected population would be \approx 13,847 individuals, of which 51% would be under knee-level water (0.3 to 0.7 m); 21% up to waist level (up to 1.2 m); and 24% at neck level (above 1.2 m). Further, damages to properties was estimated to reach up to PhP3.02 B, with the municipality of Santa Cruz

incurring the highest proportion of damage (72%). These results underscored the importance of improving land cover condition as any alterations in the watershed influence its response when excessive or intense rainfall occurs. To reduce flood risks, it is critical to restore/rehabilitate forests in the upland areas of Liliw, Rizal, Nagcarlan, and Majayjay while prioritizing investments in flood control structures in lowland areas in the municipality of Santa Cruz. Keywords: rainfall-runoff, unit hydrograph, land cover change, flood damages and losses.

MOICO, CHERRY LUZ D.

Assessment of Waste Management System and Water Quality of an Ecotourism Destination in Caramoan, Camarines Sur, Philippines – 2016.

Ecotourism is an emerging local industry in the municipality of Caramoan, Camarines Sur. Bestowed with ten beautiful islands, it is currently a tourist destination that boasts pristine white sand beaches, beautiful rock formations and blue marine waters. Through the years, massive developments such as construction of hotels and resorts have occurred especially in the coastlines of barangay Paniman, which served as the tip off point of tourists to the ten islands. The current waste management system of the community and the accommodation providers does not comply with the standards of the Department of Tourism, thus, this study was conducted to assess the waste management system of the community and the business establishments as well as assess the coastal water quality. Result of the social survey showed that the community has positive response to the waste management system in barangay. Furthermore, the accommodation providers does not have proper sewage disposal system within their business establishments thus posing threat to the environment specifically the coastal waters.

As a result, quality of the coastal water was analyzed by examining water parameters such as DO, BOD, pH, TC and TFC for two seasons to evaluate if the quality of the water is still within the standards of DENR-EMB. Results showed that the coastal water during the peak season sampling was within the standard however during the off-peak season, TFC count was beyond standard specifically in one station while the other parameters were still within the standard. The increased TFC count in one of the stations is attributed to the waste management practices of the households as well as the lack of sewage system of the accommodation providers. Additionally, surface run-off that washes domestic and agricultural wastes to the sea during the rainy/off-peak season was viewed to be another reason for the increase in TFC count.

MOJICA, LESTER RYAN P.

Geospatial modelling of groundwater quality in Bay, Laguna, Philippines. – 2014.

Spatial and temporal patterns of shallow groundwater qualities from hand pumps of varied ages on the floodplain in selected barangays of Bay, Laguna were evaluated using geostatistical methods and water quality index (WQI). Physico-chemical and bacteriological characteristics were determined during the three sampling periods in 2013: January, April, and July. Thematic maps of different water quality parameters and WQIs, including the anisotropy for each parameter, were produced. The interpolated surfaces were generated using the best model chosen for every parameter with respect to their prediction errors. Metals, such as iron and manganese, had major influence on the computed WQI scores, which suggest that the age of the hand pumps affected the quality of the samples. Model prediction errors such as mean standardized error (MSE) and root-mean-square-standardized errors (RMSSE) were evaluated for the generation of final thematic maps for each period. In the first sampling period (January), K-Bessel model was used (MSE = 0.0431; RMSSE = 0.9944). The best model for the second period (April) was J-Bessel with an MSE value of 0.1093 and RMSSE of 0.9865. Gaussian model was used in the third sampling period (July), with MSE and RMSSE values of 0.0335 and 0.972, respectively. The results of the study can be used to prioritize the areas for removing the sludge of the septic tanks in compliance with the recent municipal ordinance in septage management of Bay, Laguna.

MOLDEZ, ALICIA G.

The effect of monocrotophos on soil microflora in a ricefield ecosystem -- 1994

Monocrotophos, a toxic organophosphate insecticide was studied to determine its effect on the soil microflora. These soil microflora include a wide variety of : bacteria, actinomycetes and fungi which are responsible agents for increasing soil fertility and other soil properties. This study aimed to determine the effect of monocrotophos on microbial population and on some biochemical activities as affected by the presence of microorganisms in soil. The soil physico-chemical properties of irrigated soil from a ricefield were characterized as to its pH, moisture content, organic matter and waterholding capacity. The range of values for soil pH, moisture content, organic matter and waterholding capacity were : 6-7.35, 26-122.32 percent, 2.15-5.07 percent, and 93.74-114.61 percent, respectively. These values served as baseline information about the soil being used in the study. Monocrotophos did not affect these properties since the time frame of gathering samples was too short to warrant any detectable change on the physico-chemical properties of the soil.

The rapid hydrolysis and short half-life of monocrotophos also account for the inability to detect its presence easily in the soil. Biochemical activities were also measured in terms of ammonia, nitrate content and dehydrogenase activity. There was no marked change in the mean values for nitrate and dehydrogenase activity for both treatments in all depths but ammonia content showed a marked increase for the monocrotophos-treated sample. Monocrotophos increased ammonium content of the soil. The mean values of the microbial population per gram of the soil sample for bacteria, actinomycetes and fungi were decreasing at increasing depth for both monocrotophos-treated and control samples. Monocrotophos treatment effected increase in the populations of bacteria. It, however, severely affected fungal population but had the least effect on actinomycete population.

Benefit cost analysis showed that the net return of the treated plot is greater than the control taking into account yield and cost of production. The short duration of the study may not give a very clear indication of monocrotophos effect but gleaned from the results, monocrotophos treatment has an immediate effect on soil microbial population.

MOLINA, LILIA R.

Evaluation of cadmium contamination in paddy rice agroecosystem for environmental health risk mitigation -- 2011

Existing methodologies for the trace analysis of Cd in the different components of the paddy rice agroecosystem (rice grain and straw, soil and fertilizers) were modified and evaluated for accuracy, precision and suitability. The limit of quantitation (LOQ) obtained for Cd were as follows : 0.004 mg kg⁻¹ (rice grain), 0.002 mg kg⁻¹ (rice straw), 0.11 mg kg⁻¹ (soil) and 1.13 mg kg⁻¹ (fertilizer). The developed methods were used to assess Cd contamination in rice grain as affected by varietal types, fertilizers used and timing of application, and water management.

Using IRRI long term experiment (LTE), grain Cd levels were influenced by the rice varieties used but not by type or length of fertilizer use. Long term use of phosphate fertilizers had not increased the level of grain Cd and the maximum Cd level obtained was 0.02 mg kg⁻¹. Zinc (Zn) fertilization and timing of application showed an enhanced effect on grain Cd uptake (max. Cd level = 0.003 mg kg⁻¹) but neither Zn levels nor Zn/Cd ratios affected. An increase in grain Cd level (0.007 mg kg⁻¹) was observed under alternative wetting and drying (AWD) water management scheme but grain Zn levels were not affected. Analysis of 21 rice genotypes used for screening of high grain Zn showed different grain Cd and Zn levels among genotypes. However, grain Cd levels were below the LOQ (0.004 mg Cd kg⁻¹).

Survey of Cd levels in rice obtained from IRRI and Batong Malake, Los Banos, Public Market showed very low Cd levels ranging from 0 to 0.034 mg Cd kg⁻¹ well below the maximum permissible limit of 0.2 mg Cd kg⁻¹ in rice grain. Likewise, all fertilizers obtained from and being used at IRRI showed Cd levels below the set limits (20 mg Cd kg⁻¹ of fertilizer). Very low health risk to humans was found with trace Cd contaminant in brown or milled rice produced in IRRI or sold in Los Banos public market.

MONSERATE, NOLAN F.

Determinants of Compliance to Formal Choice Rules among Artisanal Fishers in Calamba City, Philippines. -- 2017

The behavior of resource users within common pool resources (CPRs), such as coastal fisheries, is directly influenced by the characteristics of the resource, the resource users themselves, and the rules that govern the use of the resource. The primary aim of this study is to identify the determinant factors influencing the cooperative behavior of Barangay Bucal artisanal fishers, measured as consistent compliance to the formal choice rules, within the coastal fishery of Calamba City. In this study, formal choice rules refer to the enacted prescriptions of actions the fishers must, must not, or may take in the city's coastal fishery.

A questionnaire survey was conducted last August 2015 using items previously proposed by Agrawal as recurrent factors associated with cooperative behavior in CPRs. The mode of the fishers' compliance to the formal choice rules was also evaluated in the survey.

Based on the skewness of their Compliance Index (CI), it was discovered that the consistent compliance to the formal choice rules among the artisanal fishers is moderate despite the existence of an alternative set of informal choice rules. Using phi, the fishers' level of wealth, age, educational attainment, mode of utilizing Laguna de Bay catfish, and membership status in the local fishermen's association were found to be strongly associated with the consistency of their compliance to the formal choice rules. Specifically, through simple logistic regression it was revealed that the odds for consistent compliance is higher if a fisher a) has medium to high number of household fixtures, b) is more than 50 years old in age, c) has finished high school, d) markets his Laguna de Bay catfish catch, and e) is a member of the organisation Barangay Bucal Fisheries and Aquatic Resources Management Council/Sagisag ng Mangingisda ng Barangay Bucal (BFARMC/SAMBBU).

As such, these results show that increasing cooperation among the artisanal fishers in using the formal choice rules, which can potentially improve the conservation of the Calamba City-coastal fishery, is possible. Specifically, this can happen a) if the fishers are not experiencing survival constraints; b) if they have the necessary set of cognitive skills, interest, and knowledge of the political and ecological issues surrounding the management of the coastal fishery; and, c) if they have developed strong moral norms in favour of following the formal choice rules.

MONTILLA, MA. GEORGIA C.

An analysis of the implications of the 1991 local government code on environmental planning and management in Silay City and Sagay, Negros Occidental -- 1994

The study intended to find out the specific implications of the 1991 Local Government Code on the task of environmental planning and management (EPM) at the local government level. It tried to determine whether or not the Code has indeed made a difference in the area of EPM at the local level. The local governments of Silay City and the Municipality of Sagay in the province of Negros Occidental were selected for the study. The analysis of the study focused on the Environment and Natural Resources Councils (ENRCs), which are newly organized EPM bodies at the local government level. To establish the Code's influence on the exercise of EPM at the local level, the study looked at three (3) areas of consideration, namely: (1) the perceptions of key local government officials, concerned government personnel, and private sector representatives on the Code in terms of EPM; (2) EPM in local governments before and after the Code; and (3) the background and rationale behind the formation of the ENRCs.

The findings of the study shows that the New Code's due consideration for the environment sector has clearly influenced the process of EPM at the local government level. This consideration, together with the Code's emphasis on clode GO-NGO-PO collaboration and greater public participation in local governance, facilitated the organization of the ENRCs as EPM bodies in selected cities and municipalities in Negros Occidental, two of which are Silay City and Sagay. In Silay City, EPM was virtually non-existent before the Code, but was set in motion after the Code's implementation. In the municipality of Sagay, on the other hand, EPM was already present, but was further enhanced and strengthened with the formation of the ENRCs. At the same time, the study tried to identify the different factors which appeared to affect the manner and quality of EPM that was being carried out by the ENRCs. The findings of the study revealed that these were : (1) the environment profile of the study areas; (2) the level of community participation; (3) the system of coordination or linkages; (4) the political milieu and the leadership qualities of the local chief executive; (5) the available manpower with technical knowledge and expertise; (6) financial resources; and (7) the socio-cultural context.

MONTECILLO, MA. ERICHA V.

Beliefs, Vulnerability, and Disaster Risk Management: Complementation and Conflicts towards Community Resiliency.-- 2023

Sitio Kabaritan is one of the coastal communities in Barangay Sto. Domingo in Bae, Laguna which experienced frequent flooding in a year thus considered as a disasterprone area. This community showed a strong belief in which they considered themselves as poor and perceived that their children will also become poor in the future, while their livelihood will only revolve around fishing and farming because the lake dictates so. Thus this study aimed to assess the relationship of these beliefs to disaster risk reduction and management, specifically (1) identify the socio-economic characteristics and present cultural belief; (2) document the number and characteristics of protracted extreme weather events; (3) investigate how these events influence cultural changes; and (4) analyze how beliefs impact community resilience and DRRM response . A survey method of 108 households and key informant interviews was used to validate the secondary data. From 1970-2020, total rainfall in Bay is variable across seasons: DJF season showed an increasing and significant trend; MAM season showed a slightly decreasing but not significant trend; JJA season showed a decreasing but not significant trend; and season showed a decreasing but not significant trend. A historical flood timeline was generated based on observed anomalies in total rainfall, coupled by results of the household survey and KII.

Flooding in the study area is usually caused by tropical cyclones and the southwest monsoon. In identifying the protracted extreme weather events using historical timeline in Sitio Kabaritan, it shows that it brought a depth of 0.22 to 2.24 m of flood that lasted for four days and 289 days, respectively. There is a gap and no transfer of information in those events that may have implications on DRRM such as information dissemination and acceptance. Protracted extreme weather events influence cultural changes in terms of how they are adapting and accepting strategies of DRRM in the study area. Ayuda or food packs as one of the projects of the government has become more detrimental in terms of decreasing the cultural value of the community members where it allocated large amounts of money that can be used in other adaptation strategies. Results from the correlation shows that adaptation and resilience is based on socio-economic status thus, it can only be achieved at an individual level. Therefore, sustainable livelihood and improving economic status should be included in DRRM.

MORALES, AGNES G.

Phytoremediation of Bisphenol A and Heavy Metals (Pb and Cr) from Contaminated Soils using *Sansevieria trifasciata laurentii* Prain. – 2018

The phytoremediation ability of a naturalized ornamental succulent plant *Sansevieria trifasciata laurentii* Prain also known as 'snake plant' was investigated to treat contaminated soils. After 45 days of culture pot experiment,

analysis of Pb and Cr via AAS showed high concentrations of retained heavy metals in soils while absorption in snake plant tissues was relatively low. The transfer coefficients of Pb and Cr are all <1 which revealed that snake plant is an excluder of the toxic metals thereby making it ineffective for phytoremediation of Pb and Cr. However, snake plant tissues were found to absorb up to 168.83 mg/kg Zn and was observed to be a potential phytostabilizer of the essential metal.

An optimized and validated method of quantitative analysis of BPA by HPLC-PDA, on the other hand, exhibited a significant absorption only in the roots after 30- and 45-day exposure to the pollutant. About 98% loss in bisphenol A (BPA) concentration from the culture pots suggested that BPA was not accumulated within snake plant tissues but has undergone metabolism proposing that snake plant utilizes phytodegradation mechanism.

A survey conducted to determine social acceptability of the proposed phytoremediation revealed that the high acceptability rating could be affected by their knowledge and awareness, risk perception, and values.

MORALES, LUNINGNING R.

An assessment of swine waste disposal management in San Jose, Batangas -- 1995

Primary data were obtained through semi-structural questionnaires for 38 swine raisers of the 12 barangays of San Jose, Batangas. Secondary informations were obtained from relevant institutions and organizations. The data were analyzed using means, frequencies and percentages. The swine raisers were categorized according to small, medium and large scale operators. Different swine raisers employed different waste disposal management schemes as follows : pit method, lagoon system, drying bed method, open tank system and biogas digester. Waste disposal practices were influenced by the swine raisers' socio-demographic characteristics, location of operations, size of area of operation and knowledge on waste disposal management. However, despite the system employed, problems were still encountered during heavy and prolonged rains, like waste overflow. Areas affected include the surrounding areas as well as rivers and creeks, since most of the operations were located at the bank of the river and creeks. Wastewaters and cleaning waters directly disposed towards these natural bodies of water impair its downstream beneficial uses. Moreover, the existence of animal raisers without waste disposal facilities produce persistent foul odor and accelerates the process of eutrophication.

The community affected by the rampant pollution problems in the area, initiated mass actions with the help of the "Hoy Gising" TV program. It created awareness among the residents of the municipality as well as the Local Government of San Jose. As a result, the following alternative courses of actions were formulated : 1) promulgation of Municipal Ordinance by the Local Government regarding the proper disposal of animal wastes, as this was found to be non-existent; 2) commitment of the swine raisers to help in the abatement of pollution; 3) creation of swine raisers association; 4) adoption of biogas digester; 5) construction of organic fertilizer plant by private corporation, which is expected to utilize 60 percent of the total waste production in the area; and 5) the DENRs massive information dissemination campaign and stricter monitoring activities. These courses of actions are expected to prevent pollution problems caused by swine raising activities despite the increase in number of animals raised and ultimately result to the attainment of desirable environmental conditions.

MYO THANT KYAW

Assessment on farmers' adaptation strategies of water resource management under the climate change challenges in Pakokku township, Central dry zone, Myanmar – 2020

Pan Daing Chon Village, Pakokku Township, Central Dry Zone Myanmar is a drought-prone area impacted by climate change. The farmer community of 138 respondents from the study area were included in the study. The study was aimed to 1) Characterize the existing available sources of water as affected by climate change in the study area of Pakokku Township, Magway Region of Myanmar; 2) Identify appropriate adaptation strategies of farmers' water resource management as affected by climate change; 3) Recommend efficient adaptive technologies for water resource management with current global climate change challenges as it relates to food security in the Central Dry Zone of Myanmar.

Climate change condition as the changes of temperature and rainfall is happening in the study area of Pakokku Township. The temperature is generally increasing and the rainfall is decreasing in the study area of Pakokku Township. Climate Change is affected to water resources and agricultural crop production. Therefore, the farmers are practicing climate change adaptation strategies for the purpose of water resource management in agricultural crop production in the study area of Pakokku Township, Central Dry Zone, Myanmar.

In the study area of Pan Daing Chon Village, rainwater is the only existing available water resource and the farmers are using rainwater only for agricultural crop production. Different farmers are using different kinds of climate change adaptation strategies to adapt to climate change and reduce its impacts in the Central Dry Zone. Changing Planting date is a strategy commonly practiced in the study area. Other strategies include practicing crop rotation, using improved varieties, following government instructions, changing planting method, practicing crop diversification, and some other strategies. In order to recommend the more efficient adaptive climate change adaptation strategies for water resource management in the study area of Central Dry Zone Myanmar, following the government's instructions

can reduce its impacts in terms of yield than the other adaptation strategies. The intervention of government and non-government organizations refers to different kinds of general farm management practices guided by government and non-government organizations depending on the conditions and situation. It is followed by crop diversification is found to reduce climate change impacts on agricultural production. Crop diversification is growing a variety of crops in an area. If one crop variety fails this year, the other variety of crops in this field can still survive. Crop diversification can help to improve natural biodiversity, increase crop production, reduce the risk of total crop failure, and reduce the insect and pests problems. Mixed-cropping is shown to be the most effective cropping system in order to reduce climate change impacts on agricultural crop production. Hence crop diversification strategy is an effective climate change adaptation strategy in the study area of Central Dry Zone Myanmar, mixed-cropping system that has the same effect to reduce climate change impacts.

MYO WIN MAUNG

Climate Change Awareness and Farm Level Adaptation of Rain-fed Farmers (Central Dry Zone) in Monywa Township, Sagaing Region, Myanmar. – 2014

Primary data were gathered from the Monywa Township, Sagaing region in Myanmar. Using geographical stratification, 50 respondents each from up-stream, mid-stream and down-stream strata were randomly selected having a total of 150 study respondents. The study aimed to 1) determine the factors influencing climate change awareness of rain-fed farmers; 2) determine the perceived effects of climate change among farmers growing four major crops such as pigeon pea, chick pea (pulses) and onion and garlic (culinary crops); 3) identify the methods of farm level adaptation practiced by farmers in coping climate variation and other factors; 4) study the relationship between awareness of climate change and farm level adaptation of rain-fed farmers in Monywa Township, Sagaing Region, Myanmar; and 5) provide key recommendations to the concerned stakeholders to promote sustainable agriculture in area.

Majority of the respondents are men who are likely to have access to information, skills and knowledge to adapt to climate change. Institutional factors that influence awareness of climate change include farm input costs, provision of farm machinery by either the private sector of the DoA, and agricultural support programs. Over 43% of total respondents altered agriculture activities depending on input costs and 29% changed their farming system based on agricultural support of private or government sector due to the lack of access to capital/finance, water and agricultural inputs without due consideration of climate change.

Perceived effects of climate change include negative effects to agriculture as the sown area was reduced due to pests and diseases infestation, insufficient availability of rainfall or heavy rainfall, shorter growing season, and increased erratic rainfall pattern. Among the four major crops in the study area, pigeon pea was heavily affected by variation in rainfall pattern since it is grown during the rainy season. Chick pea, onion and garlic are cultivated during the winter season according to cropping pattern.

In terms of farm level adaptation, 72% of total respondents used mono-cropping as traditional farming although mono-crop choices can make farmers extremely vulnerable to climate-induced shocks.

The study showed the awareness of climate change is related to farm level adaptation. About 285 of the respondents changed cropping system from mono-cropping to other practices which include intercropping, mix-cropping, crop rotation and multiple cropping to minimize the risk of climate change in the dry zone area.

Effective strategies to promote community resilience in the dry zone area must include building the capacity of individuals as well as communities to sustain agricultural productivity and household incomes. Human capacity development should be a priority to ensure effective farm level adaptation to climate changes.

NACAR, CATALINO B.

The Subic Bay Metropolitan Authority environmental agenda defining alternative intermediaries from the perspective of indigenous peoples -- 1998

Tribal perception regarding the policies that affects them and their corresponding social action details the identified policy impacts. Most evident are on how the tribe is reach by the policy and how it reacts to the said policy. Most revealing is that SBMA policies, or the policies formulated by the Subic Authority dominate the list of policies the tribe have knowledge and access. The study leads to several results which are deemed important in the identification of the alternative intermediaries that would subsequently lead to the formulation of an alternative policy. First, the Aetas have always looked at their land all the earth as sufficed with life and therefore scared. Second, the indigenous communities perceived their environment as an expression of their own social structure and system of kinship. Third, the perception of an Aeta regarding an environmental policy is an expression of how directly he/she is affected by it conforms with their practical needs. Fourth, their expression of understanding and apprehension to a certain environmental policy revolves in the context of economics, land tenure, biodiversity, conservation, livelihood, leadership patterns, health and education, politics, labor and customary laws. Fifth, the inherent rights of the Aeta are articulated in their customary laws, norms and beliefs. Lastly, the tribe have opened itself to the "money economy."

An imperative re-examination of the present condition in the area and deriving from the results of the study, 5 conditions appeared to be significant in the formulation of alternative intermediaries namely : resource scarcity, resource boundary, group territorial identification, technological and economics. Also factors like politics, labor, conservation, health and education, customary laws, rules and beliefs are equally valid conditions to be considered if a viable policy option is desired. Looking at the access points defined above, they are considered as conflict areas between the Tribe, SBMA and DENR. But analyzing it from the entire policy framework and working in the concept of Berkes et al, it makes sense to say that all the concerns and factors in the policy conflicts that one way or the other have many things in common. Resource scarcity is bare existent. Tenure is addressed under DAO 2 series of 1993, biodiversity conservation is subjacent to the NIPAS Act and RA 7227 addresses economic activities. Health and education are under the LGC while provisions on customary laws are provided in RA 7586. In short, every policy player is talking in the same policy preferences but differ in perception and understanding of the policy.

NATOZA, MA. RUSSELL A..

A Transactional Approach for the Improvement of Solid Waste Management: The Case of Pila, Laguna, Philippines

A transactional approach was employed to explore the underlying reasons behind the current solid waste management practices of the municipality of Pila. As representatives for the upland, urban, and lakeshore communities, respondents from Pansol, Sta. Clara Sur, Pinagbayanan were surveyed. Also, a KI and secondary data analysis were done.

It was found that majority of the respondents declared that they practice segregation, 3Rs, and are refraining from burning waste. However, some are still not practicing proper management. Also, their waste disposal practices vary. Consequently, the respondents are knowledgeable on proper waste management and laws; and have positive attitude towards proper waste management. Moreover, it was observed that the history of land use and solid waste ordinances affect the respondents' practices. The different landscapes of Pila, its residential and municipal waste facilities, in connection with their practices, were also identified.

Therefore, their practices can be explained through the interplay of psychological processes, physical environment, and temporal qualities. By understanding these relationships, strategies were formulated to aid the municipality towards an improved solid waste management. In general, recommendations address issues on the knowledge and attitude of the respondents, the improvement of their physical setting, and enactment or amendment of municipal ordinances.

NATUEL, FATIMA A.

Microplastic Characterization and Concentration in Surface Waters of Lakes Sampaloc and Yambo in San Pablo City, Laguna, Philippines. – 2021

Plastic pollution remains one of the perennial environmental problems in the Philippines due to high dependence of Filipinos on single-use plastics for food packaging, hygienic products, and other purposes. Microplastics that are less than five mm in size have become one of emerging contaminants and are of great public concerns due to its ubiquitous presence and persistence in the aquatic environments. This microplastic comparative study between Lake Sampaloc and Lake Yambo was conducted to fill the knowledge and research gaps regarding the occurrence and distribution of freshwater microplastics. Results of the microplastic analysis revealed that fibrous, colored, and small-sized (<2 mm) were the main features of the microplastics detected in surface waters of the studied lakes. Lake Sampaloc, an aquaculture lake, had significantly higher mean microplastic concentration (587.18 n/m³) than Lake Yambo, an ecotourism lake (448.72 n/m³). This suggests that fishery activity and tourism could be important sources of microplastics. One-time measurement of water quality parameters such as DO, salinity, conductivity, temperature, pH, and TDS was also conducted in-situ to determine the lakes' environmental condition and its relationship to microplastics investigated. Lake Sampaloc had significantly lower DO level but higher TDS than Lake Yambo, indicating that Lake Sampaloc could be filled with more nutrients or toxic organic matter than Lake Yambo. Results of Spearman Correlation Analysis further showed that there is no significant correlations between the lakes' water quality and microplastic concentration.

Although it is difficult to specifically identify the sources of the microplastics investigated, their observed physical characteristics (i.e. shape and color) as well as the results of the social surveys (PRA and KAP) provided sufficient insights into possible sources of microplastic pollution in the lakes and ways to improve future microplastic-related problems in aquatic ecosystems. This study highlighted that fishery, tourism, and domestic activities were potential sources of microplastics in both lakes. Results of the PRA activities conducted also entailed that the water quality of the studied lakes had deteriorated due to an increase in the number of fish pens and cages as well as informal settlers, especially in Lake Sampaloc over time. Meanwhile, although the high economic growth of the residents living near Lake Sampaloc is assumed to be correlated with high education level and awareness of various environmental problems, results significantly showed that respondents in Lake Sampaloc had lower knowledge, attitudes, practices and over-all KAP levels on SWM than the respondents in Lake Yambo. Perhaps, the main reason

why residents of Lake Yambo were observed to have higher KAP on SWM, on the other hand, is their dedicated involvement on promoting sustainable tourism since the lake is a source of livelihood for them as well. More so, the residents are being incentivized when they collect their waste and bring them to the nearest material recovery facility (MRF). Overall, this study is not only relevant in providing baseline data on microplastics but also in communicating salient information and recommendations for decision makers or the LGU of San Pablo to strengthen environmental policies and educational strategies related to plastic pollution.

NAVAL, DIOSDADO P.

Analysis of the biophysical and social factors affecting the utilization and management of Sagumayon-Macabalo river in Legaspi City and Daraga, Albay, Philippines -- 2006

The study analyzed the existing biophysical conditions of the Sagumayon-Macabalo River, the stakeholders' level of awareness and interest on utilization of river resources, and the degree of influence of government agencies on river protection and rehabilitation. The results showed that the river system contained considerable number of plant species with a diversity index of 3.5, 3.01 and 2.43 in the upstream, midstream and downstream areas, respectively. Sagumayon-Macabalo River is extremely polluted because it has become a dumping site of solid wastes from various sources with an estimated total volume of 530 m³ and as convenient disposal for human and animal wastes.

The people living along the river are aware (55-70% of the total respondents) of its polluted condition, showed high interest in its rehabilitation, but most of them believed that responsible agencies have not significantly encouraged people to protect the river. The stakeholder analysis provided better insights on the problems and conflicts between resource users and managers and allowed for greater stakeholder participation in drawing up of strategic actions and recommendations for effective and efficient river management programs.

NAVASERO, CECILIA S.

Upland Farming Systems in Lucban, Quezon and its Ecological Implications in the Conservation and Management of Mt. Banahaw the Lucban Watershed -- 1993

This study sought to present and analyze the manner and extent to which watershed conditions in Lucban, Quezon are related to local upland farming system. Three study sites which are all located in Barangay Palola, Lucban, Quezon were selected based on the type of vegetation present and degree of cultivation. Sites 1, 2 and 3 represent the relatively preserved, moderately cultivated and intensively cultivated sites, respectively. Rapid Rural Systems Appraisal, Agricultural Non-Point Source Pollution Model (AGNPS), quantitative vegetation analysis, and regression and correlation analysis were used in the study. Forty percent (n=50) of the total population (n=132) were taken as respondents. Respondents are all upland farmers cultivating an approximate area of 185.74 hectares within the Southern Luzon Polytechnic College (SLPC) Civil Reservation. The study shows that upland farmers are cultivating in Site 3. There are three farming systems identified in this site namely: vegetable-based farming system, vegetable + passion fruit-based and vegetable + coconut-based farming systems. Vegetable-based however, is the most dominant.

Regression analysis revealed an inverse relationship with the farmers' number of years within the reservation and vegetable-based farming system. Vegetable + coconut-based on the other hand, is positively related to three factors namely: size of landholding, number of parcels owned and number of years within the reservation. Vegetable + passion fruit-based, however is influenced both by income and current agricultural practices prevailing in the community. Vegetable farming is the primary source of income of upland farmers. Correlation analysis shows that income is significantly correlated to the size of landholding. Farmers do not have problem on where to sell their produce but their problem lies on middlemen's control on prices. Soil chemical analysis revealed that Site 1 has the highest values of OM, total N, total K and pH. On the other hand, Site 2, being the deposition area, has the highest available P. Among the three study sites, Site 3 is considered the most degraded as it shows the highest erosion of 44 OMT/ha. This can be attributed to low vegetative cover and destructive farm practices. The findings of this study suggest that Lucban watershed can be efficiently conserved and managed when there is unified and active participation of the four actors (SLPC, Local government, Department of Environment and Natural Resources and upland farmers) in planning and implementing projects such as introduction of agroforestry technologies and adoption of appropriate land use system.

NAZARENO, PATRICIA ANNE G.

Assessment of the industrial pollution of the Butuanon River in Mandaue City, Metro Cebu -- 1999

The study was conducted to assess the industrial pollution problem of the Butuanon River based on the biophysico-chemical component of the river system and the interaction and behavior of the industrial and institutional components that affect the physical state of the river. To determine the level of pollution the following physico-chemical parameters were measured: water level, flow rate, temperature, pH, dissolved oxygen, biochemical oxygen demand, and metal concentration. The coliform bacteria level, which is a biological parameter was also measured. The industrial

component included the different kinds of industries located within the banks of the Butuanon River which were mainly involved in food processing, industrial gas manufacturing, seaweed production and metalwork/foundry. Assessment of this sector was based on the level of awareness, insight into the problem, and attitude towards the pollution problem of those involved in the study. The institutional component included the local government of Mandaue City, the barangays traversed by the river, a water firm and a non-government organization.

Results of the study showed that the river had a high coliform bacteria level regardless of what season and a high biochemical oxygen demand (BOD), which area indicative of a polluted river. A high BOD level resulted to a low DO level. However, the dissolved oxygen (DO) level was within the water quality standard but could go down depending on the other biophysico-chemical factors. How the different components interacted with each had an effect on the pollution problem. Because of the recent effort of the government to clean up the river a high level of awareness was shown by the industrial and institutional components. Although they were aware that the Butuanon River is polluted each sector involved in the study did not believe that they contributed to the pollution problem. The industry sector was blamed by the institutional component for polluting the said river. Enforcement of existing regulations are weakened because of lack of manpower that could handle the monitoring of the industries, lack of commitment and sincerely for their job, among others. Based on the findings, a set of pollution control alternatives needed in the management of the river was recommended.

NICOPIOR, OZZY BOY SAIREZ.

**Modelling Fire Occurrence and Distribution Using Maxent in the Pantabangan-Carranglan Watershed, Philippines.
-- 2014**

Grassland fire has been a persistent problem identified in the Pantabangan-Carranglan Watershed (PCW), Philippines. Prevailing knowledge suggests that fires in the PCW are caused by human activities. Yet, most data are based only on limited ground observations and many areas are beyond access for sustained monitoring. This study provides insights on the best predictors of fire within the PCW using historical data derived from Moderate Resolution Imaging Spectroradiometer (MODIS) burned area product over the period 2000-2012. A total of 25 candidate predictors were selected based on citation frequency from literature and then categorized into four variable groups: anthropogenic, topographic, vegetation, and climatic. Data analyses employed a machine learning algorithm called Maximum Entropy (Maxent) to estimate the probability of fire occurrence. Six models were generated: (a) four partial models (based on four variable groups), (b) one Full model (based on 25 variables), and (c) one Final model (based on full model plus a series of variable reduction methods). Models were evaluated using Area Under Curve (AUC) and True Skill Statistics (TSS). Results showed that the Final model performed best (AUC = 0.866; TSS = 0.634) among the six models tested. Based on the Final model's analysis of variable importance, the top five predictors of fire in the PCW are: rainfall of the warmest quarter, normalized difference moisture index (NDMI), land cover, normalized difference vegetation index (NDVI), and temperature of the driest quarter. The results of this study can be used in the creation and implementation of spatially-explicit and proactive fire management approaches in the PCW, especially in light of limited resources for watershed protection.

NOLOS, RONNEL C.

Ecological and Health Risk Assessment of Selected Heavy Metals in the Soil of Mogpog, Marinduque, Philippines.—2023.

Heavy metal (HM) pollution of the soil is a major global concern because of the potential risk to people. However, there is a limited study in the Philippines regarding the assessment of the ecological and health risks (HRs) of HM pollution in the soil. This study was conducted to assess the HM contents of the soil in Mogpog, Marinduque, and estimate the HRs for the population. Soil samples were collected and analyzed for HM concentrations using Inductively Coupled Plasma – Optical Emission Spectroscopy (ICPOES). Additionally, a survey was conducted to determine the knowledge, attitude, and practices (KAPs) of the respondents in relation to HM pollution in the soil.

Results revealed that the mean concentration of arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), and zinc (Zn) in the soil of Mogpog exceeded the limits of international standards. Similarly, Cr and manganese (Mn) had the highest contribution to non carcinogenic risk, while As, Cr, and lead (Pb) had the highest contribution to carcinogenic risk. Low to moderate ecological risks were recorded in the sampling sites. The extreme HM pollution was recorded at the site where an abandoned Cu mine is located. Notably, age, income, and educational attainment were significant predictors of the respondents' KAPs. The findings of the study are useful for land use strategies and management, risk communication, and remediation activities.

NUESTRO, EDNA D.

Institutional Incentives in Community-based resource management in Kanawan negritos reservation, Morong, Bataan -- 1997

The study was conducted to analyze the different institutions that give incentives or sanctions to the community in managing its resources. In the analysis, a four-part model was considered : (1) characteristics of available resources; nature of community that control and use the resources; and the rules that govern relationships among users; (2) incentives created by the different attributes in 1; (3) the strategies undertaken by the community as a result of the incentives; and (4) effects which resulted from the strategies adopted by the people involved in the project. Results showed that sixty-percent of the population were Aetas and the rest were non-Aetas (Tagalogs, Visayans, Bicolanos). Farmlots were privately managed while forest resources growing in open areas such as bamboos, cogon and residual trees were communally managed by the Kanawan Negrito community. Major crops planted in farmlots included bananas and sweet potatoes. The different organizations created institutional incentives such as land security, market opportunities, education, training and skills development and support services to the Aeta community. When the community adopted the incentives given by the organizations, both positive and negative consequences occurred. With respect to positive consequences, there were improved land security, better market opportunities, increased area cultivated, diversified livelihood activities and high regard on education. On the other hand, the negative consequences include increased migration, land fragmentation, non-adoption of agroforestry, SALT and some provisions of CFSA and low level of community cohesion.

The study recommends that assisting organizations should provide institutional incentives that will first, establish a common leader in the community that will facilitate coordination among resource users to avoid conflicts and second, provide continuing guidance in the implementation of accepted development plan until such time that the community can manage on their own.

OBEDENCIA, SELFA B.T.

Assessment of environmental education programs in tertiary level institutions in Region VI -- 2002

The tertiary environmental education programs in 13 higher educational institutions composed of 11 private schools and three State universities and colleges in Region VI, Philippines were assessed. The existing facilities and physical resources, faculty profile, and infusion of environmental education concepts, core messages and issues in selected general education subjects were evaluated. The 13 representatives of the heads of these institutions and selected 55 faculty served as respondents. Descriptive research and descriptive statistics were used. Thirty point eight percent of the tertiary level educational institutions have environmental education specific vision and overall environmental policy while 53.8 percent incorporated environmental policy in their vision and mission statements. Some of these institutions are either members of Environmental Education Network of the Philippines (EENP) and Philippine Association of Tertiary Level Institutions in Environmental Education and Management (PATLEPAM). The existing structures, facilities and resources are adequate to meet the present needs of environmental education programs for instruction, research and extension. However, the faculty profile falls short of the necessary number and expertise to address the present and future needs of environmental education programs.

Majority of the faculty are below 50 yrs old and have permanent status. They have less attendance in EE trainings. The teaching materials such as course outline, syllabus, workbooks, textbooks are not updated and adequate. Environmental education program plans for research and extension require adequate financial and appropriate technical support from the school administration. There were only few faculty (5 in research, 8 in extension) who participated and conducted EE-related research and extension programs. They have been overloaded with teaching and other work assignments.

Only 3 schools have "high" degree of infusion of environmental education concepts, core messages and issues that ultimately enrich the curriculum, increase awareness, improve knowledge, skills and attitude toward the environment and sustainable development. The rest have an "average" infusion of these concepts.

There are still so much to be done, more challenges to strengthen EE programs in the tertiary level educational institutions in Region VI such as : there is a need to review and revise the school's vision, mission statements and policies to meet the present and future thrusts of environmental education programs and to address pressing environmental issues and problems; the demand for environmentally-friendly structures, physical facilities and equipment must be given attention; faculty must be provided with EE continuing education program; teaching methods should be varied, innovative and creative to arouse the interest and motivate students to engage in a more dynamic activities and providing them experiential learning process; development of relevant instructional materials; and offering of EE courses or infusion of EE concepts in general education courses.

OCAMPO, MARIA THERESA NEMESIS P.

Carbon Storage of Corn-based Cropping Systems and Climate Change Mitigation Strategy in Isabela, Philippines. -- 2013.

The study was conducted to evaluate the level of carbon storage of corn-based agricultural land under various cropping systems and climate change mitigation strategy in Upi, Gamu Isabela. The cropping systems studied were: legume in crop rotation, intercropping and monocropping system. The C stocks in herbaceous vegetation, surface litter, root at 0-5 cm and soil up to 30 cm were determined at fallow period and crop maturity. Carbon stocks at fallow period served as a reference point to quantify net C gains or losses.

Carbon stored in herbaceous vegetation at crop maturity was ranked as follows: monocropping > intercropping > legume in crop rotation. The increase in stored C in all cropping systems indicates the importance of maintaining the land covered with crops. For surface litter, only intercropping system had an increase in C stock and this was attributed to higher crop diversity. Carbon stored in the roots of legume in crop rotation while C in the other two systems increased.

There was a net increase in the total system C stocks in all cropping systems. The highest C was in monocropping system (3.6726 Mg ha⁻¹) and 5.12 times higher than the legume in crop rotation system (0.7171 Mg ha⁻¹). Monocropping and intercropping systems can store higher C than legume in crop rotation system. However, lost C from the soil of monocropping system is 1.25 and 1.94 times higher than the intercropping and legume in crop rotation respectively. The lower SIC loss and minimal chemical fertilizer used in intercropping can ideally contribute and play an important role in mitigating climate change more than the monocropping system.

OCATE, ABIGAIL D.

Field-Scale Study for Electrochemical Recovery of Silver from Gold Smelting Wastewater as an Alternative to the Copper Displacement Process for Gold Smelting Operations in the Marilao-Meycauayan-Obando River System (MMORS), Philippines – 2013.

A field-scale study was conducted to assess the feasibility of using an electrochemical method, as an alternative process for silver recovery in gold smelting operations along the Marilao-Meycauayan-Obando River System (MMORS). This was done as an attempt to replace the traditional copper displacement method (which generates toxic copper-containing effluents that contribute to heavy metal pollution in the MMORS), and to test the reproducibility of the lab-scale results obtained by Laurio (2009) on a field-scale. The feasibility of the electrochemical method was assessed in terms silver ion removal efficiency, purity of the recovered metal deposits and charge dose. A comparative analysis on the performance of electrodeposition and copper displacement method was also conducted including cost analysis between two silver recovery procedures. Results showed that electroanalysis achieved higher silver removal efficiency (99.36%) and purity at (98.20%), compared with copper displacement (97.61%), 94.41%, respectively). The actual mean charge dose for silver recovery in the field-scale study was 1.84 coulombs per mg of silver removed, which was slightly higher than 1.24 coulombs per mg silver removed obtained from the lab-scale study (Laurio, 2009). Cost computations also showed that the electrochemical method has some cost effective advantage over the copper displacement method.

OLAGUER, EDUARDO B.

Economic analysis of alternative management strategies of ancestral domain of the Dumagats in Isabela Province -- 1996

The economic analysis of the ancestral domain being claimed by the Dumagats of Isabela Province was done to assist policy makers in determining the optimal resource management scheme in the sustainable utilization of the ancestral domain. Being located within the critical watershed of the Sierra Madre, the comprehensive analysis of the ancestral domain can help in the preservation and protection of the watershed which is crucial to the sustainability of the government funded Ilaguen B Hydroelectric Power Project.

Using existing government guidelines in the recognition of ancestral domain and the watershed approach in the delineation process, a 18,600 hectare of forest land was theoretically identified as the ancestral domain of the Dumagats. The existing environmental condition of the delineated ancestral domain was characterized using the Rapid Rural Appraisal (RRA) approach. Under a scenario of minimum government intervention or by maintaining the existing resource utilization within the theoretically delineated ancestral domain, several significant environmental impacts were identified. These include, among others, the increase in soil erosion rate due to intensified forest extraction activities and the displacement of the Dumagats due to influx of in-migration of the lowlanders.

Given the perceived critical impacts and issues in maintaining the present resource use of the ancestral domain area, three (3) management options were considered in mitigating the problems and issues and enhancing the opportunities of the ancestral domain. Using the sustainable development criteria of economic efficiency, social acceptability and ecological stability, the study recommended for the adoption of a multiple-use resource management scheme that allows restricted extraction of forest products in areas with slope less than 30 percent. The framework plan for the recommended ancestral domain management scheme was formulated using appropriate principles in the efficient allocation of resource within the domain. The total economic costs of implementing the recommended ancestral domain management plan over a period of 50 years is estimated at P134 million of which P122 million is attributed to opportunity

costs due to foregone product value and labor earnings of the displaced lowlanders. On the other hand, the total benefits of the proposed management plan upon full program development is estimated at P143 million at economic prices. Since the economic benefits was greater than the associated costs, the recommended ancestral domain management plan is therefore, worth pursuing. However, recommendations that should be considered by policy makers and/or resource managers in order to influence the successful implementation of the proposed plan include, among others, the need to formulate an integrated and coherent legal and policy framework in the recognition of ancestral rights; and appropriate guidelines for the devolution and decentralization of functions and responsibility in the resource management of ancestral domain.

ONKAEW, NANTAPORN

Shrimp farming and water quality conditions in Phuket, Thailand -- 2003

The shrimp farming industry in Muang and Ta-Ihang District was characterized and preliminary assessment of the potential impacts on water quality in the coastal zone of Ban-Chi-Lao, Phuket, Thailand were done from February to June 2003. A total of 29 randomly selected shrimp farmers were interviewed. Water samples were collected from four shrimp ponds and the adjoining coastal area and chemically analyzed based on salinity, pH, temperature, transparency, TSS, Chl-a, DO, BOD, NH₃-N₂, NO₂-N, NO₃-N, TN, ortho-P and TP. Descriptive statistics and correlation analysis were done using SPSS. The shrimp farmers were primarily male from Phuket and had a college degree. Most of the largest-scale respondents owned the land and had longer experience than the smaller scale. Sex, educational attainment, experience of respondents and farm scale had no relationship with farm productivity and profitability. However, experience had a positive relationship with farm scale. Large-scale farms had the highest productivity, and incurred the highest production cost. Medium- and small-scale farms had higher profitability than the large-scale farm.

Compared with the recommended stocking densities for shrimp farming, the general stocking rate in the study area is rated excessive. As a result there is tendency towards over feeding which could lead to a water quality degradation, reduced survival rates, and increased productivity of shrimp diseases outbreaks, hence, low production. This chain of events might explain the diminishing shrimp production currently experienced in Phuket. Use of some dangerous chemical and prohibited antibiotics by farmers might have a potential health risk for humans.

The intake and coastal waters satisfied the coastal water quality standards for temperature, pH, DO and NH₃-N. The pond water pH and DO were within the acceptable ranges for shrimp production. Pond water temperature, TSS, secchi transparency and salinity did not meet the optimum ranges for shrimp growth. The discharge water was acceptable from aquaculture, except TSS. In the overall, shrimp farming does not seem to degrade the quality of the water used in shrimp ponds and afterwards released into the coastal area. Since this study was done during the transition period from the dry to the wet season only, it is essential that the same assessment be carried out at other times of the year in order to get the annual trend. To achieve sustainable shrimp farming development, it is recommended that the stock density be reduced and better quality of broodstock be used.

ORLANES, ORLYN B.

Ecological dynamics in Tabunan forest fragment in Cebu City -- 2002

The study examines the characteristics of the Tabunan forest fragment, specifically its structure and diversity. It also investigated the relationship between its biological and physical characteristics, and attempted to explain the relationship between land use history and forest fragmentation. The inquiry used a combination of vegetation survey, key informant interview and map analysis. The structure of the forest fragment was examined using profile and canopy diagrams, while species richness, Shannon-Weiner index of diversity, evenness of distribution, and Sorensen's coefficient of community were computed to quantify its diversity. Present and historical land use and land use practices in the area were determined using maps and were supplemented by key informant interviews. The Tabunan forest remnant predominantly lies on limestone geology. It sits on the ridge with elevation ranging from 400 to 880 masl and slope of 11 percent to as high as 50 percent. Soil analysis reveals low levels of nitrogen, phosphorus, and potassium in the forest. However, organic matter content is high and soil pH and temperature are within the range favorable for plant regeneration, growth and development. The air temperature inside the forest is lower (24C) compared with the open area in the forest edge (27 C). Consequently, relative humidity is higher inside the forest (93.6percent) than in open areas (78.5percent).

The profile of the Tabunan forest fragment revealed at least three vertical strata, the emergent, canopy and lower canopy layers. Furthermore, it has a closed canopy with an average of 82.66 percent crown closure. One hundred eleven species belonging to 71 genera and 36 families were observed in a total area of 600 m². The Shannon-Weiner index of diversity ranges from 2.29 to 2.54 and is comparable to that of the Dipterocarp midmontane forest (3.899) and mossy forest (3.57) in Mt. Makiling as observed by Gruezo (1997). The evenness of distribution between sites ranging from 0.89 to 0.94 approaches the highest value of 1, indicating equitable distribution of species. Sorensen's community coefficient is low (range = 19.23percent to 31.68percent) with plots 2 and 3 having the least similar species composition. The forest edge is composed of cultivated and abandoned farms. In the abandoned farms where succession has already proceeded, herbs, shrubs, and pioneer trees characteristics of secondary vegetation dominate. On the other hand, cash crops of

various kinds dominate the cultivated farms. Land use history generated thru key informant interviews indicated that the expansion of agriculture and settlements resulted in forest fragmentation and consequently, the decline of population of some economically important plants and animals. Furthermore, results of key informant interview show that there are two groups of forest users : the local community, and visitors who utilize different goods and services of the forest. Increasing awareness as to the importance of the Tabunan forest fragment to the community was also observed. The community likewise recognizes the economic as well as the ecological functions of the forest.

ORLINA, ANDREA KATE M.

Analysis of soil microbial diversity and gross primary productivity in Magabuyo (*Celtis luzonica* Warb.) – dominated area and corn (*Zea mays* L.) planted area – 2020.

Soil microorganisms are important component in an ecosystem for they mediate various ecological processes such as nutrient availability in the soil on which the primary productivity of the ecosystem partly depends. Conversion of natural ecosystems to agricultural lands has resulted to alterations to biogeochemical cycles. The study aimed to determine the interactions of the soil physicochemical properties, soil microbial community and Gross Primary Productivity (GPP) in Magabuyo-dominated Area (F1-3) and Corn-planted Area (C1-3) in Mt. Makiling. The soil in both areas were dominantly clay loam in texture. F1-3 had a lower electrical conductivity (C1-3=376; F1-3=236) but had a higher pH (C1-3=5.4; F1-3=6.3), moisture (C1-3=10.0%; F1-3=16.6%), organic matter (C1-3=3.1%; F1-3=3.9%), Total N (C1-3=1528.1 ppm; F1-3=1925.7 ppm), Avail P (C1-3=3.6 ppm; F1-3=20.5 ppm), Total Fe (C1-3=22066.7 ppm; F1-3=23933 ppm) and Total S (C1-3=1087.3 ppm; F1-3=1133.3 ppm) compared with C1-3. Actinobacteria and Proteobacteria were the dominant phyla in C1-3 and F1-3, respectively. In the species level, *Gaiella occulta* and an unrecognized species dominated C1-3 and F1-3, respectively. F1-3 had a more diverse microbial community compared with C1-3 but this difference was not statistically significant. Temperature and Greenness model showed that F1-3 had a higher average daily GPP than in C1-3 during both dry and wet seasons. There was no significant association between soil physicochemical properties and soil microbial diversity, and between soil microbial diversity and GPP in the two study areas.

ORNO, JESUSITA L.

Sustainability analysis of upland farming systems in Bagong Silang, Makiling Forest Reserve (MFR), Laguna, Philippines -- 1996

With the general objective of analyzing the sustainability of farming systems in Bagon Silang, Makiling Forest Reserve, this study was conducted in three places : 1) identification of the existing farming systems, 2) identification of the factors and processes in the evolution of these farming systems, and 3) evaluation of system's sustainability/unsustainability based on its ecological and socio-economic attributes. Bio-physical and socio-economic information for these analyses were gathered from 42 households respondents and five key informants representing 35% of the total household population. Five farming systems were identified : a) kaingin farming system, b) monocrop plantation based, c) multiple crop plantation based, d) annual homegarden, and e) perennial homegarden. All are characterized as : a) managed by the household, b) untitled, c) with steep slope, with rugged topography, and e) rainfed.

More than 73% of household respondents practiced two or more of these farming systems. The most common was the multiple crop plantation based farming system with more than 66percent of household respondent practicing it, followed by the monocrop-plantation based (59.52) and perennial homegarden (47.61). These farming systems have five major components : annual crops, perennial crops, nitrogen fixing trees and cover crops, livestock and other enterprises. The three most common components are perennial crop (with 100 percent of the respondents having it), annual crops (95percent) and cover crops and NFTs (80percent).

These farming systems are products of processes like: a) migration and settlement, b) changing land-use and vegetative plant succession, c) man's organization of social relation with respect to land use, and d) technological innovation and adaptation pattern and interaction of various socio-economic and bio-physical variables. Bio-physical variables: soil fertility, rainfall pattern and hydrological system while socio-cultural and economic variables are : income and sources of income, market and transportation facilities, education and training, number of years in MFR, farming experiences, family status, institutional policies, and perceptions and beliefs.

Three farming systems are found ecologically sustainable, namely : the multiple crop plantation based, annual homegarden and perennial homegarden. This is based on some bio-physical indicators observed such as : a) high bio-diversity, b) low external input and high internal resource generation, c) protected soil surface, d) organic matters accumulation, e) multistorey cropping system, and f) minimum soil disturbances. These indicators signify system efficiency in terms of nutrient cycling, light and energy utilization and other ecological functioning. Monocrop plantation based system has high bio-diversity and productivity but was rated low in sustainability because of its poor efficiency in resource utilization and poor stability. Monocropping of citrus appeared to be the most profitably but long term accounting showed that multiple cropping with multi-storey of fruit trees and annual crops gives better investment return.

Economic analysis showed that multiple crop plantation based farming system is the most economically sustainable compared with other farming system. It has longer production period and higher total production and net return per area (though not per crop basis), requires less fertilizer and pesticides input due to better resource utilization, less labor intensive, and less risk of market failure. On a farming system level, multiple crop plantation in combination with annual homegarden can be considered as the most ecologically sustainable and economically profitable. Generally, farming systems in Bagong Silang, MFR can be considered as ecologically and economically sustainable while there are still farmers practicing farming systems that are ecologically and economically unsustainable, a large majority of them are shifting to the sustainable ones. Institutional support and community organizations contributed much in encouraging the shift. Indeed, institutional support provided by UPLB among others is important for these sustainable farming systems to flourish in Bagong Silang. The still unresolved conflict between the University and the community poses a threat in the sustainability of the system at the community level. Strict implementation of forestry law on forest reserve, e.g. eradicating all farmer occupants within the reserve, will affect the system's stability. It is recommended that a study on the possible implications of enforcing the forestry laws in Mt. Makiling Forest Reserve on the community and to the sustainability of the systems be given proper attention.

ORTIZ, EUFRONIO

Environmental assessment of fishery resources in Magat reservoir -- 1993

This study presents an analysis of the environmental problem confronting the Magat watershed with emphasis on the possible impacts of the July 16, 1990 earthquake on the reservoir's fishery productivity. The interrelationship of the physico-chemical, biological and socio-economic components of the reservoir is discussed in relation to both human interventions and natural calamities in the watershed. Transformation of the watershed into grasslands and agricultural lands at the expense of primary and secondary forest is a result of human interventions in the watershed. The July 16, 1990 earthquake represents a major perturbation that moved huge volumes of soil eroded along the mountain areas of Cordillera and Caraballo mountains. This accelerated the sedimentation of the Magat reservoir. Deposition of eroded materials into the Magat riverine ecosystem reduced algal growth and reportedly caused the temporary disappearance of some freshwater fishes. The occasional deposition of erosion materials in waterways during the rainy season continue to cause turbidity, sedimentation of waterways resulting in the decline of fish population.

Data on the water quality of the reservoir before and after the July 16, 1990 earthquake indicate disturbances in the watershed. The biological productivity of the reservoir before and after the calamity showed significant differences which could be accounted for the cumulative effects of changes in chemical and physical conditions. Declining fishery productivity of the reservoir affected the socio-economic condition of Magat fisherfolks though a decreased fish catch of 393,478 kgs in 1984 to 54,823 kgs in 1991 and a longer culture period of 5-6 up to 12 months.

OU GUOWU

Environmental performance analysis of community-based forest management in Guizhou Province, China -- 2007

Conducted from July 2006 to December 2006, this study compared and analyzed the environmental performances in Jitian Village without Community-based Forest Management (CBFM) and Chaoshan Village with CBFM. Environmental performance analysis focused on the biophysical and socio-economic performances. Soil chemical analysis was conducted for a total of 21 soil samples. Plant species biodiversity data were collected by using quadrat method. By using questionnaire, 20 respondents were selected randomly and interviewed in the Jitian and Chaoshan Villages respectively, in term of income, population and employment, community organizations and management regulations, public participation in village affairs, traditions and customs related to forest resources, and social issues.

The results revealed that top-down and large-scale reforestation with pure pine tree had more adverse environmental performances including soil acidification, decreasing soil nutrients and soil moisture, biodiversity degradation, decreasing community income, and poor community governance.

Chaoshan Village with CBFM had better environmental performances than Jitian Village. Its soil and biodiversity degradation were relatively lesser compared with Jitian Village. The community's diverse needs from forest resources were considered reasonably in CBFM. Community had diverse and increasing income from forest resources. More villagers came back to the community to engage in agricultural production and forest resources management. Through CBFM, the participation of Chaoshan villagers in the CBFM improved, community organizations and management regulations were built, and community capacities were enhanced. Based on this study, CBFM has potential to promote the sustainable development of Chaoshan Village.

PADILLA, CHERRY S.

Carrying Capacity Assessment of Mt. Balungao Hot and Cold Springs Resort and Hilltop Adventure in Balungao, Pangasinan, Philippines –2014.

The LGU-operated Mt. Balungao Hot and Cold Springs Resort and Hilltop Adventure is the only resort in eastern Pangasinan with hot spring waters believed to be therapeutic thus gaining popularity among local and international visitors. While economic benefits are being realized, sustainable tourism development needs to be taken into consideration. Carrying capacity assessment offers a practical and effective tool for tourism destination stakeholders to help attain sustainable tourism.

The resort's physical and social carrying capacities were assessed during the peak days of Christmas break in 2013 extending to February 2014. Adapting Cifuentes' (1992) formulae adjusted by Tran *et al.* (2007), the estimated daily effective real carrying capacity of the swimming pools was 443 bathers. Records confirm that there were days that it was exceeded. Social carrying capacity was assessed through evaluation of recreation satisfaction of visitors and determination of residents' attitude towards tourism exploring the Doxey's Irridex using semi-structured survey questionnaires. Despite some deficiencies in the resort, visitors were generally satisfied with their vacation while residents are at the stage of euphoria. Thus, the social carrying capacity of the resort is not exceeded at present.

Validation of the standard user requirement of the 2012 ISPSC using visual approach revealed that it was not applicable to the visitor-respondents of the resort.

PADRID, JENNIFER C.

Environmental Performance of Handicraft Production from Recycled Tetra Packs. -- 2014

Environmental performance of handicraft production from recycled and rejected tetra packs from garbage and rejected packing materials for fruit juices was evaluated. Environmental performance is a function management and operational performance from material acquisition to handicraft products. The inputs-outputs and environmental burdens during life cycle were determined. The management performance of the producer of the handicraft, KILUS Foundation in Pasig, Rizal was assessed. The social impact on the workers of handicraft production and the net income from production of similar products with the two materials were also determined.

Environmental performance of handicrafts production from rejected tetra packs of fruit juices companies was better than those from recycled tetra packs. The former had very low environmental burden than the latter. The former was for export markets and gave better net income and almost no environmental costs. Production of these handicrafts generally had positive social impacts on the workers.

KILUS Foundation had excellent management performance. It provided livelihood systems to their members, good working environment for the workers and complied to national and local policies, and received numerous awards. Value-adding to recycled and rejected tetra packs reduces environmental burden.

PADURA, VIVIENNE RHEA S.

Environmental Audit of Swine Waste Management System in Lipa City, Philippines. -- 2013

An environmental audit of anaerobic digester-and-lagoon-based swine waste management systems of various scales of swine production was in Lipa City. This was based on Ontario Environmental Farm Plan (Ontario Farm Environmental Coalition, 1996) and Arkansas farm Assessment System (Arkansas University of Agriculture, Cooperative Extension Service, 2005). Twenty (20) swine farms were selected and the farm owners or managers were interviewed to determine their perceptions of alternative technologies on swine waste management. The risk of each environmental aspect of swine waste management practices was assessed. The rating of the risk level was 1-4 with 1 for low risk and 4 for high risk.

The environmental audit system based on the Ontario Environmental Farm Plan and Arkansas Farm Assessment System can be adopted in the Philippines. However, environmental aspects on methods of cleaning the swine pens, design and maintenance of anaerobic digester system, and use of biogas and effluent should be included. Farms with environmental compliance certificate (ECC) have better environmental performance than those without ECC. Farms that adopted anaerobic digester-based swine waste management system, in compliance with the local government's requirement, were satisfied with the technology. Conversely, farms with lagoon-based swine waste management were not willing to adopt alternative technologies because of financial constraint. Majority of the respondents stated that they preferred technologies that will address odor nuisance and other environmental concerns if cost is not a constraint.

PAGLINAWAN, LUVIE E.

Flood Risk Analysis under Climate Change Scenarios using Simulation Modeling for Lapad River, Sta. Cruz, Laguna, Philippines – 2012.

Flooding is a natural and inevitable process, it occurs with or without the influence of climate change. Two of the many causes that affect the severity and degree of flooding related to climate change are extreme rainfall events and land use change. For this study, the weather data generator LARS-WG was used to generate downscaled rainfall data corresponding to the present and future climate scenario according to projections of the HadCM3 A2 and B1 climate scenarios. The results were then analyzed and compared with the historical data to assess the changes in extreme rainfall characteristics. Land use change detection from 1993 to 2001 was conducted and validated to quantify the degree of change and aid in the identification of areas most at risk of flooding inside the watershed. The Rational Method was used to determine the effect of land use change on the rate of the Lapad River at different return periods based on historical and projected climate change scenarios.

The results obtained in this study illustrate an increasing trend on the amount of total monthly rainfall at the onset of the rainy season, while lesser amount of rains on the summer months. On the other hand, land use analysis revealed a decrease in the area covered with forest, agriculture, and grasslands/open areas whereas there is an increase in the area covered with infrastructures (build up) and coconut/mixed plantations.

PAHM, ESTELA A.

Environmental impacts of the establishment of a fish sanctuary in Lake Buhi, Camarines Sur (Bicol Region, Philippines) -- 1989

The study was undertaken to predict and assess the significant environmental impacts of the proposed fish sanctuary project on the Lake Buhi ecosystem. The study considered the three general sub-systems of the lake ecosystem, namely : biological, physico-chemical, and socio-economic sub-systems. Likewise, the two major phases of the proposed project were taken into consideration, i.e., site preparation and construction phase, and operation and maintenance phase. Using the general procedure in the conduct of an Environmental Impact Assessment (EIA) study, all possible impacts of the project were identified at each project phase. However, only the significant impacts were selected and were quantified, using acceptable economic and ecological models.

The study showed that there will be significant effects on the socio-economic and biological sub-systems. In the short run, negative income effects will be experienced by the fishermen operating within the fish sanctuary area. In the long run, however, positive effects are seen, such as the potential increase in fish yield due to the fingerling dispersal scheme of the project. It is predicted that eventually the present fish stock in the lake will be upgraded. Along with these, significant positive increases in fish catch and income can be expected. In the short run, no effects are seen on the physico-chemical condition of the lake waters. However, due to the intensive use of supplemental feeds during project operation, the water quality of the lake may become nutrient-enriched especially with nitrates and phosphates. In the long run, the possibility of algal blooms (that could be detrimental to the fishes) still remains.

Considering, however, the net benefits, of the proposed project, this study strongly recommends that the project should proceed. Two management options are suggested : (1) establishment of a hatchery and nursery project that will be limited to five hectares and (2) establishment of the same project that will need the enclosure of the total 86 hectares designated fish sanctuary. These two options were found to be both ecologically and economically viable. This study further recommends that a thorough monitoring scheme for fishery utilization and resource status be undertaken from the initial year of operation of the project. Special attention must be given to yearly fish stock assessment, at least during the first five years of operation of the project, to serve as a time-series data set for estimating a more realistic maximum sustainable yield of the lake. This would contribute to a more effective planning and management of the lake resources.

PAILAGAO, CHARMAINE T.

Dynamics of land renting on vegetable production and its influence on adoption of soil conservation measures in the uplands of Lantapan, Bukidnon, Philippines -- 2009

Agricultural intensification has been the key to addressing the growing demand for food production both for home consumption and supplying the market. The market demand on agricultural production has therefore triggered a change in land use. For farmers, it makes a lot of economic sense to venture on high value agricultural products where land and labor capital is limited. Currently, there is high market demand for vegetable crops here and abroad. The high economic benefits from vegetable production have encouraged farmers to expand their production even in steep sloping area, and through land renting, which has become a trend in Lantapan. However, lease agreements are usually informal or verbal, without expression of conservation objectives, and without policy support.

The study examined whether policy incentives can mediate soil degradation in rented vegetable farms in Lantapan. It also analyzed the type and nature of land renting schemes and identified the gaps and weaknesses of conservation policy that result to the non-adoption of soil conservation in rented vegetable farms. Several methods were

used to obtain data that would address the different objectives. These include household survey, participatory mapping, focus group discussion, and key informant interviews on selected local government personnel.

Results of the study showed that land use change in Songco is influenced by high demand on certain agricultural product and that intensive and inappropriate farming system on vegetable production has caused severe soil erosion. Furthermore, land renting agreement in Songco gives little attention on conservation measures, wherein, landowners do not entail lessee to adopt SWC during their tenure. Although most leaseholders are willing to adopt SWC in the sloping rented farm area provided that landowner would extend the lease tenure to compensate the yield reduction due to crop area loss. Moreover, majority of the respondents opt to establish SWC in owned land and not on rented farm. The demands for technical assistance on soil conservation as well as policy incentives by farmers are high but the implementation by the municipal agriculture, being the key implementor of conservation ordinance, is insufficient due to political transition and abrupt shift of program priority along with budget constraints.

PAJADAN, KAREN M.

Willingness to Pay for Water Ecosystem Service Improvement in Cambantoc Subwatershed: The Case of Downstream Communities in Bay, Laguna, Philippines – 2022.

The study estimated the economic value of the improvement of water ecosystem service of the Cambantoc sub-watershed by examining the willingness to pay (WTP) of the downstream communities for the improvement of the water supply using the Contingent Valuation Method (CVM). It made use of interviews from 375 household respondents randomly selected from five barangays and classified into lower and upper downstream households. There are three categories of potable water users in the municipality, namely the residential, commercial, and government or institutions. The domestic connections comprised most of the recorded water supply connections of Laguna Water District Aquatech Resources Corporation (LARC).

The respondents' knowledge, awareness, perception, and attitude towards the improvement of the water supply that comes from the watershed varied. The majority of them are not aware of the services and functions of the watershed compared to the forest importance. The result shows that only 33% of the respondents are willing to pay for a watershed management and protection program. Logistic regression analysis was employed to determine the factors affecting the respondents' WTP. Four variables were found to be significant: bid levels, water problem experience, household ownership, and perception about the program. The mean WTP was also calculated using both parametric and non-parametric methods. For the parametric method, the mean WTP was estimated at PhP39.79 per month for the unadjusted and PhP38.36 per month for the adjusted. Meanwhile, for the non-parametric, the mean willingness to pay computed using the Turnbull estimator was about PhP55.43 and PhP55.87 per month for unadjusted and adjusted, respectively. It implies that the mean value computed using the non-parametric will result in a higher willingness to pay since it does not consider the probable effects of other important variables, aside from the actual responses.

Moreover, an analysis of the policy option was conducted using benefit-cost analysis (BCA) to determine if the computed welfare estimates exceed the costs of the initiatives. The result shows a positive and high net present value (NPV) over a 5-year period for both parametric (5,728,698.34) and nonparametric (9,181,761.25) models. Likewise, the benefit-cost ratios (BCRs) are greater than one with 4.12 for the parametric model and 6.00 for the non-parametric model. It means that the benefits procured by the community-based watershed program exceeded the costs of its implementation. This indicates that the proposed program is worth investing in as it will generate the expected benefits once implemented. The study, therefore, recommends for the formulation of a payment for ecosystem services (PES) mechanism with an operational and management committee solely focused on watershed management.

PALAFIX, MA. ELIZABETH T.

Assessment of the performance and impact of an agroforestry project in Ilocos Norte -- 1993

The Agroforestry Project component of the Program on Strengthening Applied Research and Training for the Development of Dryland Agriculture in Ilocos Norte was studied to determine the following 1) the extent of participation of project participants and the factors affecting such participation; 2) the rate of survival of agroforestry crops and the biophysical factors affecting it; 3) the increase in income of participants and 4) the impact of project performance on sustainability, productivity and equity. Thirteen percent (n=34) of the total population (n=451) was taken as respondents. Seventeen of them were farmer cooperators of the agroforestry project. Data on soil properties and survival rates of trees were taken from the demonstration site. Some information was taken from secondary sources. Descriptive statistics, correlation and regression, and percentage difference were used in data analysis. Based on the findings of the study, the factors which significantly affected the extent of participation were : age, education, household size and land size.

Survival of the agroforestry crops significantly affected by soil pH, and the amount of P and K in the soil. Rainfall variation partly explains variation in survival percentages. Species richness had no significant effect on the survival of agroforestry crops. The increase in income of the respondents was found to be brought about by the increased income from the lowland farm and not from the agroforestry farm or by other livelihood activities of the project. The study shows that the project is ecologically sustainable as indicated by the extent of soil and water conservation. For the impact on

productivity, there was a minimal increase in terms of income from agroforestry farms. Most of the respondents' income were derived from other on-farm activities in the lowland. Equity in income distribution was found to have improved and based on the benefits received from the project, there was a relatively equitable income distribution among in all the farmer cooperators.

PALAO, LEO KRIS M.

Dynamic of land use change in Cabayugan, Puerto Princesa City, Palawan -- 2009

Landscape evolves through time by internal (direct) and external (indirect) forces. Land use change may eventually be transmitted to a landscape and cause change. Likewise, land use may change due to exposure to migrant resource practices, market demand and price signals, shifting policies, and demography. Swidden, as a traditional and old-fashioned land use system of indigenous people, is often connoted as environmentally-destructive and unsustainable; hence many efforts have been made to stabilize it.

The main objective of this research is to gain understanding on the processes and mediating factors that cause land use change vis-à-vis landscape change in Cabayugan. A semi-structured questionnaire and observations were used to assess land use change. Aerial photographs, satellite images, and available land cover data were used to assess landscape change. Indigenous people are now in the era of agricultural transition; from a traditional to a more intensified land use that bridges their subsistence, market demands, and policy conformation. The move to a more intensified land use was triggered by restrictions in access to forest area, development of market, and personal aspirations, as well as programs and projects such as rice paddy and fruit farming spear-headed by various institutions. Forest cover loss decreased by -1

PALEVINO, MHAOLENE LEANA B.

Integration of Calamian Tagbanwa's Indigenous Knowledge in the Establishment of Duyong, Dugong dugon (Mueller, 1776) Protected Zones in the Ancestral Waters of Calait, Palawan, Philippines -- 2019

A mix of participatory approaches such as key informant interviews, participant observation, focus group discussion, and participatory mapping process were used to analyze the indigenous knowledge of the Calamian Tagbanwa of Calait (Nurunutan yang Tagbanwa tung Calait may Quezon) and how these can be used in establishing duyong protected zones in their ancestral waters. The community participated in the data collection and in discussing how these can be used for duyong conservation. Results showed that applying their knowledge in mapping the zones, benefit both their cultural wellbeing and duyong conservation. The map produced highlighted several areas around their community that are suitable for duyong protected zone delineation. The study revealed that the presence of duyongs and the creation of the map benefitted the wellbeing of the community. The presence of duyongs strengthened the community's cultural wellbeing by shaping their identity, experiences, and capabilities. These are shown through gaining sense of pride, responsibility of care, spiritual growth, historical rootedness, aesthetic and memorable experiences, tight social bonds, strong authority over claim, and knowledge and skills. The maps produced allowed the strengthening of both duyong conservation and their identities as rightful owners of their domain and the preservation of their culture and practices.

PANINHUAN, SITHISACK.

Indigenous People's Wildlife Hunting Practices and Forest Use in the Nam Ha National Protected Area, Luang Namtha Province, Lao PDR. -- 2012

This study is a follow up of Wildlife Conservation Society (2002-2003) indigenous people (IP) interview regarding the use of local wildlife at the Nam Ha National Protected Area. Questionnaire was used for 200 households in 23 villages and the Geographical Information System (GIS) – remote sensing (landsat 7 images of April 2003 and February 2012) was used for mapping. The study aimed to understand the change in forest cover, wildlife use, wildlife hunting, and the trend of wildlife between in 2003 and 2012 through the assessment the perception of local/indigenous people. T-test was used for detecting the change. This study also assessed the indigenous people's knowledge and understanding on the importance of wildlife, forest values, forest services, and relationship between forest and wildlife. The results found that the forest cover has declined. Average human population increased at 2.4 percent annual rate, 6 out of 56 studied species were not used in 2003, but 3 of 56 were not used in 2012. Wildlife use ($p>0$) have decreased. Wildlife sale ($p>0$) have decreased, but the use of medicine has increased ($p<0$). Meanwhile, hunting effort of using gears ($p<0$) have increased. Out of the surveyed IP households, 95% understood the importance of wildlife, 100% understood the forest values and provided wildlife habitat (33 percent), protection of the climate impact (28%), water supply (27%), watershed (11 percent) and others (1 percent). The understanding of wildlife decline because of increasing human population was 95percent and forest cover change due to human was 81%. The observed forest change was 75 percent (187,647 ha) of total area of NH NPA to 54 percent (136,437 ha). Based on the

IP's perception, the forest cover change was mainly due to shifting cultivation (46%), plantation (37%), establishing infrastructure (16%) and others (1%). Finally, reported the wildlife and human conflict was high at 94%. Generally, indigenous people have a good understanding on the importance of wildlife and forest, while wildlife and forest cover have continued declining and human population and hunting effort have increased.. Interdisciplinary recommendations are provided for sustainable forest and wildlife use.

PARAISO, PATRICIA MAE J.

Vulnerability Assessment of the Communities in Molawin Subwatershed to Flooding – 2020

Molawin subwatershed experienced destructive floods in recent years. Flooding in the area was a combined outcome of biophysical and socioeconomic aspects like rainfall, lake level rise and increasing settlements. Scenario-based hydrologic and hydraulic modelling using HEC-HMS and HEC-RAS was conducted to understand flooding event in the Molawin subwatershed. Watershed DEM, land cover, soil type, river streamflow and rainfall data were inputted in the hydrologic and hydraulic models. The extent of the model is approximately 164 hectares covering barangays Bayog and Maahas in the municipality of Los Baños and barangays Maitim and Santo Domingo indicating susceptible areas to flooding. Household survey of 192 respondents in the four flooded barangays was conducted using a vulnerability assessment instrument that contains questions regarding vulnerability indicators. The study assessed the vulnerability of the communities in Molawin subwatershed to flooding as a function of exposure, sensitivity, and adaptive capacity. Population, depth, and duration of floods were selected as exposure indicators. Age, percentage of women, income losses and experiences encountered greatly influence the sensitivity of the communities. Adaptive capacity indicators include support from social networks and institutional programs. The model generated a hydrograph characterized by a steep rising limb with a high peak discharge of 1.4 m³ /s and volume of 155.46 mm due to the fan-shaped, with semi-circular shaped catchment of the Molawin subwatershed. The hydrograph featured a lag time of 9 hours between the peak rainfall and peak river discharge. This lag time of 9 hours provides a window of opportunity for the downstream communities to prepare for evacuation using an early warning system. Principal component analysis (PCA) results have shown that income losses and flood duration had the highest weights and contributed the most in the vulnerability index. The order of vulnerability index indicated that Brgy. Maitim is the most vulnerable, followed by Sto. Domingo and Bayog, whereas Brgy. Maahas is the least vulnerable. Several residents cannot work in Brgy. Maitim during flood contributing to the low income and highest sensitivity index. Brgy. Sto. Domingo has a high sensitivity next to Brgy. Maitim and low adaptive capacity index. Brgy. Bayog has the highest average income contributing to the lowest sensitivity among the barangays. Brgy. Maahas has low exposure and sensitivity, it also possessed the highest adaptive capacity index making it the least vulnerable. The proposed adaptation strategies include adoption of bottom-based approach where the communities are actively involved in monitoring and early warning systems are useful since they have indicators including markings in walls of past floods, lake water level and visual monitoring. Mitigation measures include solutions that will reduce the impact of floods on livelihood and income like strengthening the resilience and adaptation of agriculture and fisheries and mainstreaming financial literacy. Flood control measures and replanting of vegetation in the areas with high exposure are recommended. Having strong structural materials for building houses are also suggested because damages in housing is the most encountered difficulty of the residents. Technological advancements like hydrologic and hydraulic modeling is a useful tool for visualization of behavior of floods in a watershed and thus, it offers great potential in the management of rainfall-related disasters.

PARDO, KRISTYL CKAYE E.

Life History and Reproductive Traits of *Sardinella tawilis* (Herre, 1927) and its Implications to Fisheries Management -- 2019

The life history and reproductive traits of *Sardinella tawilis* were studied to update the current information available on the biology of this species. A total of 312 samples were collected at five landing sites for eight months between 2017 and 2018. Results shows that the length-weight relationship at $W = 0.0296 FL^{2.658}$ indicates that *S. tawilis* exhibits a negative allometric growth. Female *S. tawilis* have larger sizes, are significantly more abundant than male individuals, and exhibit an asynchronous oocyte development. The mean gonadosomatic indices (GSI) implies that peak of spawning was from December to March, where the mean GSI on these months were found to be significantly higher from other months. The size at sexual maturity for both male and female *S. tawilis* were at 75 to 79 mm FL. Growth overfishing was shown to occur by the smaller lengths (average, maximum) of the samples collected, lower estimated L_{∞} , higher fishing mortality rate ($F=6.24$), and beyond optimal exploitation rate ($E=0.84$). Socio-economic survey elicited the knowledge, attitude, and perception (KAP), as well as practices, of key sectors towards the regulation of fisheries and conservation of *S. tawilis*. Passive gear users and the management sector have high level of KAP on regulation of fisheries and conservation. Active gear users have medium to moderate to level of KAP towards these aspects. Gill net users are highly compliant to the allowable mesh size of net, whereas active gears users utilize nets with fine mesh sizes. Lowest CPUE was recorded in using gill net (4.5 to 5.4 kg day⁻¹), whereas using beach seine (90 to 180 kg day⁻¹) and motorized push net (600 kg day⁻¹) were recorded to have the high CPUE. The primary

problem identified in fisheries of *S. tawilis* is the continuous operation of active fishing gears in the lake which highly contributes to the unsustainable harvest of *S. tawilis*. Overall, the life history and reproductive traits of *S. tawilis*, coupled with the assessment of the socio-economic survey, may serve as guide in formulating management measures for the regulation of fisheries and conservation of *S. tawilis* population.

PASICOLAN, PAULO N.

Environmental impacts of and some factors affecting firewood extraction : the case of Callao caves National park upper watershed areas, Penablanca, Cagayan. -- 1988

Using primary and secondary data and structured interview schedules, the study aimed to determine the effects of some socio-economic and institutional factors on volume of firewood extraction per household at Quibal, Penablanca, Cagayan and to determine the extent of the resulting environmental degradation in the area in terms of land use change, soil erosion and impact on lowland agriculture. One hundred households representing 50 percent of the total households in Quibal, were randomly selected from five sitios. Almost all the respondents were lowland migrant farmers who have shifted from farming to firewood gathering because of the declining productivity of most swidden farms in the area.

For the environmental impact assessment, topographic maps taken at three different time periods were analyzed to determine the pattern and extent of forest transformation to other land uses. The Modified Universal Soil Loss Equation (MUSLE) was used to estimate the area's rate of erosion at varying slopes and landuse combinations. Personal consultation was made at the National Irrigation Administration (NIA) for the assessment of the impact of the area's continuous soil erosion on the irrigation system. Regression and chi-square (X^2) test were the basic statistical analysis used. Likewise, frequency counts, percentages and means were used for simple comparisons. Results of the statistical analysis showed that household income, household size, size of family labor and number of work days spent in firewood gathering are directly correlated to volume of firewood extraction. Similarly, type of land tenure and market condition significantly affect firewood extraction intensity.

On the other hand, size of land holding, distance of farmers' house to the forest, environmental awareness, and awareness of governmental restrictions to logging do not significantly affect the intensity of firewood extraction per household. The absence of alternative sources of livelihood and increasing deterioration of the swidden farms are two major factors that compel most households to depend greatly on firewood sales for their subsistence. Thus, largely due to this need to survive, the size of land holdings, distance to forest, environmental consciousness, and governmental pressures are not limiting conditions to firewood extraction. Majority of the respondents regarded the forest as public property but placed the total responsibility on the government for its protection. The preferred land use and livelihood are agriculture and farming, respectively.

As for the land ownership issue, majority of the respondents viewed land more as "used resource" rather than "property held" or for inheritance. Majority of the respondents have positive response to tree farming, indicated 1-2 hectares as preferred size of tree farm, and preferred the family approach over the community approach. The respondents' assessment of their present economic condition is retrogressive with reference to five years ago, yet almost all of them do not want to leave the area even though the government would offer better settlement for them. For land use change, there was a more rapid transformation of forest to non-forest cover for the period 1979-87 compared to the period 1953-79. Likewise, estimated soil erosion in tons/ha/yr in the area is considered severe to very severe except for land use under forest cover. Average estimated rates of soil erosion by land use at slope 0-30 percent are as follows : swidden (45.5), grassland (30), and forest (1.3) tons/ha/yr. The study also found out that continuous excessive soil erosion at the upper watershed area results to heavy siltation of the Pinacanauan river, shortening the life span of the irrigation system and eventually decreasing the rice production of the lowland communities.

PASTOR, FLORAMANTE C.

Cumulative effects of the existing land uses on the water resources of the sand dunes of Ilocos Norte -- 1998

An assessment of the cumulative effects of the existing land uses (LUs) on the quantity and quality of the water resource in the different portions of the sand dunes in Ilocos Norte was conducted from December 1997 to February 1998. Three main LUs that depend on groundwater resource were identified : agricultural uses, tourism-based uses, and residential uses. The static water table observed in the study area is confined to shallow well areas (SWA). Estimated water supply based on pumping test and estimated renewable safe groundwater yield based on recharge rate, are comparably substantial. Of the estimated supply of 67.15 million liters per day (M lpd) or estimated renewable safe yield of 74.80 m lpd (based on recharge rate), only 4 percent is being used by the current LUs. Future expansions of the different LUs based on different scenarios indicate a big increased in water demand. However, estimated safe groundwater yield far exceeds this demand. In fact, a full-range development of the sand dunes (based on current uses) shows a water demand of 50.93 M lpd, which is already 68percent of the available safe yield.

Analysis of the sand dunes' current groundwater also showed a level of quality demanding slight restrictions for domestic use. Nitrate concentration, for instance, exceeded the permissible level in most parts of the residential area. Evidence of contamination with coliform was also found in most of the areas but stil passed the permissible limits for

use. The study predicts that the continuous expansion of various uses in the area will affect the available supply not only due to massive extraction but also due to contamination. This dilemma should serve as a challenge for the sand dunes' users to manage every activity in a manner that could not adversely affect the water supply and quality, so that the full range of benefits that this resource can offer is maintained and sustained.

PATAGNAN, KIM LOUISSSE A. U

Incidence and Risk Factors associated with parasite soil contamination in Selected Rural Communities in Caraga Region, Philippines –2020

Soil plays a significant role in the transmission of STH eggs. Soils from selected rural provinces of Region 13 were examined for parasite contamination. A total of 199 soil samples from four municipalities were collected and processed through a modified sucrose flotation technique. Results revealed that 83 out of 199 (44.72%) household soil samples were contaminated with parasite eggs. Parasites recovered were *Ascaris* sp. (29.15%), *Trichuris* sp. (5.02%), *Toxocara* sp. (2.51%), *Capillaria* sp. (2.01%), strongyle/hookworm and *Schistosoma* sp. (1.51%). Practices such as toilet sharing with neighbors ($p = 0.001$), SHW RU FaW¶IV ZaVWH GLVSRVaO ($p = 0.004$), and deworming of cats ($p = 0.003$) showed significant relationships with parasite contamination in the soil. The QGIS map also demonstrated the distribution of parasite soil contamination. In Agusan del Sur, Trento showed moderate to high incidence of contamination ($20 \pm 50\%$) and Bunawan with low to moderate ($0 \pm 19\%$); while in Surigao del Norte, San Isidro showed moderate to high and Mainit with low incidence of contamination. The study revealed that barangays distant from municipal centers showed higher incidence of soil contamination. This could be associated with poor access to basic services such as health infrastructures and clean water. The survey conducted also revealed that the selected barangays belong to poor socio-economic status with impacts on practices and perception regarding sanitation, hygiene, and health. Finally, the presence of parasites contaminating the environment is an indication of human and animal activities associated with poor sanitation and hygiene practices, poor husbandry, and farming practices vis-à-vis poor socio-economic conditions. Thus, coordinated efforts to educate the local people and build local capacities are key measures to control and prevent parasite transmission in rural communities.

PATI, ROMEO C.

Flood vulnerability analysis for the towns of Santa Maria and Mabitac, Laguna, Philippines. -- 2011

Flood and social vulnerability analyses were used to assess the dynamics and social impact of flood in Santa Maria and Mabitac, Laguna. The HEC-HMS and HEC-RAS modelling system were used to derive the synthetic hydrograph and delineate the inundated areas in the flood-prone areas of Santa Maria and Mabitac, Laguna. The social vulnerability of the flood-prone barangays of the two towns was also determined.

The HEC-RAS modelling system predicted the flood depths and delineated the inundated barangays of the two towns. Simulated flooding using peak river cross-section discharges derived from a 20-year return of daily extreme rainfall using HEC-RAS model were almost equal to the observed flood depths of the communities in 7 out of 10 flood-prone barangays in Sta. Maria and Mabitac, Laguna. Mabitac are very vulnerable to flooding. The two major environmental adaptive measures needed to be done are the development of a comprehensive social services program that cater to the health, job and education needs of the residents of the two towns, and implementation of a comprehensive community-based watershed rehabilitation of Santa Maria and Mabitac.

PATINDOL, SOCORRO L.

Landownership and land use change in the municipalities of Calamba and Los Banos, Laguna, Philippines -- 1991

The relationship of the characteristics of landowners from 1946 to 1990 and the pattern of land use changes in Los Banos and Calamba were evaluated. The difference in the characteristics of the landowners and the process of change in landownership in the area were also determined. Secondary information were collected and interviews of randomly selected landowners were conducted. The increase in population, particularly in-migration, development of subdivisions, establishment of industries and urbanization contributed to land use change. The shift of land use pattern was from forest to shrubland to grassland or agricultural to built-up area and from agriculture to built-up area. Built-up areas expanded while the agricultural and forest areas receded.

The age of the landowners when the land was acquired, birthplace, length of residence in the barangay where the land is and the year they transferred residence in the barangay where the land is significantly differed among the four groups of landowners - those who acquired lands before 1960, in the 1960's, in the 1970's and in the 1980's to 1990. Age, birth place, number of children of the landowner, and the year the land was acquired significantly correlated with land use change.

PATINDOL, TEOFANES A.

A case study of an integrated social forestry project in Leyte -- 1994

The study was conducted in the Tacloban Upland Development Project to : 1) to prepare a socio-economic and socio-cultural profile of the project beneficiaries; 2) document and classify the agroforestry technologies adopted in the project; 3) determine the factors related to agroforestry adoption; and 4) assess the impact of the project on the farming system and socio-economic well-being of the beneficiaries. Primary data were obtained through personal interview with 55 legitimate project participants and through field measurements of selected farms. Descriptive and inferential statistics were used in the analysis. The study showed that the ISF model was not fully implemented. Participants have low income level and low educational attainment. They also received very little assistance from the government despite the presence of the project in the area. Government assistance was unequally distributed and availed only by selected project beneficiaries, mostly core group members and farmer cooperators. A mere possession of CSC is not a guarantee that the project would succeed. The traditional cropping pattern practiced by the participants was a combination of small-scale mixed cropping and large-scale monoculture. To check the deficiency of the monoculture cropping which has been practiced even in steep slopes, SALT-I was introduced by the project.

The project's impacts remained unnoticeable. Agroforestry farm development which is considered the core component of the project was still in its infant stage. Agroforestry technology was introduced only recently. Very few participants have adopted the technology. Thus, to date, the project had not yet made significant changes in the farming system and level of income of the participants. Illegal logging still occurred. The sad state of the project could be attributed to the slow pace of its implementation.

The result of the correlation analysis showed that the adoption of agroforestry package was significantly associated with the duration of training related to technology package and respondents' perception of farm condition before the project. Results imply that given the participants' perception of declining farm condition, they could readily be persuaded to adopt the technology being provided to them through trainings.

PATRICIO, ERWIN D.

Copper content of selected marine fishes, bivalves and mangrove sediments in Marinduque, Philippines -- 2003

This study was conducted to determine the total copper content of selected marine fishes, bivalves and mangrove sediments affected by mine tailings in Marinduque. The copper content was determined by atomic absorption spectrophotometry (AAS). Total copper content of mangrove sediments of Marinduque ranged from 21.25 to 3,956.65 mg/Kg. Most of the values of total copper content of the sediments were above the average crustal abundance except from three stations (Yook, Salomague and Poblacion). The total copper content of the sediments obtained from Calancan and Capayang Causeways and Mogpog and Boac Rivers ranged from 889.16 to 3,956.65 mg/Kg. Hence, these areas were high of copper level and considered as point sources of copper contamination in Marinduque. Adjacent areas were also contaminated with copper. These can be considered as potential hazard in the environmental health of Marinduque for at those levels, copper is toxic to both plants and animals.

The total copper concentration in bivalve samples ranged from 0.17 mg/Kg (*Anadara maculosa* in Ipil) to 58.78 mg/Kg (*Lucinoma annulata* in Balogo). In fish samples, *Rastrelliger kanagurta* gave highest the copper concentration (4.52 mg/Kg) and *Auxis thazard* gave the lowest copper concentration (0.33 mg/Kg). The mean copper level in fish was lower than those in the bivalves. Fishes are mobile and hence are able to regulate the metal intake while the bivalves which are sessile can accumulate copper. The copper concentrations of selected bivalves and fishes may be exceeded the recommended dietary allowance (RDA) of World Health Association (WHO). Nevertheless, the body does not readily absorb copper. Copper poisoning may occur by ingestion of copper dust or drinking water contaminated with high levels of copper from the dumped mine tailings.

PENAFLO, LIZ AHREN C,

Institutional partnerships on coastal resource management in Calatagan, Batangas, Philippines -- 2009

This study analyzed the institutional partnerships on coastal resource management in Calatagan, Batangas. The general objective of this study was to evaluate the effectiveness in the partnerships of institutions in managing the coastal resources of Calatagan, Batangas. Specific objectives were to identify and characterize the major institutions involved in the management of Calatagan's coastal resources, to analyze the interactions of institutions present in relation to coastal resource management in Calatagan, to determine the impacts of the institutional partnerships on the status of coastal resources, to determine attitudes and perceptions of the local community towards coastal resources and its management, and to identify indicators in terms of effective partnerships in coastal resource management.

Institutions involved in the coastal resource management (CRM) in Calatagan were non-government organizations (NGOs), people's organizations (POs), local government unit (LGU), Municipal Fisheries and Aquatic Resources Management Council (MFARMC), Bantay Dagat, national government agencies (NGAs) and the community. Other institutions like the church and the academe are also supportive in CRM. As forms of interactions, several institutional

partnerships developed in Calatagan. These included NGO-PO partnership, LGU-NGO partnership, LGU-LGU partnership, NGA-LGU partnership and multi-stakeholder partnership. Impacts of institutional partnerships on the condition of coastal resources were evident on mangroves and fisheries. The community's favorable attitudes on their natural resources were indicative of success for CRM programs/projects. IEC were needed to raise the level of awareness of the community on the status of coastal resources and the laws related to CRM. Indicators of good partnerships were identified and analyzed. Deeper and longer commitment of stakeholders was needed to achieve a sustained management of coastal resources.

PEREZ, KINSLEY MEG G.

Land Snail Diversity and Distribution Across Habitat Gradients and Local Ecological Knowledge in Mount Banahaw Protected Landscape. – 2018

The diversity and distribution of land snails across three habitat gradients, old-growth forest, young secondary forest and agroforest, were determined in Mount Banahaw. Four slopes (northeast- Lucban, southeast-Tayabas, northwest-Majayjay, southwest-Dolores) were selected for land snail sampling, key informant interview (KII), and focus group discussion (FGD). Altitude, temperature, relative humidity, canopy cover, soil pH, soil moisture, soil exchangeable calcium, leaf litter depth, number of trees, and dbh, were measured. Thirty-six 20x20 quadrat (400m²) were set randomly per slope. Point-center quarter method (PCQM) perpendicular to the quadrat were set to determine the tree species per sampling site. Out of 868 individuals, 34 species of land snails belonging to eleven families (Achatinidae, Ariophantidae, Bradybaenidae, Camaenidae, Cyclophoridae, Diplommatinidae, Helicinidae, Helicarionidae, Pupinidae, Subulinidae, Trochomorphidae) were identified. The most diverse ($H'=2.44$) and even ($J'=0.63$) was old-growth forest. Canonical Correspondence Analysis (CCA) and Generalized linear mixed models (GLMM) revealed that the most significant predictor for species richness was altitude ($E=0.4748$, $p < 0.02$) while for abundance was exchangeable soil calcium ($E=0.8029$, $p < 0.01$). Model averaging showed that altitude and calcium ($\Delta AICc=0.0$, $wAICc=0.10$) was the most parsimonious model for species richness while calcium and canopy cover ($\Delta AICc=0.0$, $wAICc=0.04$) for abundance. Moreover, KII and FGD revealed that the local communities along Mount Banahaw were aware and knowledgeable on macro land snails (> 5 mm shell diameter and height) such as *Helicostyla rufogaster* (bayukong tulis), *Helicostyla mirabilis* (bayukong lason), *Lissachatina fulica* (bayukong hapon) and the edible endemic land snail *Ryssota otaheitana* (bayuko/bikuyo). However, they were unaware of the existence of micro snails (< 5mm shell diameter and height). Local ecological knowledge showed awareness of ecological roles of snails being a food and calcium source for animals, decomposers, and aid in nutrient cycling and soil formation.

PEREZ, MA. GRECHELLE LYN D.

The Assessment of the Tourism Carrying Capacity of Lake Pandin, San Pablo City, Laguna, Philippines. – 2020

Lake Pandin, one of the Seven Crater Lakes in San Pablo City, has an emerging ecotourism potential, offering recreational water activities since 2005, hence, providing income for residents. This study assessed the tourism carrying capacity of the Lake in terms of the optimal area for sustainable tourism, community-based tourism management and practice based on social surveys, the quality of the environment, and tourists' visiting motives. Over the last ~80 years, the Lake's micro-watershed of 44.70 ha had portions converted into rice fields, agricultural and poultry farm areas, and built spaces. At present, tourism activities and tilapia cage culture used only 1.15 ha and 0.45 ha, respectively, of the Lake's surface water (24.15 ha), and a large open area remains to be used for fishing. Observations from rapid surveys indicated that rich forest cover surrounded the Lake, the most abundant freshwater fish was the endemic *Leiopotherapon plumbeus* or silver perch (ayungin), and *Hydrilla verticillata* or water thyme (kulantra) was the most abundant macrophyte. The Lake's water quality parameters met the criteria for Class C waters, hence, may indeed be beneficially used for limited contact recreation and fish cage culture.

The community-based tourism in the Lake is led by the Samahan ng Kababaihang Bangkera at Mangingisda sa Lawa ng Pandin (SKBMLP) and is ably assisted by the Pandin Lakewide Fisheries and Aquatic Resource Management Council (FARMC) and the Pandin Lake Tourists Service Cooperative. The organization currently offers two-hour rafting services daily, solely (at Php200.00 per person) or packaged with local cuisine (Php400.00 per person) and steers a total of 12 bamboo rafts. A SWOT analysis conducted with the organization revealed that unity and respect among community members strengthened the management of the Lake's community-based tourism while shortage of tourist facilities appeared as their weakness. Trainings from the City Government of San Pablo and several non-government organizations have been opportunities to enhance local tourism management. Finally, land privatization within the micro-watershed and the deterioration of water quality through the abundant growth of the water thyme *H. verticillata* were identified as threats to the ecotourism services in Pandin.

Estimates of the Lake's carrying capacity, calculated using the Boullon's Carrying Capacity Mathematical Model for different tourist activities, revealed that for swimmers, the daily basic carrying capacity (BCC) was 408 persons up to potentially ~1,836 at assumed two-hour stays of visitors. When limiting factors were considered, i.e., rainy days, typhoons, time available for activities, and visitors' level of satisfaction based on the site's biophysical aspects and quality of facilities, the real carrying capacity (RCC) was estimated at 296 tourist swimmers per day. The calculated RCCs for sight-seeing and

photography, rafting, and fishing in the Lake were less at 284, 165, and 106 persons per day, respectively. When compared with tourist arrivals data since 2005, these RCCs have not been exceeded so far. Further, the perceptions survey with 250 tourists showed that over half (55%) were highly satisfied with their visit experience. Improving the biophysical state of the Lake's micro-watershed and investing on tourist facilities may return more highly satisfied visitors in the future, but would require government agencies and local stakeholders to work together towards the vision of Lake Pandin as a sustainable ecotourism enterprise

PEREZ, PAULINE T.

Morphometric Analysis of Otolith Shape Variation in *Siganus fuscescens* from Selected Philippine Basins -- 2018

The Philippines, a country gifted with high marine biodiversity and of great dependence on fisheries, is highly vulnerable to climate change. Hence, it is important to determine how commercially important resident species adapt to changes in environmental conditions. This study aimed to determine possible adaptations of *Siganus fuscescens* (loc. danggit) from selected basins in the Philippines to climate-induced stress by detecting variations in otolith shape using landmark-based geometric morphometric analysis. Spatial analyses show that *S. fuscescens* populations exhibit slight differences in otolith shape attributed to the landmarks located on the rostrum and antirostrum, suggesting possible morphological adaptations to exposure. Additionally, temporal analysis of individuals collected from Bolinao, Pangasinan also resulted to significant otolith shape variation, illustrated by the complete separation of individuals collected on January 2017 when subjected to canonical variates analysis (CVA). This indicates that *S. fuscescens* may also morphologically adapt to ongoing seasonal or annual changes in environmental conditions. In line with this, key informant interviews of people involved in siganid fisheries in Bolinao, Pangasinan were held to provide a general description of trends in Siganid fisheries and to gauge the level of knowledge and understanding of selected relevant issues. Examination of responses indicate a decrease in volume, frequency, and size of siganid catch and products sold as well as limited knowledge and understanding about climate change and overfishing implying possible over-exploitation of fish stocks. However, majority provided informed answers when asked ways on how the local marine environment should be taken care of to ensure fisheries sustainability. To strengthen the implications of this study for resource management, it is recommended that there is further examination of ecological traits to identify possible manners of adaptation of *S. fuscescens* as well as the development of a more comprehensive analysis of local siganid fisheries.

PHANISONE SAMOUNTRY

Sustainability Assessment of River-based Tourism in Nam Xong Watershed, Vang Vieng District, Vientiane Province, Lao PDR. -- 2012

The sustainability of Nam Xong River-based tourism in Vang Vieng District, Vientiane, Lao PDR was assessed using global sustainable tourism criteria. Survey interviews of resort or hotel operators, tourists, and community members were conducted in Phou Din Deng, a rural village and Huaysangao and Sawang, urbanized villages, during the peak of tourism season. Secondary information were collected from various agencies.

The commitment of the local communities, resorts and hotels, and the environmental and tourism regulatory agencies to maintain the environmental quality of the riverine landscape, safety of the local and foreign tourists, and the integrity of the Nam-Xong River watershed to protect the river water quality determined the sustainability of the river-based tourism. The resorts and hotels complied with some of the global sustainable tourism criteria. The environmental management information of the resorts and hotels influenced the choice of tourists for their accommodations. Tourism brought local employment but the communities are concerned about garbage and sewage disposal, noise nuisance from tourist establishments, deterioration of river water quality, enforcement of environmental laws, inequity in hiring local women for tourism establishments, limited social development projects of the resorts and hotels, and code of conduct of the tourists in local communities, among others. Environmental management options to address the environmental concerns of the tourists and the communities were recommended. Quantitative environmental methodologies like environmental performance evaluation based on ISO 14030 and waste audit were suggested to improve the environmental assessment of sustainable river-based tourism.

PHAT, TRAN VAN

Environmental impacts of impoundments on mangrove ecosystem, at Cangio, Hochiminh City, South Vietnam -- 1994

The study was conducted to assess the environmental impacts the impoundments, a method of shrimp culture, on mangrove ecosystem and recommend the appropriate management scheme that is environmentally, socially, and economically acceptable. It considered three general subsystems of mangrove ecosystem, namely, the biological, physico-chemical, and socio-economic. Significant differences between IN and OUT the impoundments of the various bio-physical and the socio-economic components were tested. The physical-chemical component, the study showed that there were

significant differences between inside and outside the impoundments, the former being higher from the latter in terms of water transparency, total suspended solids, salinity, PO₄, SiO₂, Ca₂, Mg₂. The study also showed that there were no significant differences between inside and outside the impoundments in terms of water temperature, DO, BOD, NH₄, NO₂, and soil properties.

On the biological component, the study results shows that there were significant differences in terms of mean of quantities of Phytoplankton, Gross Primary Productivity, Zooplankton, and Benthos between inside and outside the impoundments. The lower quantities were collected inside impoundments. There were no correlation among gross primary productivity, zooplankton, benthos. On the socio-economic components, the study showed that there were many positive changes in the improvement of living conditions due to the high income derived from impoundments, in the pattern of natural resource use, and in the environmental awareness of the participants.

The high level of satisfaction of the respondents reflected the positive results of impoundment application this demonstrated that there are the positive impacts on the community as reflected in the social and economic acceptability of the impoundments integration on the mangrove forest ecosystem at Cangio, Hochiminh City, South Vietnam. Results shows that the new policy on land allocation and forest care taking contract has accomplished both targets : 1) the demand on land use of local community to develop shrimp farming, and 2) the efficient conservation of mangrove forest ecosystems, has been initially successful.

PHOMMASENG, KEOSANGKHOM

Water Quality Evaluation of Nam Xong River in Vangvieng District, Vientiane Province, Lao People's Democratic Republic – 2013.

The study was conducted to contribute to the improvement of the Sustainable Management Plan for Nam Xong River. Four villages along Nam Xong River in Vangvieng district were selected for the study. A total of 90 respondents were interviewed for the assessment of the knowledge on the importance, perception of the current status towards Nam Xong River that affect behaviour toward the river. The assessment of the parameters for water quality was based from the analysis of the water samples collected from three sampling stations. The parameters that were analyzed included water temperature, pH, electrical conductivity (EC), turbidity, dissolved oxygen (DO), biochemical oxygen demand (BOD), total nitrogen (T-N), total phosphorus (T-P) and fecal coliform.

Results of the interview showed that majority, or almost all respondents are knowledgeable on the importance, uses, responsible office, and prohibited activities and factors affecting the water quality of the river. The result of the analysis of the water quality shows that all nine (9) water quality parameter are still within the water quality standards established by NES-Lao PDR affirming the findings of the 2008 study on the Status of Water Environmental quality and current Major Issues in Lao PDR that concluded that: Water quality throughout the country as well as the Mekong River generally varies between "very good" and "good" quality. Likewise, results of the survey showed a relatively higher level of knowledge and positive perception and attitude of the respondents on the resource.

The study concluded that knowledge, perception, and attitude of the communities over the resource on which they are dependent are indeed major factors that influence the status of the resource. This would mean that communities that are well informed on the importance and the interactions that affect the state of the resource could have a positive and attitude towards the resource. These communities will not undertake activities that will lead to the deterioration of the resource.

Based from this findings, the probability of identifying and implementing a Sustainable Management Strategy for Nam Xong River will be high. The strategy should however be based on the real needs not only of the community but also of the resource. Again, the importance of public consultation and participation of the stakeholders should be taken seriously.

PHOUTHASONE KHOUANGVICHIT

Assessment of Land use and Land Cover Change in Dong Na Tard Provincial Protected Area, Savannakhet Province, Lao PDR. – 2018

The study was conducted in Dong Na Tard Provincial Protected Area in Kaysonephomvihane District, Savannakhet Province with the primary objective of analyzing the influence of different drivers to land use/land cover change (LU/LCC). Specifically, it aimed to 1) determine and evaluate the change in land use/land cover in two time periods, that is, 2007 and 2017; 2) analyze the relationship of the different drivers with land use/land cover change, and 3) predict the future land use/land cover change in the protected area in the next ten years.

The integrated approach of remote sensing (RS) and Geographic Information System (GIS) for the land cover change detection was employed. Similarly, MOLUSCE model technique was used to simulate the land use/land cover change (LU/LCC) in the future. The different drivers influencing LU/LC change were analyzed using correlation and regression. Historical land use/cover data of the Dong Na Tard PPA were extracted from the 2007 and 2017 Landsat images. The image for 2017 was used in addition to the household interviews in order to capture the history of different land uses and land cover changes over the last 10 years. Key informant interview (KII) was likewise conducted

specifically with representatives of the PAFO, FRMS, the six target villages, and the DNT PPA Management Unit Office. The results show that in the percentage of LU/LC change from 2007 to 2017, the agriculture area had the highest positive value indicating high increase of 175.88% from its initial 3955.23 has, followed by plantation area with a percentage increase of 155.77% and urban and built-up area had increased by 100.51%. On the contrary, mixed deciduous forest, dry dipterocarp forest and bare land had negative values indicating a reduction in the size by 20.51%, 3.00% and 75.68% respectively. This was attributed to the conversion of lands to other categories. Family size, crop production density and crop farm income factors were found to be moderately correlated with land use in 2007 where (P-value < 0.05). Income factors derived from off-farm, crop farm and livestock were found to be moderately correlated with land use in 2017. After a decade, number of family members, crop production diversity, and farm distance no longer showed any correlation with land use as family income was also found to be the main factor affecting livelihood conditions.

Regression analysis of land use change showed crop farm income and crop production diversity to have significant influence on land use change using Unstandardized Coefficient value about 0.0000002 and -0.825, respectively. These factors were found to have significant correlation (p-value < 0.05) to land use change. Sample respondent households usually engage in agriculture production and have practiced crop rotation and integrated crop-livestock production during a one-year production cycle.

The LU/LCC trends were simulated for 2027 which indicated that built-up land would increase by 62.28% in 2027. This shows that the spatial pattern of agriculture land and urban and built-up areas will continue to expand and is projected to cover about 25% of the total study area by 2027. Meanwhile, mixed deciduous forest, dry dipterocarp, plantation, water body, and bare land were projected to decrease for the next decade.

PLETO, JOHN VINCENT R.

Assessment of Different Bioremediation Strategies on the Environmental Quality of the Aquaculture Ponds of Brgy. Nagbalon, Marilao and Brgy. Liputan, Meycauayan, Bulacan, Philippines – 2015.

Several bioremediation strategies such as phytoremediation (vetiver grass), use of probiotics and biomin (with filtration as a pre-treatment) were utilized to address the pollution in the aquatic environment of the MMORS. Two sites were chosen as the pilot remediation sites – ponds in Brgy. Nagbalon, Marilao and Brgy. Liputan, Meycauayan, Bulacan. Pond bottom preparation was also done in order to improve the condition of the pond bottom sediments before stocking.

Baseline assessment was done as a reference point before applying the remediation technologies. Physico-chemical, biological and heavy metal content were monitored throughout the four months of culture. The dissolved oxygen levels (early morning) in both sites were below the recommended limits (5.0 ppm) for aquaculture but reaches supersaturated levels (20 ppm) in the afternoon. Ammonia (0.1 ppm), phosphate (0.4 ppm) and chemical oxygen demand (100 ppm) exceeded the recommended limit. Copper was observed to be present on water and fingerlings. Numerous phytoplankton and zooplankton species were observed which serves as indicator of pollution in the water. Copper, chromium, lead and zinc were present in sediments for both sites. Compare with the baseline heavy metal content, decreased for chromium, lead and zinc upon application of biomin in the sediments. The pond with probiotics at Nagbalon site had the highest biomass at harvest while in Liputan site applied pond with vetiver, had the highest. The pond applied with probiotics and biomin had the highest percent survival of 98.30% in Nagbalon site; while the pond applied with vetiver grass had the highest for Liputan site (94.70%).

Probiotics helped the milkfish to grow more, improve their feed digestibility and feed utilization. Application of biomin on sediments brought decrease in chromium, lead and zinc. The vetiver grass system emerged to be the most effective strategy based improvement in water quality and fish quality parameters. The ammonia had decreasing trend throughout the cultivation period while BOD and COD were relatively lower in phytoremediation ponds. The filtration technology helped in preventing entry of contaminants, suspended solids and predators.

These bioremediation strategies brought changes to the environmental quality of the aquaculture ponds in both sites. It may not be significant, but still changes were observed. These strategies could still be improved through engineering design and proper application.

POKHAREL, RAM K.

Impact of biogas technology on environmental stability in Nepal. -- 1990

The study was conducted to determine the impact of biogas technology on the utilization of fuelwood, kerosene, chemical fertilizer and on sanitation enhancement among biogas adopters. Primary data were obtained through semi-structured questionnaires for 105 biogas owners of 15 village panchayat of Jhapa District, Nepal and secondary information from relevant institutions and organizations.

The data were analyzed using means, frequencies, percentages, chi-square test and pair wise t-test. The biogas plant sizes were determined by income, household size and landholding. Within the biogas plant, the use of fuelwood

and kerosene decreased and the number of livestock heads increased. Fuelwood and kerosene oil practices seemed to have improved.

The level of satisfaction of the users showed the growing positive impact of biogas technology, especially on meeting their cooking and lighting requirements. The slurry applied in agricultural farms increased productivity. However, problems with maintenance and technical problems were met. Generally, biogas technology eventually leads to environmental stability as shown by the findings of the study.

POQUITA, ALLAN L.

Assessment of the First Community-Based Coastal Resource Management Project in Aquining, Carlos P. Garcia, Bohol -- 2000

An assessment of the first community-based coastal resource management (CBCRM) project introduced by the Central Visayas Project-I (CVRP-I) in barangay Aquining, President Carlos P. Garcia, Bohol, and implemented by the community (in particular the fisherfolks) was conducted from November 1997 to February 1998. Identification and analysis of the different strategies, approaches and processes employed by CVRP-1 in facilitating the implementation of this project in this barangay was the focus of the study. The assessment showed beyond doubt that the coastal resources and habitat have been substantially rehabilitated and improved and that the protection and management activities have consistently been carried out by the community even after the end of the project life in 1992.

The two major interventions that brought about a tangible impact in the community are mangrove reforestation and coral reef/fish sanctuary management. Simple and requiring a small financial input, these interventions were implemented by the application of the following processes : 1) rigid control of illegal fishing and other activities that are destructive to the marine habitat; 2) replanting mangrove in areas earlier denuded by fishpond developers who have subsequently abandoned these areas allegedly to their unprofitable productivity; 3) protection and management of all coral reefs and the establishment of marine sanctuaries in designated areas thereof; 4) construction, placement and management of artificial reefs; 5) establishment of small scale and limited mariculture so as not to deprive the shell gatherers of their livelihood; 6) in the later stage of the project, deepsea fish attracting devices were installed to harvest fish using handlines only; and 7) organization of fishermen associations to carry out the protection and management activities after CVRP is phased out.

The CBCRM project clearly showed that the community should be given the role of lead element or actual implementors of the program and not the government agency sponsoring the project as practiced in the past. Sustaining effort on resource management and protection could be achieved and institutioned within a given community if its members are well-organized, properly trained and highly motivated to carry out the required task. In summary, the intent of the project was to empower and capacitate the community in order to achieve what is now termed as co-management of coastal resources.

POSA, GABRIELLE ANN V.

Incidence and risk factors of waterborne pathogens in the seven lakes of San Pablo, Philippines. – 2022.

The seven lakes of San Pablo City provide aquaculture and recreational ecosystem services to the local residents. However, water quality is not routinely monitored and the parameters for monitoring pathogenic parasites are lacking. Cryptosporidium and Giardia are two of the most common causes of waterborne disease outbreaks in the world listed by the WHO and are responsible for half of the reported recreational water-associated outbreaks of parasitic protozoans worldwide. This study aimed to monitor the surface water pathogens in the seven lakes of San Pablo and assess the socio-economic risk factors that contribute to their emergence. Based on AFS, Cryptosporidium spp. was detected in 24.8% (N=105) of the water samples. Highest percent contamination was recorded in Sampaloc while the highest mean density (0.76 oocyst/L) was recorded in Bunot. On the other hand, Cryptosporidium spp. was detected in 30.48% of the samples while 18 (17.14%) samples tested positive for Giardia spp. based on IFA. Highest percent contamination of Cryptosporidium spp. was recorded in Palakpakin while highest mean density was detected in Bunot (0.70 oocysts/L) based on the results of IFA. Moreover, highest percent contamination of Giardia spp. was found in Calibato while highest mean density (0.70 cysts/L) was recorded in Mohicap as revealed also by IFA. Sensitivity and specificity of AFS in the detection of Cryptosporidium spp. in water samples were 40.62% and 82.19%, respectively, when compared to IFA as the reference test. Significant inverse correlation was revealed between the presence of Cryptosporidium spp. and total dissolved solids (TDS) ($p=0.032$) in Calibato. A positive correlation was found between parasite presence and TDS ($p=0.023$) and water or Secchi-disk transparency (SDT) ($p=0.020$) in Yambo. Prevalence maps generated using GIS Significant risk factors include use of exclusive ($p=0.046$) or alternative toilets ($p=0.038$) and consumption of lake water products such as fish and shellfish ($p=0.031$). This report provides evidence of waterborne parasite contamination in the lakes and considers these parasites as good indicators of anthropogenic impacts. Recognizing their apparent threat to public and ecosystem health, there is a need to improve sanitation and waste management in the vicinity of the lakes, as well as regulation of agricultural activities and residential establishments to prevent further deterioration of the lakes.

POSADA, MARSHA LITA I.

Co-management strategy in Snake island as fish sanctuary and ecotourism destination in Hondoy Bay, Palawan -- 2010

The roles of the identified major stakeholders in the management of Snake island in Honda Bay, Palawan were defined and the extent of interactions between stakeholders was determined and assessed. The major interacting stakeholders were the Department of Environment and Natural Resources -- Community Environment and Natural Resources Office (DENR-CENRO) Puerto Princesa and the Local Government Unit (LGU) of Puerto Princesa, under a Memorandum of Cooperation, and the boat operators.

Other stakeholders identified were the Palawan Council for Sustainable Development (PCSD), Barangay Council of Bgy. Manalo, Puerto Princesa city, Environmental Legal Assistance Center (ELAC), Inc., and the academe. PCSD provides technical assistance and ECAN zoning or the graded system for the protection and development of the entire province of Palawan as the main strategy of the Strategic Environmental Plan (SEP) for Palawan Act (RA 7611); the council of Bgy. Manalo conducts monitoring of fishing activities within its territorial waters; the ELAC provides assistance to the Honda Bay Boatowners Association, Inc. (HOBBAI) and has no direct interaction in the management of the island. The result of the research studies conducted by the students of the state universities in the island could be used as baseline information in the planning of management strategy for Snake island to understand key factors and properly address management issues.

Absence of a well-defined comprehensive development and management plan resulted to weak links that resulted to conflicts and issues among stakeholders.

The strict implementation of the city ordinances and national policies by the LGU on fishery management resulted to increased average percent cover of coral reefs in the island. # Cooperation, collaboration and continuous coordination between the two governing bodies are crucial contributory factors to the island management as well as stakeholders or resource user's participation, interaction, and initiatives in every phase of the planning of management strategy for the island.

PREDO, CANESIO D.

Estimating the recreation and preservation benefits of Lake Danao national park -- 1995

The study was conducted to estimate the willingness to pay (WTP) for recreation and preservation benefits of protection of environmental attributes of Lake Danao National Park (LDNP) in Ormoc City, Leyte. This was implemented using the Contingent Valuate Method (CVM) with three willingness to pay question formats: open-ended, payment card and iterative bidding. Results shows that all respondents were aware about Lake Danao National Park as a recreation site in Ormoc City.

Forest quality was most preferred among urban respondents attached equal importance to biodiversity as an environmental attribute. There were 91 of the respondents who expressed WTP for protection program to preserve the various environmental attributes of LDNP. The mean annual total WTP for and P89.29 for rural respondents. For all the households in Ormoc, the total social WTP was estimated to be P2.62 for rural respondents. For all the households in Ormoc, the total social WTP was estimated to be P2.62 million per year. This value reflects maximum amount that Ormoc residents to invest to preserve LDNP.

Willingness to pay for various motives of protection (recreation use, option, existence and bequest) was derived in the study. Of these various motives, the last three (collectively termed as preservation value) received the highest allocation (77 to 91) of total WTP. Factors affecting WTP for recreation and preservation values were identified in the study. Recreation demand was significantly influenced by years of education, household size, household annual income, number of visits per year to LDNP, number of days spent on places other than forest, willingness to pay for an entrance fee, environmental attributes preferred, organization membership, and household location.

PRING, HEAK

Environmental management of the Stung Treng Ramsar wetland site in Samaki Sangkat and O'svay commune, Stung Treng Town, Cambodia -- 2011

The study assessed the environmental management in the four villages of Samaki Sangkat in Stung Treng town and five villages of O'Svay commune in Thala Boriwat district, Stung Treng town, Cambodia. Both primary and secondary data were used. Primary data were generated from the survey of the 98 household heads selected randomly with equal representations from the total of 9 villages. In addition, 13 key informants were selected from relevant government, NGOs, civil society and local authorities were also interviewed to obtain their professional assessment of the current situation. Public and individual consultations and dialogues were also conducted to validate information generated from the survey and from the key informant interview.

Results of the study revealed that the major sources of livelihood for the two communities are farming, fishing and wildlife trading. These are interconnected with and dependent upon the various natural resources that are accessible and

available in the Stung Treng Ramsar wetland. However, household heads and key informants from relevant institutions had identified a number of environmental issues and concerns that confronts Ramsar site management. These issues and concerns resulted from depletion of the wetland ecological, economic and cultural ecosystem services. The respondents attributed these to the anthropogenic disturbances both from within and outside the Ramsar sites.

Environmental management options are recommended. This includes strengthening of the relevant departments of the government. There are also international convention and treaties that can be used to obtain regional cooperation of the riparian countries in the management of the Mekong river.

PULHIN, PERLYN M.

Assessing Climate Disaster Resilience of Ormoc City, Philippines after Typhoon Yolanda (Haiyan) – 2016.

This study assessed the climate disaster resilience of selected communities in Ormoc City after Typhoon Yolanda based on the five dimensions: natural, physical, social, economic and institutional. A survey method of 250 household was used coupled with focus group discussions and validated by secondary data and key informant interviews. Resilience was measured using 18 indicators and 62 sub-indicators under five resilience dimensions. Climate Disaster Resilience Index (CliDRI) was computed using the balanced weighted approach and Analytical Hierarchy Process (AHP) tool.

The overall CliDRI is 0.44 (average level of resilience or LoR) under the balanced weighted approach, and 0.39 (below average LoR), and 0.44 (average LoR) using the community and the LGU-based AHP-derived approaches, respectively. Based on the average values of the three scenarios, Physical Dimension has the highest score (0.53), followed by Social (0.51), Institutional (0.44), Natural (0.43), and Economic (0.17). Institutional Dimension has a strong positive correlation with the overall CliDRI.

Differences in resilience perception between the community and LGU of what contributes to the resilience of Ormoc and the varying weights and scores per dimensions and indicators are important for future planning to ensure well-aligned priorities and maximum community cooperation towards a more climate disaster resilient Ormoc City.

PULUMBARIT, CLARICE C.

Comparative Analysis of Adaptive Capacity to climate Risk of Organic and Conventional Vegetable Farmers in La Trinidad, Benguet, Philippines – 2015.

Farmers are among the most vulnerable to climate change. Organic farming is a promising adaptation measure to climate risks but micro level analyzing farmers' adaptive capacity are lacking.

This study provides a comprehensive analysis of the adaptive capacity and current adaptation strategies to climate risks of organic and conventional vegetable farmers in La Trinidad, Benguet. The farmers generally have small-scale and high commercialized farms. The municipality relies largely on agriculture and is located in a highly vulnerable province. To revive its vegetable industry, the LGU is promoting organic farming.

Household survey was the main data gathering instrument coupled with focus group discussions, key informant interviews, and secondary data. Adaptive capacity was analyzed using the Sustainable Livelihood Approach. Thirty variables under five livelihood capitals were used and household adaptive capacity index (HACI) was computed. The t-test shows that organic farming households have a significantly mean HACI (0.69) than conventional farming households (0.23) and higher mean index in four of the five capitals: natural, financial, human and social capital. Conventional farming households have weak natural and financial capital mainly due to low crop diversity and income instability. Thus, organic farming potentially enhances adaptive capacity to climate risk of small-scale farmers with highly commercialized operations characteristic of the study area.

QUINTANA, BELEN B.

Estimation of maximum residue level and dietary risk assessment of cyfluthrin in tomato (*Lycopersicon esculentum* Mill.) var del Monte in the Philippines -- 2002

Cyfluthrin cyano (4-fluoro-3-phenoxyphenyl) methylchloroethyl 1-2,2-dimethylcycpropanecarboxylate, is a relatively new syntetic pyrethroid insecticide popularly used in tomate to control tomato fruitworm. At present, there is no existing or proposed maximum residue level in the Philippines for cyfluthrin tomato. A maximum level (MRL) of cyfluthrin in tomatata is estimated to provide data on the residue of cyfluthrin under the country's climatic conditions and farming practices.

The study of the decline of cyfluthrin residue in tomato field located in Brgy. Gagalog, Majayjay, Laguna during a dry season (January to April 2001) using the following application rates : recommended rate (25 g a.i/ha. applied once a week); twice the recommended rate (50 g a.i/ha. applied once a weed); and farmers' practice (50 g a.i/ha applied twice a week). Additional supervised trials were also attempted in various sites in Laguna to satisfy the Food and Agriculture

Organization's guidelines for the estimation MRL. However, the high incidence of bacterial wilt and the frequent strong rainfalls made the attempts futile.

In this study, estimated local MRL of cyfluthrin in tomato which was 0.1 mg/kg. Application of twice the recommended rate and farmers' practice resulted to higher residue levels of cyfluthrin in harvested tomato in all the dates of harvest compare to that using the recommended rate. The half-life of cyfluthrin in tomato based on the recommended rate, twice the recommended rate and farmers' practice were calculated to be 10, 8, and 6 days, respectively. The impact of various household practices on the cyfluthrin residue in tomato gave the following per cent reduction: washing by soaking in water with gentle hand rubbing (67.86percent); cooked without lid (47.09 percent); washing using flowing water followed by cooking (40.10percent); washing using flowing water (37.43 percent); cooking with lid (36.59 percent); and pressurized cooking (5.22percent).

QUINTANA, EDWIN J.

Trade liberalization, mango production system and the environment -- 1997

The study examined the environmental effects of mango production systems as influenced by economic policies toward trade liberalization. By using cost benefit analysis (CBA) and policy analysis matrix (PAM), the study compared farm budgets (revenues, cost and profits) of two distinct mango production systems, one environmentally degrading and another environmentally conserving. Based on private and social prices, it determined the competitiveness and measured the efficiency of production practices within the existing government policy distortion and market failures.

Results showed that the current mango production systems are competitive but is not operating efficiently relative to comparable world price level and opportunity cost values. There is a need to improve technical (product research and technological innovation), marketing (trade policy) efficiency to be able to gain competitive advantage in the global economy. Furthermore, the benefits from widened free trade could be enhanced if appropriate government policies and structural investments are put in place to support the agricultural sector. However, liberalized trade can encourage unsustainable farming practices to increase production for the export market through land conversion, excessive use of fertilizers and pesticide, and overuse of water resource that can cause significant environmental damage.

The analysis of private profitability indicates that the current agricultural policies of government and the presence of market failures are biased toward promoting environmentally degrading mango production systems. However, based on social profitability the shift to conserving mango production system is more competitive and efficient such that higher benefits for mango growers and reduced environmental degradation are realized. Therefore, environmental protection measures must be an integral component of agricultural policies and programs, since increase trade can magnify existing environmental problems. Policy makers should integrate economic and institutional policy reforms with better resource management and conservation policies that promote environmentally sound technologies. Sustainable development principles of efficiency, cost internalization, equity and environmental integrity are needed in order for the mango industry and the agricultural sector in general to take full advantage of trade liberalization.

QUIRAY, ANDRE E.

Environmental threats to small scale seaweed farming in Calatagan, Batangas, Philippines -- 2012

This study aims to examine the relationships between the change in environment brought upon by activities from different sectors, the socio-economic aspects of the local population, sustainability of small scale seaweed farming, climatic changes and small scale seaweed farming in barangays Balitoc and Poblacion 2, Calatagan and Batangas. The study employed a combination of qualitative and quantitative methodologies, like key informant interviews, household survey, and cost return analysis to meet the objectives of the study.

Small scale seaweed farming in Calatagan, Batangas started in the 1970's and is now under several environmental threats. Seaweed farmers in the area attribute their production loss to development of recreational facilities, hotels, fishponds and hatcheries. Production period of seaweeds in 2008 and 2010 show great profitability but went down greatly in 2011. The net income derived from the cost analysis for 2008 is PhP 165,541, PhP 129,420 for 2010 and PhP-11,701 for 2011.

Increase in Sea Surface Temperature (SST) was also perceived as a threat to seaweed production. However, the highest recorded SST during the four year period is on 2010, the year in which the average yield of seaweeds per unit of 3,122 ks is also the highest. Thus, SST directly being a threat to seaweed production is inconclusive and needs further research. The massive decline in seaweed production in 2011 is attributed to other threats such as the occurrence of ice-disease, grazing by Siganiids, and bad farming practices.

Seaweed farmers in Calatagan have high environmental awareness to merit sustainable farming in the area. The local government unit should pay more attention to the needs of seaweeds farmers in Calatagan as seaweed farming is an increasing trend in aquaculture at the national level. Also, the LGU should review the compliance of several establishments in the study area regarding their waste disposal practices.

QUISAGAN, CHINGA LEA T.

Fishery resources and some biological parameters of selected native fishes in Mahucdam and Pagusi lakes, Caraga region, Northeastern Mindanao, Philippines. -- 2012

The study assessed the current condition of fishery resources in Mahucdam and Pagusi Lake and described the biological parameters of selected native fish species. Fish sampling was conducted using traditional fishing methods. Composition and abundances of fish communities in both lakes were determined and compared between two sampling periods. Native fish species collected from both lakes were described in terms of morphometric characters and reproductive biology. Survey questionnaire was used to know the perception of fishermen on their lake resources. Biological and fish community parameters were compared using chi-square test and t-test.

Fish survey revealed a total of six fish species comprised of 81 percent introduced and 19 percent native species in Mahucdam Lake, and seven fish species represented by 82 percent introduced and 18 percent native species in Pagusi Lake. *Tilapia zilli* and *Oreochromis* sp. were the most abundant species in Mahucdam and Pagusi Lake, respectively. Chi-square analyses revealed that fish density in both lakes varied between two sampling periods ($P < 0.05$). On the other hand, Friedman's test revealed that fish biomass in both lakes did not differ significantly between sampling periods ($P > 0.05$).

Levels of physico-chemical parameters fall within the normal ranges observed in freshwater systems indicating that Mahucdam and Pagusi Lakes are still favorable for growth and survival of fishes.

T-test revealed significant differences ($P < 0.05$) in some morphometric characters such as first dorsal fin base (DFB1), preanal length (PAL), snout to anus length (SA) and eye diameter (E) in *Giuris margaritacea* and *Glossogobius giuris*. The presence of vitellogenic oocytes in gonads of *Giuris margaritacea* suggests potential spawning period of this species in Pagusi Lake is in August. The dominance of perinucleolar oocytes in gonads of native fishes indicates that the species were still immature in the month of July.

Knowledge and perception survey revealed that most fishermen in Mahucdam Lake think that a decline in fish catch has been happening over the years while majority of the fishermen in Pagusi Lake think otherwise. Majority of the fishermen in both lakes believe that their respective lakes are still in good condition which they regard as good fishery sources for livelihood and consumption.

Low diversity of fish communities and the dominance of introduced species observed in Mahucdam and Pagusi Lake may indicate a deteriorating condition of the native fish assemblages. In spite of the generally good water quality condition in both lakes, the presence of a large number of introduced fish species may pose a threat to the native species and the ecological integrity of the whole lake. However, the economic benefit of an abundance of introduced species to fishermen should be considered. Sound management measures should be implemented to conserve the native fauna of lake ecosystems without compromising the economic well-being of the community.

QUITOS, MISHAELLE S.

Arsenic Quantification and Risk Characterization in Select Tap Water of Los Baños, Laguna, Philippines – 2022

Due to the emerging health issues related to Arsenic (As) exposure in drinking water, this study was conducted to quantify the total As in ten (10) selected tap water in Los Baños, Laguna, Philippines and to assess its potential human health risks (carcinogenic and non-carcinogenic) based on As concentrations. Total arsenic levels were determined using the inductively coupled plasma atomic emission spectroscopy (ICP-OES) and results were compared with the Philippine National Standards for Drinking Water (PNSDW). Results showed that the total arsenic levels in six (6) sampling locations exceeded the PNSDW standard for arsenic (0.01 mg L^{-1}). As levels appeared to be positively correlated with temperature. According to USEPA (1989), potential non-carcinogenic health effects are also possible in people consuming tap water with Hazard Index (HI) values > 1 . In this study, eight (8) sampling stations (S7, S5, S3, S8, S6, S4, S10, and S2) had HI values greater than 1. Assessment of the potential carcinogenic health effects showed that all tap water samples had As values exceeding the acceptable Cancer Risk (CR). This study suggests further investigation into As levels in the tap water, drinking water, and groundwater sources of Los Baños, Laguna. A more comprehensive examination on potential health effects from long-term exposure to As in water is likewise needed. Future studies may also focus on the assessment of water purification processes and their efficacy in removing As in water.

RABAÑO, KRISTINE YEW.

Assessment of Microplastics in the Sediments of Laguna de Bay, Philippines. -- 2019

Laguna de Bay, commonly known as Laguna Lake, is the largest body of freshwater in the Philippines and is utilized for multiple ranges of services, from open fisheries and aquaculture to being a source of water for domestic and industrial uses. As a consequence, it has, thus, become a major sink of pollution and wastes. One such pollutant is plastic. However, as plastics are emerging pollutants that are only just being studied globally, much fewer information is known about them as to being pollutants in the Philippines. This is more true for microplastics, those with sizes of $< 5 \text{ mm}$, in freshwater habitats. Thus, this study aims to assess the presence of microplastics in the sediments of Laguna

de Bay, more specifically, to quantify and describe the physical characteristics of microplastics observed in the South Bay of the lake. Seven grab sediment samples were collected from the study area and were analyzed for their microplastic contents. Results showed that microplastics occurrence ranged from 0.16 to 0.40 items/kg, with the most abundant particles being transparent (37.13%), fibrous (68.97%), and <200 microns s (74.71%) in size. In comparison to other sites around the world that have been studied for these emerging pollutants, the South Bay of Laguna de Bay has a microplastics contamination level that is in the same range as those of other freshwater environments.

RABENA, MARK ANTHONY F.

Plant Community Structure, Nutrient Dynamics and Local Ecological Knowledge in *Muyong* System of Banaue, Ifugao, Philippines. -- 2014

The study described the plant community structure of *muyong* using quadrat method. Physico-chemical characterization of the *muyong* sites showed properties typical of high elevation forest ranging from 1157 to 1320 m asl, with coll temperatures (18°C – 23°C), and steep slopes ranging from 18% to 75%. Dry season is from November to April while rainy season (>200 mm monthly rainfall) is from May to October with a peak in August. The abundance of organic matter and moderate levels of nutrients in the soil provides favorable environment for the germination of seeds, establishment of seedlings and growth of *muyong* trees. Results also showed that *muyongs* are categorized as secondary forests with close affinity to a tropical lower montane forest.

A total of 52 woody species (≥ 3 cm DBH; ≥ 2 m height) representing 40 genera and 31 families were recorded in the *muyongs*. Pioneer species dominate while endemic species make up 20% of the floral composition of the *muyongs*. The most represented families were Euphorbiaceae, Fabaceae, Myrtaceae and Phyllantaceae while the most represented genera were *Macaranga*, *Ficus*, *Syzygium* and *Desmodium*. These species are used by the local community as important biological resources for various socio-economic-cultural purposes. More than 50% of the *muyong* stands are on their early stages of plant community succession as evidenced by the abundance of short stature (>10 m) and low BDH (>10 cm) trees, low species richness and Shannon's index of diversity and 70% canopy closure. There is also the introduction of an exotic species (*Alnus* sp.)

Nutrient analyses on soil and water revealed spatial relationship between *muyong* and *payoh*. Higher water nitrate, soil phosphorus and potassium and higher rice growth and grain yield were observed in *payoh* terraces located near *muyong*. Results showed that *muyong* serves as the resource of nutrients and water for the *payoh*. Through the years, the community has developed local ecological knowledge on the ecological functions and relationships of the *muyong* and the *payoh* terraces. They are aware that the *muyong* is the source of water and nutrients for their *payoh*. They have a rich local ecological knowledge on *muyong* plant diversity and soil fertility and have developed indigenous ways of enriching and maintaining the floral composition of the *muyong*. The current problems in the *muyong* are the declining number of large diameter trees, lack of manpower in maintaining the *muyong* and stealing of wood. To address these problems, there is a need for regular visits, cleaning and trimming of understory plants and tree planting to replace cut trees.

Organic farming is common practice among *payoh* farmers. They use rice straw, weeds and wild sun flowers as organic fertilizers. They apply these plant materials during land preparation in order to give them ample time to decompose prior to transplanting of rice seedlings. Pests were managed by (1) incorporating plant residues into the flowing water wick is believed to eliminate insects larve; (2) synchronizing rice seedling transplanting schedule and (3) use of multiple native rice varieties to decrease the chance of massive pest infestation.

Institutional and developmental interventions aiming to preserve and conserve both the *muyong* and *payoh* as well as addressing the current challenges should include the rich local ecological knowledge of the local community. Conservation of the structure and functions of *muyongs* and the rich local ecological knowledge of the community ensures not only the sustainability of the *payoh* but the whole landscape.

RACHMAN, AGUS H.

Socio-economic and environmental analysis of smallholder tea plantation nucleus estate program in Central Java, Indonesia -- 1993

A socio-economic and environmental analysis of smallholder tea plantation nucleus estate program in Central Java, Indonesia showed that tea farmers are likely to participate in Nucleus Estate Smallholder Program (NES) if they are relatively economically well off.

Farmers characteristics such as age, educational attainment, and farming experience are not significantly related with the participation of respondents in the NES program. Farmer participatns of NES program use high yielding clones, vegetative planting materials, pesticides, fertilizers, and pruning and plucking system. The support services which induced tea farmers to participate in the NES tea program include the availability of infrastructure and marketing facilities and access to credit. Through historical transect analysis, the development of the NES program has contributed to the prevention of soil erosion.

RAMOS, LAWRENCE

Simulating streamflow in the Sta. Rosa river in Laguna, Philippines -- 2010

A GIS-assisted event-based rainfall-runoff model that predicts streamflow on a catchment scale was developed and parameterized using biophysical attributes of an urbanizing catchment which drains into the Santa Rosa River in Laguna province, Philippines.

The model solved discharge using the Newton-Raphson method through the kinematic wave approach. PCRaster modeling language was used to implement the model. Primary data inputs required to run the model were stream network, stream width, roughness, digital elevation model (DEM), catchment area, surface cover, soil type, roughness coefficients, gravitational water height, saturated hydraulic conductivity and rainfall.

Surface cover was delineated using supervised classification of an Aster L1B image. Surface soil samples were collected, their gravitational water capacity and saturated hydraulic conductivity were determined. Rainfall was measured using two tipping bucket rain gauges with loggers. A 5-meter water level logger was installed in the Macablang Irrigation Dam for measuring discharge height.

The calibrated model predicted discharge and water height with a coefficient of determination, $r^2 = 0.774$ and a Nash-Sutcliffe efficiency index, $NS = 0.776$. After validation through sensitivity analysis, scenarios of urban and forested land use change were simulated driven with a rain storm event. The model can be used to generate scenarios showing the relationship between rainfall, land use change and streamflow response and thus aid in land use planning.

RASONABE, LEAH M.

Environmental monitoring system on the operations of corn post harvest processing and trading center : the case of Carmen West, Rosales, Pangasinan, Philippines – 2011.

The study was conducted to design an environmental monitoring system appropriate to the operations of NABCOR's corn Post Harvest Processing and Trading Center. The study finds from the assessment of the nature and extent of environmental impact of corn PHPTC, human resource capacity of NABCOR for environmental monitoring and institutional capacity of NABCOR to implement an environmental monitoring system, through actual field inspection, key informant interviews, focus group discussions and time and motion study, that (1) depending on the location, corn PHPTC has environmental impacts particularly on air, land and people, although minimal; (2) NABCOAR has low human resource capacity for environmental monitoring; and (3) NABCOR has low to moderate institutional capacity to implement an environmental monitoring system.

REBUGIO, JESAMINE F.

Interrelationship of drinking water quality from groundwater sources and environmental sanitation in coastal barangays of San Fabian, Pangasinan, Philippines. -- 2012

This study aimed to establish the relationship of drinking water quality from groundwater sources with environmental sanitation in the coastal barangays Nibaliw East and Sobol, San Fabian, Pangasinan possibly affected by the households' socio-economic condition, environmental awareness, and sanitation practices. A multi-method research design comprised of structured survey, water sampling, focus group discussion and statistical analysis was employed to meet the objectives of the study.

Almost all respondents have toilet facilities in their house. Only about 8 percent of the respondents do not have a toilet facility. In spite of their desire to have toilets, investment in them is in competition with budget requirements for other expenses like food and allowance for school children. Their willingness to pay to improve their current facility and to install a new one is correlated with their household income.

Despite the households' awareness that poor sanitation and hygiene could cause water-related disease, they insist that having ample supply of water could lessen their vulnerability to these diseases. The Municipality of San Fabian is located in an area identified having local and productive aquifers. The most abundant source of water for drinking is a natural spring (tubewell/flowing water) which 77.7 percent of the respondents have.

The groundwater is perceived to be of good quality. This is illustrated on the results of the water quality where TDS, total hardness, pH, temperature, lead and iron are within standards set by the PNSDW.

Since San Fabian have abundant supply of groundwater it is appropriate to make arrangements for the treatment and disposal of waste water which greatly contribute to health problems. There is also a need to develop a comprehensive plan on the pricing policies of the water utilities and zoning for proper solid waste and waste water disposal.

RELOX, RICHEL E.

Diversity analysis of bats and its implication for the management of Mt. Apo Natural park (MANP) at Kidapawan City, North Cotabato, Philippines. -- 2011

Mt. Apo Natural Park (MANP) diverse flora and fauna are now compromised because of continuing development inside and outside natural park. As bio-indicators, bats play a vital role in forest regeneration, hence maintaining the ecological balance. The study determined the current status of diversity, endemism, composition, diets, habitats of bats and conservation measures in MANP, Kidapawan City, North Cotabato. Bats were sampled using mistnets, their food habits were determined, habitats were characterized and conservation activities and problems were identified to assess the health of the forest.

Results showed a total of 173 individuals from six (6) species, such as *Cynopterus brachyotis* (83), *Haplonycteris fisheri* (33), *Ptenochirus minor* (25), *Macroglossus minimus* (20), *Ptenochirus jagori* (12) and *Rhinolopus inops* (1) in Order Chiroptera belonging to Families Pteropodidae and Rhinolopidae. Bats preferred *Ficus* species (50percent) as their staple food over the other known food choices. Based on indigenous knowledge, forest provides basic human needs like food, water and livelihood, which means that the people are highly dependent on them. With the health status of MANP, ecosystem services are affected by anthropogenic activities. Therefore, the presence of diverse species of services are affected by anthropogenic activities. Therefore, the presence of diverse species of bats which are highly dependent on intact forest considering their food and habitat preferences as compared to altered habitats means stability of the park and its life supporting systems. Hence, it is highly recommended that the protection and conservation of wildlife, their food sources and habitats are necessary to attain sustainability in MANP.

REPALAM, JUSTINE LOUISE R.

Rehabilitation of a mined-out site using bamboo as a phytoremediation species – 2022.

Rehabilitation of mined-out areas is often difficult due to toxic and poor soil conditions which inhibit plant growth. *Dendrocalamus asper* has high tolerance for such environments, and experiments have cited its potential for metal accumulation, hence, this research aimed to determine its phytoremediation potential in natural conditions. Soil samples with and without bamboo, including samples of bamboo roots, culms, and leaves were collected from a Ni mined-out site in Carrascal, Surigao del Sur. Soil pH, cation exchange capacity (CEC), soil texture, and total and bioavailable Ni concentrations were obtained. The bioconcentration, translocation, and enrichment factors, and absorption efficiency were then computed. Results revealed the area had high total Ni concentration (4,817.26–7,562.20 ppm) but low bioavailable Ni (13.25–24.47 ppm), indicating low availability of Ni for plant uptake. However, its dissolution into available forms was easily influenced by anthropogenic inputs (i.e., soil amendments). Ni was highest in the order of roots (924.19 ppm) > culms (43.33 ppm) > leaves (42.37 ppm). BCF was high (56.46) with low TF (<1), indicating potential for phytostabilization. However, the low growth rate of 0.3 cm/day suggests that its growth and development is negatively affected by the soil conditions despite its potential for phytostabilization.

REYES, KRISTINA B.

Developing Multi-criteria Decision Analysis (MCDA) for Selecting Municipal Sewage Treatment Plant for Cabuyao City, Laguna, Philippines – 2023.

Better wastewater management around the Laguna de Bay is needed. There are existing laws promoting the adoption of pollution abatement technologies. However, systematic selection of which to adopt is complicated. In this study, an analytical tool was developed using the Multi-criteria Decision Analysis (MCDA) for selecting the suitable wastewater treatment facility for Cabuyao City. Major factors: social acceptability, ecological, technical, and economic feasibility were assessed through the Analytical Hierarchy Process (AHP). Prioritization of criteria and aspects for selecting the technology through the judgment of the technical experts and decision makers were evaluated. For the results to be more objective, Grey Relational Analysis (GRA) was employed as input to AHP. GRA gave technological scores from documented studies and technical experts with respect to the given criteria. From the 3 alternatives, sequence batch reactor (SBR), moving bedbiofilm reactor, and Food Chain Reactor (FCR), the results showed that the FCR can provide not just environmental protection and benefits, but also social and economic advantages. This is followed by the SBR then MBBR. Generally, this study provided a systematic yet uncomplicated guide for major-decision makers in selecting a technological intervention for the improvement of wastewater management system.

ROBLES, ADORACION T.

Risks and benefits of insecticide use in cabbage (*Brassica oleracea* L.) production in Buguias, Benguet, Philippines 1998 -- 1999

The study identified, assessed, characterized and evaluated the biological, physical, social and economic risks and benefits of insecticide use for cabbage production. Data were generated through surveys, interviews, experiments and review of secondary information. The farming community of Natubleng, Buguias, Benguet involved in heavy use of insecticides for the production of cabbage was studied.

Results showed that farmers mishandled and abused the use of insecticides. Common practices were frequent spraying and short spray interval; tank-mixing of different insecticides; increasing concentration of spray; improper disposal of contaminated wastes; and non-compliance to safety nets. To test for environmental effects related to farmers' practices, residues in soil, water, air and food materials were detected using the UPLB-NCPC rapid field kit test for the detection of organophosphate residues. Results showed that residues were within safe level, except for agricultural water which surpassed DENR standards. Drinking water was negative. Despite the safe level of contaminants, health problems were encountered. These were eye, skin, respiratory, gastro-intestinal, nervous, muscular and cardiovascular disorders.

In view of the issues on health and residue levels, the insecticides were evaluated based on their characteristics. The active ingredients of insecticides commonly used were methamidophos, fenvalerate, permethrin, deltamethrin, triazophos, profenofos, carbofuran, phenthoate, lambda-cyhalothrin, *Bacillus thuringiensis*, bendiocarb, malathion, diazinon, chlorpyrifos, propamocarb hydrochloride and methomyl. A modest scheme to classify these insecticides were formulated based on the identified impact in Natubleng. The criteria for classification were the products of the magnitude of the impact and the likelihood of occurrence. Results showed that slightly hazardous insecticides were as high risk as those that were extremely while some highly hazardous was proposed as moderate risk. Assessment of the financial net return showed that farmers were ensured of financial net benefits with insecticide use. However, the risk to the living and non-living components of the environment as production costs will give a lower economic net return or a negative net economic return. These findings should be an eye opener for concerned agencies. Is it not high time that the registration and classification scheme be examined to come up with better scheme adopted to Philippine conditions and for the laws on the judicious and safe use of insecticides be strictly enforced?

RIVADENEIRA, JOEL P.

Design for Environment of Cellulosic Ethanol Production from Cogon (*Imperata cylindrica* (L.) P. Beauv.) – 2014.

The use of cellulosic ethanol as fuel additive is one of the ways to reduce CO₂ emission. Cogon was used as feedstock for ethanol production due to its abundance and non-competition with food reserves. A design for environment was made to maximize potential ethanol yield through optimization of pretreatment. Five methods were optimized and compared quantitatively (cellulose conversion, sugar losses) and qualitatively (time for completion, cost, labor intensity) to determine the best pretreatment. Giving equal importance to both quantitative and qualitative aspects of the methods, results showed that alkali-impregnation (1.49% NaOH, 73.2°C, 15.0 minutes) is the best pretreatment method resulting to 18.74% cellulose conversion after saccharification and 5.93 mg/mL total sugar losses. Potential ethanol production was projected using the identified pretreatment and assumption on fermentation efficiency. One ton of fresh cogon can produce 10.75 kg (13.6 L) cellulosic ethanol. Assuming that a grassland yields 10 tons of dried cogon per hectare, more than 39,000 ha of grassland is needed to produce 30 million liters of cellulosic ethanol per year.

ROGEL, CARMEN NYHRIA G.

Coping strategies of households in a disaster-prone area in Sto. Domingo, Albay, Philippines -- 1998

The study identified the strategies of households for coping with the recurrent eruptions of Mayon Volcano. Socioeconomic characteristics like, age, sex, civil status, educational attainment, origin, source of income, income, ownership of land, farm size, and availability of a relocation site were tested for effects on perceptions of risk of environmental impacts and of capability to respond to the natural disaster. These characteristics and the perceptions were then tested for significant effects on the choice of coping strategies. Data for the study was collected through a survey of 117 households from a proportionate random sample from the six puroks of Lidong, Sto. Domingo, Albay.

The survey were conducted from June to September 1996. Results of the study showed that age, civil status and education each heightened perceptions of risk, of environmental impacts and of capability to respond. Origin and income were negatively associated with the perceptions. Income and primary source of income, in combination, affected only perception of risk. Education and source of income together, led to the perception of better capability to respond. Ownership of land and farm size perception of risk and environmental impacts but led to the perception of lower capability to respond.

Data showed that source of income and income, particularly where farming was concerned, led to change in agricultural practices and taking on additional sources of income. Furthermore, those who had farming as a primary

source of income and were married and heads of households were under extreme pressure to produce resources to meet the basic needs of the family. Ownership of land and farm size were predictors for change in farm practices. Availability of a relocation site led to greater faith in God. Origin likewise led to increased faith in God as Protector. Perception of high risk led to strategies which were physical and material in nature rather than emotional. Perception of high environmental impacts resulted in change in agricultural practices, seeking institutional assistance and greater faith in God, singly or at the same time. Permanent relocation was the least popular course of action and institutional assistance was sought to rehabilitate property to avoid relocation. Perception of capability to respond led to a combination of physical and emotional coping strategies : change in agricultural practices, taking on additional sources of income and greater faith in God as protector. An attempt was made to develop an index for environmental perceptions. The distribution of responses on the scale and item-total correlation were used to determine which items should be retained as components of the index. The composite items need to be expanded and examined further to make the index more sensitive and more applicable.

ROMERO, JOSE FELIPE P

Life cycle assessment of goat (*Capra hircus* L.) production and meat processing – 2013

The LCA of goat production and meat processing evaluated the environmental burdens of slaughter size, 8.3 months old goat from birth to canned meat products of the farm gate. Nine experimental animals of upgraded native goat (50:50 Native X Boer) of various ages were confined for a month to simulate the growth, forage and grass, water, feed requirements, and manure yield up to slaughter size.

The functional units were 1kg carcass, 1kg consumables and 1 kg of processed meat products. Enteric fermentation was found to contribute 74.76 percent of GWP in the production stage. The carcass GWP was 7.80 kg CO₂ per kg while the GWP of consumable meat was 4.034 kg CO₂e per kg. The potential eutrophication of carcass was 0.58 kg PO₄e per kg and the consumable meat was 0.30 kg PO₄e per kg.

For the meat products, the GWP were 5.64 for papaitan, 5.24 for adobo, 3.24 for kaldereta, 3.74 for kilawen and 5.54 kg CO₂e per kg for up and down.

In terms of GWP CO₂e per 200 grams net weight of canned products, papaitan, adobo, kaldereta and kilawen yielded 1.13, 1.05, 0.65 and 0.75 kg respectively while the ready to cook up and down menu with a net weight of 500 grams had a GWP 2.77 kg CO₂e. The total potential eutrophication value was 4.53 kg PO₄e which was contributed by the production stage of 4.28 PO₄e and meat processing stage of 0.25 PO₄e. Environmental management to improve the simulated performance of goat was done.

ROMERO, MARINO R.

Watershed management : impacts on the Tumauni irrigation systems, Tumauni, Isabela -- 1991

This study focused on the impacts of various group of actors intervening in the management of the Tumauni watershed : the largescale logging concessionaires, the small-scale or carabao loggers, the kaingineros or upland farmers, and other groups such as indigenous cultural minorities and part-time fishermen. The activities of these groups were found to cause among other things, increase soil erosion and sedimentation in the Tumauni Irrigation System which led to an apparent decrease in irrigation water.

The study found that the present annual soil erosion loss for the entire watershed is 335,163 tons. The sedimentation rate is 257,705 tons per year; 62percent of which are suspended sediment and 38 percent are bed load. From these data, the sediment delivery ratio was calculated to be 0.77. Due to the inherent operational characteristics of the intake structure, about 489 and 213 tons per year of suspended sediments and bed load, respectively, entered into the irrigation system. However, an estimated volume of 5,644 cu m per year is actually trapped on the river bed section near the intake inlet. The farmer-irrigators blamed the following factors for the decrease in irrigation water : logging (41 percent), NIA-TIS inefficiency (29percent), logging plus kaingin (21percent), climatic variations (5percent), logging plus NIA-TIS personnel inefficiency (2percent), and kaingin (1percent). The study indicates that a watershed management scheme will improve the economic condition of the community. Using a discount rate of 10 percent, the analysis showed an NPV of P1,935,280 and a BCR of 1.01 for the "without watershed" management alternative. On the other hand, the "with watershed" which considers logging for 10 years with watershed protection such as reforestation and ISF projects in the area had an NPV of P167,867,460 and a BCR of 3.27. The sensitivity analysis showed that commercial log ban and planting of industrial tree species instead of dipterocarp species changes significantly the basic case results. High discount rates (15percent) would also reduce the values of the NPVs and BCRs for all watershed management alternatives. This report includes some recommendations for improving watershed management in the study area. It also lists possible topics for further research that would contribute additional knowledge on the complex nature of watershed resources.

ROXAS, EFRAIN D.

Local level Assessment of Land Degradation and Sustainable land Management of Sta. Maria, Laguna Province, Philippines. -- 2013

This study assessed the land degradation and sustainable land management (SLM) of the municipality of Sta. Maria, Laguna using LADA Local assessment methodology integrating participatory rural appraisal, with visual assessment and field measurement of vegetation, soil, and water resources. Remote sensing and geographic information system with land user survey provided understanding of the state, causes and impacts of land degradation and sustainable land management.

Results showed land degradation in irrigated rice areas as loss of soil nutrients and flooding indicated by low organic carbon content and sedimentation of new soils with impact of lower productivity. Composting rice hay and use of organic fertilizer reduced land degradation. In the upland, the practice of kaingin was decreasing. Kaingin practices were driven by small farm size, poverty, and lack of alternative livelihood that resulted to erosion and reduction of vegetation. The sustainable land management practice of agroforestry is increasing and prevented land degradation and rehabilitated resources in the municipality. Forest protection and conservation in the communal forest are also SLM practices while mahogany plantation showed land degradation in the form of loss of biodiversity. The livelihood characteristics of the municipality along with policies and strategies resulted in SLM practices.

ROXAS, RUTH R.

Mangrove Forest Change in Borongan City, Eastern Samar, Philippines. -- 2017

This study aimed to assess mangrove forest extent, detect change and identify drivers of change in Borongan City, Eastern Samar using satellite data from Landsat TM, ETM, OLI TIRS from years 1989, 1993, 2001, 2009, 2013, 2015. Maximum likelihood classification was performed on composite images comprised of cloud and shadow cleared Landsat and a digital elevation model (DEM) generating accuracies at 79.3%, 82%, 88%, and 83.6% with kappa statistics of 0.76, 0.79, 0.86 and 0.81 respectively for 2001, 2009, 2013, 2015. The mangrove forest extent was estimated to be 592.20 ha for 1989, 508.20 ha for 1993, 546.39 ha for 2001, 534.69 ha for 2009, 560.70 ha for 2013, and 51471 ha for 2015. Change analysis showed significant decrease for the periods 1989-1993 ($-3.81\% \text{ yr}^{-1}$) and 2009-2013 ($-0.27\% \text{ yr}^{-1}$), 2013-2015 ($-4.48\% \text{ yr}^{-1}$) and significant increase for the periods 1993-2001 (0.90 yr^{-1}) and 2009-2013 (1.19 yr^{-1}). Mangrove forest loss from over the 26-year period were primarily caused by extraction; conversion to built-up areas and aquaculture ponds; and natural disturbance. The remarkable increase in mangrove forest extent was detected in the period 1993-2001 and 2009-2013 and can be credited to the conversion and planting efforts. The rapid loss of mangrove forest from 2013 to 2015 can be attributed to extreme weather events (Haiyan and Hagupit). The total loss in mangrove forest during the 26-year period was estimated at 77.5 ha or about 3 ha yr^{-1} .

RUEDA, GIRLIE H.

Anthropogenic Impacts on Peatland Ecosystem: The Case of Bambanin, Victoria, Oriental Mindoro -- 2019

Peatlands are freshwater wetlands characterized by the deep accumulation of partly decomposed organic materials called "peat" and are an important terrestrial carbon pool. However, human interventions such as land use changes and unsustainable land management have adversely affected peatland ecosystems. One negative impact of these activities is that peatlands become sources of CO₂ emissions. In the Philippines, very little attention is given to peatland GHG emissions and how these contribute to global warming. This study is a first attempt to measure GHG emissions of a peatland in the country. The main objective of the study was to determine the degree of emissions of peat-derived greenhouse gases (GHGs) such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) to the atmosphere across vegetation cover types. Taking into consideration selected soil physico-chemical parameters and other environmental variables, the extent of soil CO₂, CH₄ and N₂O fluxes across land uses in Bambanin peatland, Victoria, Oriental Mindoro was investigated during wet and dry seasons. Results revealed that the highest average gross CO₂ flux of 232.47 Mg ha⁻¹yr⁻¹ was released at the cultivated area followed by the forestland (171.02 Mg ha⁻¹yr⁻¹) and grassland (102.88 Mg ha⁻¹yr⁻¹) owing to lowered water table level and decomposition of soil organic matter. The low water table greatly influenced the CH₄ emissions across sites especially in the dry season. Negative emissions were displayed by the forested ($-0.002 \text{ Mg ha}^{-1}\text{yr}^{-1}$) and cultivated ($-0.003 \text{ Mg ha}^{-1}\text{yr}^{-1}$) sites while grassland emitted $0.013 \text{ Mg ha}^{-1}\text{yr}^{-1}$. The highest gross N₂O emission of $0.045 \text{ Mg ha}^{-1}\text{yr}^{-1}$, on the other hand, was observed during the dry season at the grassland site as a result of burning where a 93% increase from wet season's emission was recorded. In contrast, both forested and cultivated sites demonstrated a decline in the N₂O emissions of 58% and 86%, respectively, from wet to dry season. Future projections by 2050 indicated that forest cover in the peatland will decrease by 15% while cropland, grassland, built-up and perennial crop areas will be increased by 11%, 22%, 74 % and 75%, respectively. If forest conversions and expansion of croplands and built-up areas will prevail in the succeeding years, higher emissions of these potent greenhouse gases to the atmosphere are very likely to happen. In terms of the concept and existence of a peatland in Bambanin, respondents tended to have a relatively high level of awareness. However, deeper understanding on the importance of peatland and the impacts of anthropogenic activities on the

overall state/condition of the Bamberin peatland was lacking. Results of this study could be used in formulating mitigation policies particularly on the land use management that will address issues on peatland hydrology, agricultural activities and human encroachment to the protected area. The participation of the community in the decisionmaking process and implementation of local policies will also help in the sustainable peatland management.

RUMUNY, CHHIM

Environmental Management of the Stung Mean Chey Solid Waste Disposal Site in Phnom Penh City, Cambodia -- 2008

Strung Mean Chey dumpsite, the only disposal site in the Phnom Penh City, is still being used now and will be full by 2010. There is an urgent need to manage this dumpsite so that its productive lifespan can be extended while waiting for a new disposal site. This study aimed to: a) describe the existing situation of the Stung Mean Chey (SMC) solid waste disposal site in terms of selected biophysical and socio-economic parameters; b) examine the interaction of different institutions that are involved in the management of SMC disposal site; c) determine the perceived effects/impact of the SMC dumpsite on the environmental effects, health, and livelihood of the directly affected communities and the waste pickers.

The study's methodology included collection of data and information through household and waste pickers surveys, key informant interviews and primary data collection for selected biophysical parameters. The analysis of current solid waste management of Phnom Penh City indicated that the system is inadequate and needs improvement from waste generation stage until the final disposal stage. Households in Phnom Penh generate an average waste of 487 g/person/day and the collection rate was 95%. The collection method is inefficient due to old and few collection vehicles. There is no waste discharge rule, thus, people throw wastes to any place after the collection service is done. The average household size of the households and the waste pickers is almost the same, that is, 5-6 members. More illiteracy was found from waste pickers (40%) than the households (28%). Most of the waste pickers come from rural areas. On the other hand, the average monthly income of the household respondents was lower than the average household income in Phnom Penh. Most of the households and the waste pickers were adversely affected by the environmental effects caused by the disposal site.

Moreover, the physical environment such as groundwater, leachate, air and noise pollution were also contributing to the environmental problems. Administratively, the roles and responsibilities of the relevant organizations are not clear. In general, the organizations lack an established system for promoting proper solid waste management including the management of the Stung Mean Chey dumpsite. During the interim period while the new disposal site is being constructed, they households and strengthening the administrative organizations of the City's solid waste management programs for extending the lifespan of Strung Mean Chey disposal site.

RUSTIA, MICHELLE M.

Household waste disposal in the municipality of Los Banos, Laguna, Philippines -- 2001

The social dimension of solid waste management at the household level is the main purpose of this study. Household waste disposal practices in the municipality of Los Banos were classified and analyzed by looking into the individual, and institutional levels in the context of the prevailing socio-cultural setting. This aims to depict an overall scenario of the garbage problem in the municipality. A multi-method research design was used which includes a descriptive analysis of the overall waste management schemes in the municipality, key informant interviews, and a social survey. Five barangays were purposively chosen based on population and type of surrounding environment. There were 405 respondents in the survey. An overview of LB waste management concerns and disposal system was presented. A comparison between the past and present LB administrations showed that some programs, policies and ordinances in the past are also being implemented at present.

Despite relatively high scores on environmental awareness, knowledge and attitude, most respondents have low environmental behavior scores. Half of the respondents recycle their wastes. While 72 percent practice reusing, more than half of them do not segregate their wastes. The methods of disposal and reuse of household wastes depend upon the lifestyle, class and value system of the household members. The transactional approach in environmental psychology was applied for an overall analysis of the waste problem in Los Banos. It was found that individual results of environmental awareness, knowledge and attitude cannot be directly linked with behavior since the latter is the sum of the household's environmental behavior. There are underlying factors that have to be analyzed in order to understand the inconsistent relationship that exists between each of the three (awareness, knowledge and attitude) and environmental behavior. Among these are the lifestyle and value systems existing within the household, as well as the existing norms in society.

RUZOL, CLARISSA DR.

Social Network Analysis of Local Government Efforts to Regulate Water Pollution from Swine and Poultry Raising in the Calumpang River Basin, Batangas, Philippines. -- 2016

The emerging potential of social network analysis to aid decision making has been emphasized in the literature, but concrete applications to solve water pollution problems are limited. This study employs social network analysis (SNA) to assess the local government efforts to regulate water pollution from swine and poultry raising in the Calumpang River Basin, Batangas, Philippines.

SNA characterizes the network of government and non-government actors as well as the types and flows of resources in the resource sharing and collaborative activities network at the local government and the river basin level. Aggregate network metrics, such as density, centralization, and network structure were calculated to assess the efficiency of each network. Network effectiveness was also assessed according to the relational and positional significance of the nodes in the network structure based on the measures of their betweenness, closeness, and eigenvector centralities. Factors influencing the probability of ties in the resource sharing and the collaborative activities network were analyzed using Pearson correlation and standard multiple regression. Qualitative analysis of the personal views about the river and its management of the focal nodes was also conducted to supplement the SNA.

Results showed that the river basin network followed a heterarchical structure where local government networks were cohesively denser. Nodes that shared resources with another node, regardless of institutional type, were likely to engage in a collaborative activity. In the resource sharing network, nodes that had high in degree of resources functioned as bridges in their respective networks connecting nodes that were otherwise not connected. Non-government actors also had limited participations in terms of number and their peripheral position in the network. Moreover, some leaders of the local government units perceives that collective action and involvement of non-government type of actors are necessary to improve the current regulatory efforts but this does not necessarily translate to actions that facilitate collaboration and sharing of resources. Social network analysis provides empirical bases for the improvement of water quality management by bringing the gap between different levels of governance.

SACDALAN, NORCELITA R.

Assessment of Domestic Water Sources for Protection and Conservation in Nagcarlan, Laguna, Philippines. -- 2017

Provision of domestic water is one of the most significant ecosystem services which constitute human well-being. While water cycle implies an infinite process like any other materials on earth, its distribution limits its appropriate use. This seemingly unlimited resource makes water prone to exploitation. Water scarcity is potentially alarming due to inefficient allocation of sources exacerbated by climate change. Degradation of water source is threatening the continuous availability for various uses.. Water balance analysis was used to predict runoff and recharge under various land use change and population growth scenarios. To determine the extent of anthropogenic and natural causes of degradation, water quality parameters were used as indicators. However, these parameters were limited to the most likely indicators. The association of socio-demographic profile with knowledge, attitudes and perceptions of various water users was measured.

Nagcarlan is primarily an agricultural municipality which depends on crops and livestock industry. Formulation of water safety and sustainability management plan is envisioned to strengthen capacities of the communities to adapt to climate change impacts and to reduce risks from natural and socio-economic development impacts. Results showed that public awareness on domestic water consumption, conservation and protection is very wanting.

SADABA, RESURRECCION B.

Environmental assesment of mangrove swamps in Taklong island national marine reserve, Nueva Valencia, Guimaras Subprovince, Iloilo. -- 1990

The study was conducted to predict and assess the significant environmental impacts of the declaration of Taklong Island and vicinity as a National Marine Reserve. It considered three general subsystems of the mangrove ecosystem, namely, the biological, physico-chemical and socio-economic. An attempt was made to apply some of the procedures in a formal Environmental Impact Assessment (EIA). Discussion of all possible impacts follow the general format of a conventional Environmental Impact Statement (EIS).

The study showed that there will be significant impacts on the biological and socio-economic subsystems. On a short term basis, negative effects will be experienced by the owners and direct users of mangrove resources. In the long term, however, the anticipated beneficial effects are the potential increase in the fish yield of near- and off-shore areas, and a similar increase in timber volume as a result of resource protection from excessive utilization. It was also predicted that the area's fishing grounds will become more productive thereby increasing the local fish catch and income. Positive significant biological impacts are predicted to occur such as increases in density, species diversity and abundance of all the biological components of the ecosystem. Such increases will favor coastal productivity to the benefit of communities dependent on it.

Coastal communities will also be protected from coastal erosion problems through the new growths of mangroves. On both long- and short-term basis, the physico-chemical conditions of the area will remain in their optimum except that of dissolved oxygen. The latter may increase with the growth of phytoplankton population on the one hand, and of periphytic algae upon mangrove roots and macrophytes on the other. Likewise, an increase in soil acidity will result from increased litterfall. Such an effect however may not prove detrimental to the human settlements existing. A through monitoring on the changes in the biological and physico-chemical aspects of the mangrove environment is highly recommended to provide ample empirical evidence to the contention that the conversion of Taklong Island and vicinity into a national reserve is indeed effective. Such an activity will significantly augment present knowledge on the dynamics of the mangrove ecosystems in support of a more effective management and utilization of this valuable resource.

SALCEDO, PRECILA V. G.

Floral inventory and assessment of Mt. Amuyao Mossy forest (Luzon, Philippines) for biodiversity resources conservation and management -- 2001

Floral inventory and assessment of the northern slope of Mt. Amuyao, Barlig, Mountain Province was conducted along altitudinal gradients from 1,600 to 2,600 masl. Community utilization of diverse bioresources were determined as well as the conservation status of each plant. A total of 280 vascular plant species belonging to 180 genera and 84 families were recorded from actual floristic surveys and vegetation analysis of the northern slope of Mt. Amuyao. Of the 280 species, 9 are large trees, 25 medium sized trees, 50 small trees, 27 shrubs, 53 herbs, 18 epiphytes, 68 ferns, 12 grasses, 16 vines, 1 liana and 1 climbing bamboo.

Gamma diversity of this sector of the mountain is $H=4.33$. The northern slope of Mt. Amuyao is divided into three zones and four subzones, as follows: Zone 1 - Tropical Moist Forest (1,600-1,800 masl) has a total of 64 species distributed in 59 genera and 37 families. Of the 64 species, 20 are trees, 5 shrubs, 14 herbs, 3 epiphytes, 10 ferns, 9 grasses and 3 vines. This zone has an alpha diversity of $H = 2.65$. Subzone A - Pinus forest (1,600-1,800 masl) is located at this zone. Zone 2 - Tropical Premontane Wet Forest (1,801-2,400 masl) has a total of 202 species distributed in 130 genera and 74 families. Of the 202 species, 56 are trees, 25 shrubs, 42 herbs, 16 epiphytes, 45 ferns, 4 grasses, 13 vines, and 1 parasitic plant. It has an alpha diversity of $H=4.61$. Subzone B - Lithocarpus-Decaspermum forest (1,801-2,200 masl) is located in this zone together with Subzone C - Drimys-Phyllocladus forest (2,201 - 2,400 masl). Zone 3 - Tropical Montane Rain Forest (2,401 - 2,701 masl) has a total of 74 species distributed in 61 genera and 44 families. Of the 74 species, 34 are trees, 6 shrubs, 10 herbs, 5 epiphytes, 15 ferns, 2 vines and 2 parasitic plants. This zone has an alpha diversity of $H = 3.12$. Subzone D - Lithocarpus-Dacrycarpus forest is found within this zone at elevations of 2,401 to 2,701 masl.

The conservation status of the 280 vascular plant species are as follows: 84 species are endemic, 3 rare, 95 common and widespread. According to their uses and functional roles, the 280 species with multiple uses can be classified as followed: 21 are medicinal, 13 timbers, 105 ornamental, 122 landscaping, 29 domestic uses and the rest is of ecological importance. Among the three zones, Zone 2 has the highest species diversity ($H = 4.61$), followed by Zone 3 ($H=3.12$) and lastly, Zone 1 ($H=2.65$). A total of 115 Fernald terms consisting of Fernald names for vascular plants and household words are recorded here for the first time. Traditional beliefs practiced by the natives in extraction of forest products are also identified. Some of the identified beliefs could help in the conservation of the resources. However, it was revealed by the study that cultural and indigenous practices of the people in the area is eroding due to modernization. Utilization of bioresources in Mt. Amuyao is still sustainable however, with the present economic condition in the area, it is necessary that socio-economic aspect of the natives be given immediate action by the government.

The socio-economic status of the indigenous tribes in the study site affects the utilization of bioresources and therefore should be given urgent attention concomitant with the government's implementation of natural resources planning and management. It is predicted that if no action will be done, denudation and depletion of these diverse bioresources of Mt. Amuyao will occur in the next decade or so.

SALES, JEMILY M.

Influence of Water Quality on Milk Yield and Milk Quality of Holstein Friesian X Sahiwal Crossbred Cows in Dairy Products and Development Technology Division, ADSC, UPLB -- 2017

The objectives of this study were to assess the quality of water used in DTRI UPLB and to determine the effects of drinking water quality consumed by dairy cows on their water intake, milk yield and composition. For the study, nine lactating Holstein Friesian Sahiwal crossbred dairy cattle cows were used. The experiment used the 3 x 3 latin square design. Wherein three different water sources were used (treated water, stock water, and deep well water). The trial lasted for 54 days with 15-day experimental period and 3-day adjustment period.

Water quality was analyzed in the laboratory of Laguna Water District. Parameters such as odor, taste, pH, conductivity and total dissolved solids were used to analyze physical properties of water. Chemical property of water was analyzed using aluminum, boron, chromium, fluoride, manganese, iron, chloride, sulfate, copper, hardness, zinc, nitrate and nitrite. The quality of water in terms of physical and chemical properties passed the water drinking standards of Philippine National Standards for drinking water. However, deep well and stock water obtained high levels

of coliform count. Upon collection, milk samples were immediately brought to the laboratory of Hacienda Macalauan and analyzed. It was found out that water intake and milk yield of cows were not affected ($P>0.05$) by the different treatments. Among the milk characteristics, only total soluble solids was significantly ($P<0.05$) affected by water quality. Incidence of mastitis was also observed from the animal drinking from stock and treated water.

SALVACION, ARNOLD R.

Assessing potential impact of changing climate on agricultural crop productivity in the Philippines -- 2009

Agriculture crop production system is considered one of the sectors that will be highly affected by projected climate change. This is because of the direct influence of climate change not only on the crop but as well as on different production processes and activities. However, major concerns focus on impact on climate change on crop productivity because it directly translates to possible problems on the food supply.

Using research tools such as the geographic information system, stochastic weather data generator (SIMMETEO), and crop simulation models (CERES-Rice and CERES-Maize), possible effects and impacts of the projected climate change on two (2) major cereal crops (rice and corn) in the Philippines were assessed under different climate change scenarios (A1, A2, B1, and B2) which are characterized by different levels of atmospheric temperature and carbon dioxide concentration.

Simulation results showed contrasting results for productivity of rice and corn crops in this study. Corn showed consistent yield decrease for most of the provinces in the country across climate change scenario for three (3) simulated time periods (i.e. 2020, 2050, and 2080) both for wet and dry season cropping while rice showed almost the opposite, except for the A1 scenario year 2020 dry season cropping. This difference in productivity between rice and corn was due to the photosynthetic pathway each crop use which determines their response to increasing level of atmospheric temperature and carbon dioxide concentration, which are the main characteristics of climate change.

SAMIANO, RONILO G.

Pollution loading from point and non-point sources in San Cristobal watershed, Laguna de Bay basin, Philippines -- 2009

The Laguna de Bay basin is facing environmental pressures due to the ever increasing population, land-use conversion, and unabated pollution deliberately discharged in the river systems. The pollution loading from point and non-point source of San Cristobal watershed was determined using Tank Model (Tajima, 2004). BOD5 total nitrogen phosphorus, total suspended solids, and total coliform were the water quality parameters used. The model calculated the run-off load and the effluent load. Ground truthing was done to validate the location of pollution sources.

Secondary data were obtained from LLDA on human population, types of industry, livestock population, and non-point sources. The generated pollution loads from various sources were integrated into watershed pollution load. The generated load were : 10,005 ton/BOD5, 1,521 ton NH₄-N/year, 409.45 ton total TP/year, 93,818 ton TSS/year and 1.12E+13 mpn/year for Tcoli. The effluent load were : 7,203 ton BOD5/year, 1,213.1 ton NH₄-N/year, 445 ton TP/day, 71,635.6 ton TSS/day, and 2.83E+12 mpn/day for Tcoli. The domestic load was the highest generator of the five water quality parameters

SAMPANG, ARLENE G.

Ethnoichthyology and conservation practices of the Calamian Tagbanwa Coron Island, Palawan, Philippines -- 2005

Ethnoichthyological studies have provided evidences of the rich knowledge of traditional fishermen about fish. Customary marine tenure systems and traditional practices are seen as alternative to approach problems in fisheries management. This study examines the extent of the local ecological knowledge of the Calamian Tagbanwa about fish and compares with existing scientific information, describe the fishing gears and methods, resource management practices and customary laws. Group discussions, ethnographic interviews and direct observations are used to understand the underlying principles of how the Calamian Tagbanwa categorize marine resources found in their ancestral waters and factors influencing their resource use and management.

The Calamian Tagbanwa classifies fish based on habitat, schooling behavior, morphological appearance and market value. Their knowledge about the habitat and the diet of the fish in most part is in accordance with the scientific literature. This indicates that their knowledge has direct implication to the status of ancestral waters and may contribute to the fishery management strategy in the preparation of their sustainable and protection plan. The folk taxonomy of the Calamian Tagbanwa includes fish as a lifeform and their naming system is constructed in terms of their interaction with the marine environment. Hook and line, spear gun and gillnet are the commonly used fishing gears during southwest and northeast monsoon, respectively. Calamian Tagbanwa conservation practices in the ancestral waters are in the context of sacred and restricted areas. The punishments traditionally practiced are panglaw -- hands are tied in a wooden contraption for 5 days and burdun -- 12 lashes of rattan cane. The influx of migrants and the use of illegal fishing methods cause the decreasing fish harvest among Calamian Tagbanwa. Poverty, influence of migrants and introduction of

Christianity are seen as a hindrance in continuing their beliefs and practices in the ancestral waters. Information campaign, consistent implementation and recognition of their customary laws will help in the protection of their ancestral waters.

SANCHEZ, FERNANDO C. JR.

Environmental assessment of the Manila Southwoods residential estates and golf and country club project, Carmona, Cavite, Philippines -- 1994

An Environmental Impact Assessment (EIA) was conducted on the Manila Southwoods Residential Estate and Golf and Country Club Project to serve as an EIA model for this type of project in a Philippine setting. This study viewed the problem from a systems perspective taking into consideration the biophysical and socio-economic characteristics of the development site and its surrounding areas. Analytical tools used in EIA were employed in the analysis. Descriptive statistics and simple frequency analysis were primarily used to describe the characteristics of respondents.

The golf course-cum-residential-cum-commercial project involved massive earth movement and clearing of vegetation which greatly affected the originally flat to slightly rolling agricultural land mainly planted to sugarcane and rice. The major impacts observed were on the clearing of vegetation and soil erosion problems during construction, stress on the water resources both in quantity and quality, modification in topography leading to change in rainage pattern, soil waste generation, fertilizer and pesticide use, and displacement of labor and human settlement. Beneficial impacts observed include employment generation, enhancement of vegetation and wildlife habitat, improved facilities, enhanced economic activity and increased revenue for the local government.

Enhancement and protection measures were presented to improve further beneficial impacts and mitigate the negative impacts. These measures include protective measuring during construction particularly for erosion mitigation, improvement and protection of natural drainage channels, equitable use of water resources, proper waste handling, reduction in fertilizer and pesticide use, maintenance of wildlife habitat and increased business opportunity. Perception survey conducted with the households of Barangays Mabuhay and Cabilang Baybay and management and laborers in the project showed that majority of the respondents see the project to be beneficial. Overall, the project is beneficial if the proper enhancement and protection measures are provided. The project is expected to improve the environmental and economic aspect of the previously agricultural land area.

SANCHEZ, MICHAEL S.

Bioaccumulation of Heavy Metals and Prevalence of Parasites in Avian Species on the Landscape of Marinduque Island, Philippines. -- 2015

The concentration of heavy metals in soils and feather and the prevalence of parasites in adult wild birds and free range domestic chicken were investigated in domestic chicken and wild birds from the uncontaminated Mt. Balagbag Range at the Marinduque Wildlife Sanctuary (MWS) and contaminated Brgy. Ipil, Sta. Cruz (Ipil), Marinduque Island, Philippines.

Highest prevalence of ectoparasites (19.44%) for both chicken and wild birds was observed in the contaminated site while hematozoan infection was also high in chicken of the same area (20%) and in wild birds from the uncontaminated area (36.5%). The trend for heavy metal burden in wild birds and chicken respectively, were Fe>Zn>Mn>Cu>Co>Cr>Hg>Sc>Pb>Sr>Se>As and Fe>Zn>Mn>Cu>Cr>Sc>Sr>Pb>Se. The amount of As, Cr, Hg, Pb, Se, and Zn exceeded the critical level reported in several studies. Indigo banded kingfishers, Barred rail and Philippine hanging parakeet from MWS and White collared kingfisher, Pied fantail, White browed crane, and Little heron from Ipil had the highest concentrations of elements in feathers while reddish cuckoo dove and Pink necked green pigeon had the lowest. Heavy metals were highest in feathers and soils from the contaminated site. The survey also revealed that birds were used by some locals to cure asthma and rheumatism.

SAÑOS, ERIBERTO B.

An Analysis of the Impacts of Users and their Uses of Local Resources on the Biophysical State of Quezon National Park (QNP) in Quezon Province, Philippines -- 1998

The study aimed to analyze how the present condition of Quezon National Park (QNP) was brought about by the different users and uses, the patterns of interaction among the users with the interplay of existing policies that govern its use and management. The degradation of the park was evaluated using forest, wildlife, minerals and water resources as indicators.

Primary and secondary data were secured by using a triangulation method which combined personal interviews among key informants, secondary information and ocular observation in the study area. A semi-structured interview schedule were administered to sixty respondents. Half of the respondents were actual park occupants and were selected

through a stratified random sampling. The other half were residents from nearby communities selected through simple random sampling.

Results of the study revealed a continuous degradation of the park. The remaining forested area is about 68.72 percent. Wildlife diversity has been severely depleted. Mineral resources particularly limestone formations are likewise threatened with degradation due to continuous extraction. Water supply has been greatly reduced. Park occupancy has been on the rise. Resource use is characterized by individualistic behavior. Users which include kaingineros, loggers/timber proachers, charcoal makers, fuelwood collectors, vines, rattan and limestone gatherers referred in this study as illegal users or park violators treated QNP as a huge open-access resource. This resulted to a mutually destructive competition over the resource. Reciprocity among the different groups of users is almost non-existent. Users do not adopt any appropriate technologies to attain a sustainable and successful joint use of the resource.

On the other hand, there exists conflict between violators and law enforcers. Relevant patterns of interaction between them include concealment, deceit, intimidation, threats and violence. The Department of Environment and Natural Resource which is mandated to protect and maintain QNP was not able to totally control violators due to some structural/administrative, political, economic and physical problems. The existing use of DENR over QNP as site for contract reforestation revealed some inconsistencies against the principle of maintaining a national park. Some of the possible adverse effects of implementing a contract reforestation include the introduction of exotic and commercial species, creation of monoculture plantation and alteration of natural condition. Likewise, the Assisted Natural Regeneration (ANR) project which was supposed to improve the natural vegetation of the park was not realized. On the contrary, the project has disposed the park into further destruction that made it attractive to violators to exploit the remaining resources therein. Furthermore, the presence of military detachment inside QNP did not totally control illegal activities. Record show that their participation in protection activities only complicates the problem besetting the park.

The study noted the need for the following measures in order to check the deterioration of QNP and promote sustainable management of its resources : strict implementation of NIPAS law; enough logistics is needed to strengthen the administrative capability of DENR; establish linkages with LGUs, NGOs, OGAs, private sectors and all stakeholders; maintain patrol trails, checkpoints together with communication facilities; relocation of QNP boundary; organize communities and park occupants in undertaking social fencing strategy; and formulate and implement a comprehensive fire management plan. The conduct of an agroecosystem analysis is further suggested to assess and prioritize problems in QNP. This will be helpful in finding appropriate solutions to address these problems. Finally, the findings of the study showing a strong relationship between policy attributes and the patterns of interaction that affect the present condition of the park could be a subject of future researches to develop a model in analyzing problems specifically on protected areas.

SANTIAGO, JHOANNA O.

Determining the Resilience of Chaya Socio-Ecological Production Landscape, Ifugao, Philippines -- 2018

The Chaya Socio-Ecological Production Landscape (CSEPL) refers to the entire Chaya Rice Terraces System including the woodlot (pinuchu), the rice terraces (pajaw) with its irrigation coming from the river and natural spring, and the village. It is one of the Ifugao Rice Terraces in Cordillera Region inscribed in UNESCO's World Heritage Site and Globally Important Agricultural Heritage Sites (GIAHS). It has been a model of grandeur and resilience for the past 2000 years. However, in the face of severe climatic and socio-cultural changes, its past resilience is not a guarantee that it can withstand new disturbances. This study hypothesized that Chaya is highly resilient. It aimed to determine the resilience level of CSEPL in order to identify vulnerabilities so that action can be taken to sustain the landscape. The study made use of qualitative and quantitative research design. Firstly, it identified the determinants of resilience based on the perspective of the community using focus group discussions (FGD) and thematic analysis. Themes included the farming practice, cultural traditions, social network, family income and biodiversity. These determinants were operationalized by looking at the social and ecological dimensions. The social resilience was assessed using semi-structured interview while the ecological resilience was determined by vegetation structure assessment using plot method. Results of the interview indicated that there was a strong institutional support in Chaya. On the other hand, vegetation analysis revealed that the forest of Chaya is biodiversity rich with $H' = 3.83$ dit. These results were combined into a composite index to determine the overall level of resilience. It was revealed that the socio-ecological resilience score of CSEPL is 0.75 indicating a moderately high resilience contradicting the earlier hypothesis that Chaya is highly resilient. The ecological indicator contributed 0.50 in the total index score while the social indicators was only 0.25. Social network had the highest index value while the family income had the lowest implying the need for government intervention if the lives of indigenous people have to be improved and UNESCO World Heritage inscription is to be sustained.

SANTILLAN, BERTAND ALDOUS L.

Characterization and Heavy Metal Pollution Assessment of Sediments from Laguna de Bay, Philippines – 2018

Laguna de Bay, the largest lake in the Philippines, is threatened by worsening environmental quality due to the negative impacts of urbanization and industrialization. One of the issues pressuring the lake is shallowing due to

increased sedimentation. Plans are underway to dredge the sediments to restore the lake. However, little is known about the quality of the lake sediments especially its pollutant concentrations. In this study, sediments in the South Bay were investigated for its geochemical characteristics and heavy metal pollution. Sediment cores from the upper >1 m of the lakebed were collected from eight locations around the South Bay. The cores were macroscopically analyzed before subsampled at 2.5 cm intervals, dried, analyzed for water content and total organic matter content, sieved up to 63 μm and analyzed for grain size and total heavy metals using XRF and ICP-OES. Results of the analyses showed that water content differs between cores, the average total OM is at 11%, and grain size and total HM differ among core locations and depth. Ten HM of industrial significance were assessed using four single indices: EF, Igeo, CF and AF, and four integrated indices: PLI, NPI, mCd, and RI. It was found that Sn and Pb are highly enriched and strongly contaminated, while Sb has moderate enrichment and contamination, the rest are minimal. As is the least enriched and polluted. Ordinary kriging interpolation was used to show the spatial distribution of pollution indices. It was found that the San Cristobal River mouth area is highly polluted, primarily by Sn, while the midlake is moderately polluted, primarily by Pb. Potential sources of Sn and Pb were identified by inspecting the industrial activities in the area, as well as other lake dynamics. The ecological risk assessment showed considerable risk in the San Cristobal River mouth and moderate risk in the mid-lake. Decision and policy makers should consider the Sn, Pb, and Sb pollution in the management of sediments and the monitor the discharges of industrial parks to the lake.

SANTOS, LOUIS BALBINO U.

Developing a Method for Modelling the Influence of Typology and Landscape Maintenance Practices on Green Roof Carbon Balance. – 2020.

A dynamic model was developed to assess the carbon dynamics of a hypothetical 1,000 m² green roof system (GRS), which includes both green roof components and its landscape maintenance regime during its 40-year lifespan. There were 6 model run scenarios: Ext-BAU, Ext-BMP, Int-BAU-t, Int-BMP-t, Int-BAU-p, and Int-BMP-p. Under each scenario, green roof physical properties and carbon dynamics varied with respect to typology (intensive/IGR or extensive/EGR), maintenance regime ("business-as-usual"/BAU or "best management practice"/BMP), and vegetation used (trees or palms; for IGRs only).

BAU maintenance regimes for an IGR and an EGR in Metro Manila, Philippines were characterized through key informant interviews. Developed from in-situ biomass estimations of *Excoecaria cochinchinensis* Lour., *Tabebuia rosea* (Bertol) D.C., and *Wodyetia bifurcata* A.K. Irvine in both sites and in plant nurseries, vegetative growth models were used to determine vegetative carbon sequestration in the model. Through a literature review that revealed the lack of research for Philippine-based GRSs, best landscape management practices, greenhouse gas (GHG) emission rates, carbon cost of green roof components, and financial cost of maintenance inputs were identified and integrated into the model.

Model run results showed that mean carbon balance of GRSs under BAU and BMP regimes was 67.3 ± 5.71 and -3.81 ± 3.43 kg-CO₂eq m⁻², respectively. Under BMP scenarios, GRSs were gross carbon sinks. However, all six scenarios became net carbon sources when high carbon cost of GRS components is considered. Using water-efficient plants and recycled materials in green roofs is highly recommended. Future researchers are encouraged to explore the influence of maintenance intensity on the sequestration rates of ornamental plants.

SANTOS, MARAIDA

An Assessment of Foreshore Land Conversion in the Northern Coastline of Mandaue City, Cebu, Philippines -- 2007

The study is a reassessment of the proposed foreshore conversion of the remaining coastline of Mandaue City, Cebu, Philippines from a predominantly aquaculture-based foreshore land use to a reclamation project for commercial and industrial land use purposes. The current net benefits being accrued from aquaculture-based industries and the remaining benefits accrued from the foreshore in terms of productivity and land values were measured. Estimation of mangrove benefits was done through a Benefits Transfer approach.

Assessment was done using the "With" and "Without" the project approach wherein the incremental net benefits were computed. The Financial Benefit-Cost Analysis (BCA) revealed that the proposed reclamation project is not financially viable due to the negative Net Present Values (NPV) and extremely low Internal Rate of Returns (IRR). In Economic Analysis of the proposed reclamation project was further conducted. Results of the analysis showed that the NPV of the incremental net benefits were negative. This implies that from the point of view of the society, the proposed reclamation project is not feasible.

SANTOS, ROWENA ANDREA V.

Environmental assessment of fishpen culture in Pansipit river (Barangay Poblacion, San Nicolas, Batangas) -- 1993

The study was undertaken to identify and assess the impacts produced from tilapia culture in Pansipit River (Barangay Poblacion, San Nicolas, Batangas). Three subsystems of the river : physico-chemical, biological and

socioeconomic components were considered. Moreover, two phases of the aquaculture technology were taken into consideration : the site selection and construction, and the operation and maintenance. The general procedure of the Environmental Impact Assessment (EIA) was used in the study listing all possible impacts that can be identified. However, only significant impacts were selected and discussed. Results of the investigation showed possible significant impacts to occur on the biological and socioeconomic subsystems of the river. On a short-term period, adverse impacts are seen to open fishermen who will not look for other fishing grounds. Disturbance of the benthic habitat is also foreseen. Water quality will also be altered because of the commercial feeds being supplied to the fingerlings. In the long-run, positive impacts will prove beneficial from the operators to the consumers who will be ensured of continuous fish supply. On the water quality level, potential improvement of primary productivity is possible because of the enrichment of the nutrient pool and when bamboo stakes or nets serve as medium for attachments of the phytoplankton. Continuous flushing of the river will ensure that eutrophication of the river is least likely. From here, it is also possible that an improvement of the fishery resources (diversity and population) will take place.

Considering the economic net benefits of the operators, this suggest that tilapia culture in the river, within certain limits, should be continued. However, along with this, monitoring on the number of pens operating should be monitored since present number of these has already congested the river aside from obstructing the navigation. Recommendations on the monitoring of a) water quality particularly sulfur content to prove that this causes fishkills in the river, b) fishery population - migration from Taal Lake into Balayan Bay and vice-versa to formulate solutions for the improvement of their population, and c) time-series data gathering of the fishery resources (pen or open) to determine maximum sustainable yield of Pansipit River. The abovementioned factors will contribute to a more effective management of the Pansipit River's resources.

SALDAJENO, PILAR B.

Social Vulnerability and Adaptation Strategies to Climate Variability and Extremes of Upland Communities in Sibalom Natural Park (SNP), Antique, Philippines. – 2011.

This study assessed the social vulnerability of upland communities in SNP to risks of climate variability and extremes and the adaptation strategies employed to address such risks. A survey method was used coupled with focus group discussions and validated by secondary data and key informant interviews. Social vulnerability was measured using 39 indicators representing human, natural, social, financial, and physical capitals. Social vulnerability index (SVI) was computed using the equation adopted from Hahn, Riederer, and Foster. Pearson Correlation, Pearson Chi Square, and Spearman Correlation were used to analyze the relationship of age and gender of the household head and household size to social vulnerability, respectively.

The result of the study showed that Tordesillas and Cabladan were the most vulnerable, followed by Imparayan, with 0.340, 0.344, and 0.367 SVI, respectively. Combined SVI for the three communities was 0.350. Positive correlation was found between age and household size to social vulnerability while gender of household head was not correlated. High vulnerability was ameliorated by diversification and labor migration. Foremost household adaptation strategies included storing either food, firewood, medicine, or water; reducing consumption; availing of loan; tree planting for timber, and conserving power. It is recommended to strengthen education, population management, access to government support, quality of income sources, and basic infrastructure to minimize vulnerability.

SALES, JEMILY M.

Influence of Water Quality on Milk and Milk Quality of Holstein-Friesian X Sahiwal Crossbred Cows in Dairy Products and Development Technology Division, ADSC, UPLB -- 2017

The objectives of this study were to assess the quality of water used in DTRI UPLB and to determine the effects of drinking water quality consumed by dairy cows on their water intake, milk yield and composition. For the study, nine lactating Holstein Friesian Sahiwal crossbred dairy cattle cows were used. The experiment used the 3x 3 latin square design. Wherein three different water sources were used (treated water, stock water and deep well water). The trial lasted for 54 days with 15-day experimental; period and 3-dau adjustment period.

Water quality was analyzed in the laboratory of Laguna Water District Parameters such as odor, taste, pH, conductivity and total dissolved solids were used to analyze physical properties of water. Chemical property of water was analyzed using aluminum, boron, chromium, fluoride, manganese, iron, chloride, sulfate, copper, hardness, zinc, nitrate and nitrite. The quality of water in terms of physical and chemical properties passed the water drinking standards of the Philippine National Standards for drinking water. However, deep well and stock water obtained high levels of coliform count. Upon collection, milk samples were immediately brought to the laboratory of Hacienda Macalauan and analyzed. It was found out that water intake and milk yield of cows were not affected ($P>0.05$) by the different treatments. Among the Milk characteristics, only total soluble solids were significantly ($P<0.02$) affected by water quality. Incidence of mastitis was also observed from the animal drinking from the stock and treated water.

SANTOS, LOUIS BALBINO U.

Developing a Method for Modelling the Influence of Typology and Landscape Maintenance Practices on Green Roof Carbon Balance. – 2020.

A dynamic model was developed to assess the carbon dynamics of a hypothetical 1,000 m² green roof system (GRS), which includes both green roof components and its landscape maintenance regime during its 40-year lifespan. There were 6 model run scenarios: Ext-BAU, Ext-BMP, Int-BAU-t, Int-BMP-t, Int-BAU-p, and Int-BMP-p. Under each scenario, green roof physical properties and carbon dynamics varied with respect to typology (intensive/IGR or extensive/EGR), maintenance regime ("business-as-usual"/BAU or "best management practice"/BMP), and vegetation used (trees or palms; for IGRs only). BAU maintenance regimes for an IGR and an EGR in Metro Manila, Philippines were characterized through key informant interviews. Developed from in-situ biomass estimations of *Excoecaria cochinchinensis* Lour., *Tabebuia rosea* (Bertol) D.C., and *Wodyetia bifurcata* A.K. Irvine in both sites and in plant nurseries, vegetative growth models were used to determine vegetative carbon sequestration in the model. Through a literature review that revealed the lack of research for Philippine-based GRSs, best landscape management practices, greenhouse gas (GHG) emission rates, carbon cost of green roof components, and financial cost of maintenance inputs were identified and integrated into the model. Model run results showed that mean carbon balance of GRSs under BAU and BMP regimes was 67.3 ± 5.71 and -3.81 ± 3.43 kg-CO₂eq m⁻², respectively. Under BMP scenarios, GRSs were gross carbon sinks. However, all six scenarios became net carbon sources when high carbon cost of GRS components is considered. Using water-efficient plants and recycled materials in green roofs is highly recommended. Future researchers are encouraged to explore the influence of maintenance intensity on the sequestration rates of ornamental plants

SEDIGO, NOEL A.

Agroecosystem analysis of Ikloy river watershed in Indang, Cavite -- 1994

The study was conducted to : 1) identify and describe the major farming systems existing within the Ikloy River Watershed; 2) identify the factors that lead to the present farming systems in the area; 3) assess the productivity, stability, sustainability and equitability of the watershed ecosystem; 4) identify how the behaviour and performance of farming systems affect the productivity, stability, sustainability and equitability of the watershed; and 5) come up with suggestions and policy recommendations for the conservation and management of the watershed.

The systems approach using the agroecosystem analysis procedure defined by Conway was used in the study focussing on the farm and watershed. Secondary data collection, transect and survey questionnaires were used to gather data. A total of 62 farmer respondents permanently cultivating upland farms within the watershed were included in the study. Chi-square test, frequency and correlation analyses were used to analyzed the data. Two major farming systems, classified as coconut-based and coffee-based, were identified. These farming systems are rainfed, with flat to hilly topography, not integrated with animals, and employ mixed or multiple cropping system of planting crops. Farmers grow crops both for home consumption and commercial purposes. Majority of the farmers apply fertilizers in their farms but do not use chemical pesticides. Soil conservation measures employed by farmers are alley cropping, planting of nitrogen-fixing trees like madre de cacao and ipil-ipil, composting, minimum weeding and "tambak" system or their indigenous way of controlling surface water flow and soil erosion. Farmer respondents have an average household income of P84,910.82. Non-farm sources contributed 76percent to the total household income while the farm contributed only 24percent. Household income, educational attainment, and farm expenses/cost have significant relationships. Household income onfarm size have highly significant relationship.

The type of farming systems in the area is attributed to prevailing market and market conditions, topography and climate. Analysis using chi-square tests and correlation coefficients showed that cropping systems have significant relationship with age, and farming experience. Cropping system and farm size have highly significant relationship. In decision-making at the farm level, the husband decides on the cropping system to follow, harvesting, marketing and price of products. The influence of co-farmers affect most the farmer's decisions. Factors that determined the systems properties or behaviour of the watershed ecosystem were classified as positive or negative. Soil and water conservation practices, mixed or multiple cropping system, land suitability and capability classification, maintenance of diversity, development of other sources of water, development of alternative sources of income, absence of big land owners and regulated resource use are factors that contribute to the productivity, stability, sustainability, and equitability of the Ikloy river watershed. The negative factors are inadequate agricultural support services, natural calamities like typhoons in droughts, inefficient water supply and distribution system, land conversion, fluctuating market price, pests and diseases, soil erosion and the absence of a watershed protection program. An impact flow diagram revealed that performance and behaviour of the farm systems directly affect the productivity, stability, sustainability, and equitability of the watershed ecosystem. Findings of the study stressed the need to have a watershed protection program. Identified key players in the area are the Indang Water District, local government units like the DA and Municipal Development office, DSAC, farmers and consumers groups.

SEGUMPAN, MARINA J.

Infusion of environmental education dimensions in the general education curriculum of selected state colleges and universities in Region X -- 1995

Some general education courses in biological, social and physical sciences of three state universities and colleges in Region X were evaluated to determine the integration of environmental education concepts, and the factors influencing their integration. Structured questionnaires and interviews of forty-one randomly selected faculty members of Bukidnon State College, Malaybalay, Bukidnon, Mindanao Polytechnic State College, Cagayan de Oro City and Central Mindanao University, Musuan, Bukidnon was conducted. Ranked according to extent of integration were concepts in Balance of Nature, Interdependence and Pollution. These were mostly integrated in Biology, Sociology and Economics. Eighty-five percent of variation of integration of environmental education concepts were due to educational background, in-service training, length of teaching experiences, personal characteristics of the respondents and availability of reference materials.

The attendance to EE and non-EE seminars, trainings, and workshops, the extent of integration of change and pollution concepts and the perception of the respondents regarding the frequency of infusion of environmental education concepts differed significantly among the respondents of the three schools. Overloaded curriculum, lack of reference materials and the need of trainings, seminars and workshops were problems encountered by most of the respondents.

SENGTHAVIDETH, SYDOMPHANE

Women's Participation in Biological Diversity Conservation in Nam Et-Phouloey National Protected Area, Lao PDR. -- 2013.

The study was conducted to determine women's participation from our four villages representing three zones (urban, sub-urban and rural) in the Nam Et-Phouloey national Protected Area (NEPL NPA) of Viengthong and Huameuang Districts in Huaphan Province, Lao PDR. The variables that are associated with the nature of participation in NEPL NPA activities and the formulation of strategy framework for NEPL NPA were identified and analyzed.

The study utilized both primary and secondary data to analyze the social-psychological characteristics of the respondents. Primary data were collected from interviews of households, key informants, and focus group discussion which provided information on the state of the knowledge on NEPL NPA program, attitude towards NEPL NPA and participation, satisfaction with existing NEPL NPA activities, participation with NEPL NPA activities, and factors limiting women's participation in the protected planning and implementation phases. Using interview schedule, a total of 192 respondents, 6 key informants were interviewed and three focus group discussions were conducted.

Results of the study show that the respondents were satisfied with the biodiversity conservation activities and on the presence of NEPL NPA program. They had positive attitudes to participation and NEPL NPA program. However, the respondents had low knowledge level on ecotourism and NEPL NPA management and were found to have moderate knowledge level on boundary and basic biodiversity conservation. But they had low participation in all activities in both planning and implementation phases of NEPL NPA program. The main factors that limited the respondents' participation were time (they do not have time to participate); ownership/rights (they do not have their right to participate); low knowledge level (whether they do not have or they lack enough knowledge to participate in NEPL NPA activities).

Based on the findings, the NEPL NPA needs to improve women's participation following the recommendation in the modified plan for NEPL NPA that will include and increase women's participation in all activities in each phase of NEPL NPA programs for the conservation goals to be achieved and to succeed.

SHARMA, MUNNI

Factors affecting the performance and effectiveness of selected community forestry projects in Nepal. -- 1987

The study aimed to : find out the effects of certain biophysical factors on the survival of plantation species; determine and analyze the nature and the extent of the villagers' community participation in relation to their socioeconomic and cultural characteristics; and assess the effectiveness of the Community Forestry Program with respect to its goals.

Primary and secondary data were used in the study. Information on the survival rates of selected plantation species were obtained from six districts which represented some of the districts in the eastern, central and western regions of Nepal. To countercheck the macro level data gathered in the six districts, two case studies were conducted in two panchayats in the Bhaktapur District: Dadhikot and Duwakot. The former represented a relatively successful community forestry project while the latter, a relatively unsuccessful. One hundred twenty households were randomly selected from the two panchayats representing 10 percent of the total households in nine wards in Dadhikot and five in Duwakot.

The primary data were obtained with the use of a pretested interview schedule and through personal observations and discussion with formal and informal panchayat leaders, school teachers and authorities concerned. The analysis was basically descriptive using frequency counts, percentages, means and standard deviations for simple

comparisons. The t test and chi-square (X²) test were also used to determine the significance of relationship between and among selected variables. The average survival rate of plantation trees was higher in Dadhikot than in Duwakot. Within Dadhikot, the survival rates were higher in three-year-old and one-year-old plantations than in the two-year-old plantations. Majority of the respondents had a clear understanding of what a Community Forestry Project is, with the proportion slightly higher in Dadhikot than in Duwakot. The most common perception was that CFP means common forest. In both projects, only a small percentage of the villagers were informed of the project during its inception or planning stage.

A great majority of the respondents from both panchayats were aware of the CFP but only a little over 50 percent were reportedly involved in some of its activities. Majority of the respondents from both panchayats were involved in actual project implementation, the proportion of which was slightly higher in Dadhikot than in Duwakot. However, participation was limited to labor contribution for afforestation activities and planting of CF species in private holdings. Participation was positively related to literacy, farm size, private forest holdings and accessibility of plantation sites. Majority of the respondents cited lack of fuel and fodder as the primary reason for their participation in the CFP.

The major reason cited for nonparticipation in CF were inaccessibility of plantation sites and lack of time for labor contribution. With regard to the effectiveness of community forestry, there was improvement in livestock-feeding practices and increase in livestock holdings. Water, fuel and fodder provision were some of the direct benefits identified. Availability of free seedlings encouraged planting of trees which promoted the establishment of more private plantations.

SHRESTHA, NEERU

Women's participation in community forestry (A case study of two village Panchayats in Kaski district of Nepal) -- 1987

The objective of the study was to assess women's participation and to determine the factors affecting women's participation and the extent of community participation in the community forestry project in Nepal. Lekhnath and Siswa were the two village Panchayats of Kaski district selected for this study. In addition to the formal survey of 120 households and 10 forestry professionals, other sources employed in data gathering were informal discussions with local leaders and forestry officers, and review of published and unpublished information from various concerned agencies.

Majority of the respondents were found to be aware of the importance of forest and also the rapid rate of deforestation due to high population growth. They were not, however, quite aware of different aspects of the community forestry programs and the benefits obtainable from them except free seedlings. Hence the willingness to participate voluntarily in such programs was low. In general, the villagers had shown unfavourable attitude towards forestry institutions. Community level participation, although low in general, was higher in Siswa than in Lekhnath with corresponding survival rates of about 90 percent and 60 percent, respectively. The extent of women's participation in community forestry in general, was quite low in both the panchayats. Their participation in implementation was limited to filling polypots and sowing seeds. They were not involved in any of the on-going management activities.

As a whole, the village level participation in community forestry was more political than a conscious, voluntary decision of the villagers. Even the forestry professionals themselves were found to have only a vague conceptualization of the community forestry. Majority of the household factors considered, namely, family size, fuelwood requirement, livestock ownership, contact with extension workers, perception of the value of the forest and the ways of conserving the resources, and the respondents' attitude towards forest committee, forest officers and government regulations were found to be positively related to participation. Farm size, however, was related inversely. Among the different cultural groups, Gurungs, and Newars showed the highest and the lowest participation, respectively. Major problems associated with community forestry projects as perceived by the forestry professionals were relatively inflexible target of the project, delayed release of funds, flexibility of panchayat boundaries, and people's indifference and lack of motivation among the forestry professionals and paraprofessionals.

SIAGIAN, DEDDY ROMULO

Land Use Conversion Impact Assessment on Landscape Provisioning Service for Rice Sufficiency in Langkat Regency, Indonesia. – 2013.

Landscape analysis of Langkat Regency, Indonesia was done to assess the land use conversion impacts on landscape provisioning service for rice sufficiency. Satellite images in 1989, 2001 and 2010, socio-economic survey and agricultural land use policy analysis were used to analyze land use conversion. The landscape was classified into 7 land use types: forest, mix vegetation, rice, oil palm, fish pond, built-up and barren. Landscape metrics for the landscape and class levels were determined.

Forest was the dominant land use type in 1989 and 2001 but was replaced by oil palm in 2010. The rice land continuously decreased overtime. The number of villages and area of oil palm had significant negative correlation. Number of patches, patch density and edge density particularly for forest and rice land increased in 1989 to 2001 and decreased in 2001 to 2010, but the total area of forest and rice land declined from 1989 to 2010. Forest and rice land was fragmented into smaller patches from 1989 to 2001.

Determinants of farming systems in the uplands of Pili, Camarines Sur -- 1995

The study was conducted to determine the socio-economic and environmental factors that influence the choice of farming systems in Barangay Curry, Pili, Camarines Sur. The type of farming systems in the area is attributed to climate, availability of water sources, prevailing market and market conditions and topography.

Analysis using multiple regression showed that farming systems have significant relationships with farm size, topography, availability of supplemental irrigation, value of workstock and tools and number of adults with no-farm occupation. The different descriptors of farming systems and the indicators that influence their adoption have the following relationships: land use descriptors such as cropping intensity index (CII) was significantly affected by farm size, availability of water sources and topography of the land while percent cultivated area planted to annual crops was significantly related to farm size. Labor use descriptors was significantly related to farm size, tenurial status, water availability, number of adults with non-farm occupation and household size. Capital use descriptor was significantly related to availability of supplemental irrigation and number of adults with non-farm occupation. The output descriptor such as percent income from crop production was significantly affected by number of parcel lots, value of workstock and tools tenurial status and number of adults with non-farm occupation. Percent income from animal production was significantly affected by number of parcel lots and topography of the land. Non-farm income was positively related to number of adults with non-farm occupation but negatively related by farm size, topography of the land and availability of water sources.

Income was highly correlated with household size, farm size, availability of water sources, number of adults with non-farm occupation and value of workstock and tools. Income is also dependent on yields from crop production. It can be concluded that the existing farming systems together with their accompanying technologies have brought problems and constraints that caused environmental degradation such that alternative crops and technologies must be looked into to minimize the ecological impacts of the farming systems while producing the needs of the people.

Pest management systems of smallholder farmers in mature cacao areas in North Sumatra, Indonesia -- 2001

A study was conducted at Deli Serdang, Asahan and Simalungun districts in North Sumatra. There were eight major pests encountered by the farmers, comprising of sap sucking bug, cacao pod borer, red branch borer, pod rot disease, pink disease, white root disease, squirrels, and weeds composed of grasses, broadleaves, sedges, and ferns. The pest problems were more serious in the farms of the IPM untrained than the trained cacao smallholder farmers. Heavy infection/infestation of the eight major pests occurred in the former than in the latter farms, while light infection/infestation of seven major pests except weeds were observed in the farms of both farmer groups.

IPM trained and untrained farmers utilized eight component pest control approaches, namely shade tree management; pruning of cacao trees, fertilization; frequent, regular, and early harvesting of pods, infected fruits and husks management; farm sanitation and chemical weed control; biological control; and judicious use of pesticide. However, the two farmer groups varied in the degree of implementation of each component pest control approach. All farmer respondents highly utilized shade trees, such as coconut, durian or their combination for pest management. Seventy percent of the trained farmers practiced pruning of cacao tree, while only 33% of the untrained farmers used the same. Ninety to 97% of the farmers applied fertilizer, 53% of the trained farmers used combination of inorganic and organic fertilizer and only 10% did this for the untrained farmers. Eighty percent of the untrained farmers used inorganic fertilizer while only 37% of the trained farmers used the same. Both farmer groups practiced frequent, regular and early harvesting of pods. IPM trained farmers made more effective use of infected fruit and husk management, farm sanitation and weeding, and use of biological control. Ninety three percent of the untrained farmers used pesticides while 63% of the trained farmers used the same. Farmers from both groups used more herbicides than insecticides.

The percentage of trained farmers who indicated that the pest management system they adopted was effective against the particular target pests was sap-sucking bug (77%), cacao pod borer (75%), red branch borer (83%), weeds (94%), pod rot and pink diseases (71%), white root disease (54%), and squirrels (21 percent). The corresponding assessment of effectiveness on target pests by the untrained farmers was for sap-sucking bug (33%), cacao pod borer (38%), red branch borer (23%), pod rot disease (24%), pink disease (55%), white root disease (37.5%), weeds (87.5%) and squirrels (3%). Most of the farmer respondents did not smoke while spraying pesticides, took a bath after spraying, and did not eat, drink or smoke before washing hands after spraying. However, more than 50% did not use protective clothing, consumed fruits and vegetables from the cacao farms and were not aware of proper disposal of toxic chemical. Most of the farmers indicated the presence of livestock and various kinds of wildlife in their respective farms, such as lizards, snakes, rats, birds, frogs, and squirrels, while aquatic organisms were predominated by frog and small fishes. The kind and amount of pesticides applied by the farmers appeared to have not adversely affected domestic livestock and wildlife in cacao farm ecosystems. The average cacao yield of the trained farmers (914 kg per hectare) was significantly higher compared to the untrained farmers (726 kg per hectare). This may be due to the more serious pest problems in the farms of the untrained farmers and the more effective use of combination of compatible component control approaches in the farms of the trained ones.

SIMONDAC, SUZETTE C.

Economic Vulnerability and Institutional Resilience of Siargao Island, Surigao del Norte, Philippines – 2015.

Small islands have been gaining attention due to its vulnerability to economic and natural shocks. Using the case of Siargao Island in Surigao del Norte, Philippines, this study assessed the island's economic vulnerability by constructing a Composite Economic Vulnerability Index (CEVI) derived from three exogenous variables of economic exposure, economic remoteness, as well as economic impact of environmental and natural disasters. In addition, the island's institutional resilience was evaluated with the aid of Q methodology.

Results of the study show that vulnerability was mostly attributed to the island's reliance to external finance and trade as well as high transportation costs while institutional reliance was found to be constrained by availability of resources. Moreover, comparison of the CEVI and resilience scores indicated that municipalities with low CEVI does not necessarily translate into high institutional resilience scores and vice versa. Thus, this study concludes that building resilience in small islands requires a holistic approach wherein efforts should not only be geared on enhancing agent and institution capacities but also in providing infrastructure and other support systems that would lessen the island's dependence on external economic fees.

SINFUEGO, KEF S.

Mangrove biodiversity and utilization in Ajuy, Iloilo, Philippines -- 2009

This study was conducted in Ajuy and Pedada Bays of Ajuy, Iloilo which aims to determine the plant diversity, local knowledge and utilization of the mangroves in the area and in consequent, provide conservation strategies.

A combination of field sampling methods and socio-economic survey were employed. Twelve mangrove species (11 true; 1 associate) were present in the two bays. Rhizophoraceae was the most represented family and Avicennia was the most represented genus. The most important and dominant species was Avicennia marina. Species diversity was relatively high on the average ($H' = 0.7941$ and $D = 0.5523$). Results of the cluster and principal component analysis (PCA) revealed four zones, named after the dominant species: Zone 1 - Avicennia - Sonneratia zone; Zone 2 - Avicennia - Rhizophora zone; Zone 3 - Avicennia - Excoecaria - Bruigueria - Ceriops zone; and Zone 4 - Avicennia zone. Correlation analysis was also done and results exhibited that available phosphorus was the only significant variable which influenced both absolute basal area and density.

For the socio-economic environment, knowledge, perception, local practices and utilization of the mangrove resource were obtained from 153 fisherfolk respondents. People showed that they held knowledge on the mangrove flora and its uses, mangrove fauna, and the mangrove's ecosystem services, which they deemed important. It is clear that the mangrove ecosystem in the area had been severely altered and fragmented as a result of fishpond development. To enhance and further sustain the mangroves in the area, a landscape corridor is suggested to be established and developed. This should be made a vital priority by the local government unit (LGU) as this will serve as a fundamental unit for mangrove conservation. It is also proposed that the practice of mangrove aquasilviculture be adopted and an intensive information, education and communication (IEC) campaign be implemented in the municipality. Active participation from the local communities in these activities is also encouraged.

SISONGKHAM, BOAUKHAM

Land cover changes and resource use patterns of selected communities in Phou Phanang National Protected Area, Sanghong District, Vientiane Capital, Lao PDR. -- 2012

The study determined the relationship of land cover changes and resource use patterns in 1989-2011 of the three selected villages in the Phou Phanang National Protected Area of Sanghong District, Vientiane Capital, Lao PDR. It adopted the concept of co-evolution of the communities and the ecosystem as its framework. This described the process in which human communities with their social-system exert selective pressure on the natural-resource base and biodiversity of a given ecosystem and how the resulting changes and alternations within this ecosystem exerts pressure over the given community in terms of the quality of livelihood.

The study utilized both primary and secondary data to analyze the past and present biophysical and socio-economic conditions of the protected area and communities. Primary data collected from interviews of households and key informants provided information on the state of the wildlife, forest cover and land uses of the Phou Phanang National Protected Area, and demography and source of livelihood of the three selected villages in the last twenty years. Secondary information used in the study included resource maps and information generated from other studies.

Land cover changes in Phou Phanang NPA are triggered by the interplay of the socio-economic, cultural and policy related factors. The population growth rate and land cover change had the positive relationship. The population growth rate was attributed more to voluntary resettlement induced by the economic opportunities brought about by the

government support to lowland agricultural intensification. This condition contributed to decline of the communities' dependence on forest resources.

The decree delineating the boundary of the protected areas and banning shifting cultivation failed to completely stop forest degradation and deforestation. It removed the customary resource management that had been observed and respected by villages around the Protected Area. Without the corresponding technical expertise and budget, the national government failed to regulate resource access in the area resulting to widespread illegal occupation and resource extraction. Management strategies for the conservation of Phou Phanang protected areas are recommended.

SOEMADIREJA, MOEHAMAD ZAINAL MOETTAQIEN

Rehabilitation of mined-out lands (MOLs) in Indonesia : a study of the factors that influence environmental compliance among mining companies in the country -- 1999

Mining significantly contributes to the economic development through revenue, employment and other support activities. As a "boom and bust" industry, it enhances and stimulates local community's income in the course of its operation, but on the other hand, it creates irreversible damage to the landscape and the environment unless rapid rehabilitation of mined-out lands (MOLs) is undertaken. In exploiting its mineral resources, the Indonesian government legislated several legal and technical measures to abate the consequences. One of the provisions requires mining companies to rehabilitate mined lands for future use. However, records show that the rate of mined-out lands (MOLs) rehabilitation in Indonesia had been slow. The success of MOLs rehabilitation activity may be enhanced or weakened by institutional and environmental factors. Institutional factors may be divided into technical aspects that include planning, technology, technical and financial capabilities, and target, and non-technical aspects such as commitment, attitude and credibility.

Despite the fact that there are factors that influence the performance of companies in rehabilitating their MOLs, this study focuses only on one of the factors, planning, as appropriate MOL rehabilitation plan incorporated in the mine plan indicates management commitment to the environment. The study reveals that the low performance of MOLs rehabilitation (shown from the Annual Supervisory Reports in 1993 to 1997) is highly influenced by the company's mine plan. It reflected the company's commitment to environmental stewardship regardless where the operation takes place. To improve the performance of mining companies in rehabilitating their MOLs, it is recommended that : (i) mine plan formats should be standardized and regulated so that companies have to put efforts to prepare it, (ii) the reclamation guarantee fund should be set up to encourage companies to do the rehabilitation work rather than losing the deposited fund, (iii) other parties (NGOs, local people) must be made to participate in monitoring rehabilitation works of mining companies, (iv) a mechanism to publicly expose the condition of Indonesia's mining activities periodically in domestic, regional and international mass media and stock market must be set up to pressure companies to comply with the rehabilitation requirements of the government.

SOLIGUIN, BEN PATRICK U.

Vulnerability and Adaptation of the Lanzones (*Lansium domesticum* Corrêa) Production System to Rainfall Variability in Nagcarlan, Laguna, Philippines – 2018.

Climate change has exerted so much pressure in Philippines' agricultural production. In Nagcarlan, Laguna, one of the most affected sectors is the lanzones (*Lansium domesticum* Corrêa) production system. This study determines the vulnerability of the lanzones production system to rainfall variability, i.e. erratic rainfall volume, distribution, and intensity in three different areas in Nagcarlan—lowland, midland, and upland plantations. Using Vulnerability Index Method and Geographic Information System, the study found out that the lanzones production system in Nagcarlan, in general, is moderately vulnerable to rainfall variability. Average vulnerability index values for lowland, midland, and upland areas are 0.487, 0.473, and 0.506, respectively. The moderate vulnerability may be attributed to the moderate to high vulnerability to rainfall volume, high to very high rainfall intensity, and moderate vulnerability to rainfall distribution, which are brought about by incidence of dry spells and dry conditions, low lanzones yield, negative change in production volume, high rainfall intensities especially during typhoons, high dependence of lanzones plantations to rainfall as source of irrigation, absence of water impoundment systems, absence of farm loan and crop insurance dedicated to lanzones, and low awareness of farmers on climate resilience of lanzones. Based on the results, adaptation measures could include soil and water conservation measures, establishment of small-scale resilient infrastructures, support in the development of Climate Information System for Agriculture, and expansion of coverage and access to credit and insurance for lanzones production. The study also envisions the integration of its results in the updating of Nagcarlan's Local Climate Change Action Plan (LCCAP), strengthening monitoring and evaluation, and inclusion of the proposed adaptation measures in the Local Development Investment Programs.

SOLOMON, ELEANOR

Good governance approach in the formulation of a ten-year solid waste management plan for the municipality of Bayombong, Nueva Vizcaya, Philippines. – 2005

Guided by a good governance approach and the mandates of Republic Act 9003, a study on the formulation of a ten-year municipal solid waste management plan for the municipality of Bayombong was conducted. The characteristics and composition of solid waste generated from different waste sources were assessed and existing solid waste management practices were described. Waste generation projections and waste management strategies for the next ten years were provided. Cost and revenue analysis in managing solid waste and policy support in the plan implementation were developed. Solid waste generated was approximately 7.45 tons per day for a population of 19,334 within the collection area and 22.53 tons per day for a population of 53,987 within the entire municipality. The per capita solid waste generation was about 0.39 kilograms per day. The projected waste generation after ten-years will be about 16.8 tons and 24.9 tons in the waste collection area and in the whole municipality, respectively.

The major plan components were engineering, information and education communication campaign, economic enterprise, policy support and enforcement mechanisms. The solid waste management strategies were waste segregation and reduction at source, segregated storage, collection and transport, materials recovery facility and disposal management.

It was estimated that the total cost required for the implementation of the ten-year municipal solid waste management plan was close to 44 million PhP. This covers the acquisition of vehicles and equipment, structure and physical development, predevelopment and the management component of the project. If the municipal LGU decides to use total revenues from collection and sanitary landfill operations to defray total expenses of collection, transport, and disposal management, it will need subsidy from other sources like the internal revenue allotment during the whole plan period.

SOMBOUN XYCHANTHA

Influences of Land-Uses on Surface Water Quality In Namtha River, Luangnamtha District, Lao Pdr. – 2016

This study was conducted to evaluate the effects of land use to water quality, through an analysis of the water quality index for the protection of aquatic life and water quality index of human impact in the Namtha River. The survey area was divided into four sampling points along the upstream, midstream and downstream of the river. Data collection was made in June 2016 which coincides with the first month of the rainy season. Results of the study reveal that built-up, lowland and upland agricultural areas as the main land-use types. Changes in land-uses in 2000 to 2007 were smaller than changes in 2007 to 2013 in built-up, lowland agriculture and upland agriculture.

Values of key water quality parameters in each sampling point along Namtha River were assessed and compared to the Lao National Environment Surface Water Standard of 2009. Data reveal that almost all of mean values of each parameter fell within the standard except for EC and DO. In the same manner, these parameters were assessed against the proposed MRC water quality criteria for the protection of human health and for the protection of aquatic life. Excesses were only observed when compared with the MRC water quality criteria for human health. No single water quality exceeded the criteria for the protection of aquatic life.

Regression and correlation analyses between sources of pollution and water quality parameters show that pollution from households, commercial services and organizations are positively or negatively related with pH, NO₃, NH₃ and COD but not related with DO and EC, while pollution from production activities as rubber productions, slaughter house, pig farm and manufacturing industries are positively or negatively related with all parameters. Similarly, land use types and water quality were analyzed and showed that land-uses are positively related with pH and either positively or negatively related with other parameters, except with EC. Moreover, slope of the area and population density are also positively or negatively correlated with water parameters. Analyses between water quality parameters and respondents' knowledge, attitude, and perception about the Namtha River indicate that the respondents' perceptions are positively correlated with the river's pH and DO. Their knowledge and attitude about the river have positive relationship with the river's EC and their attitudes on the river are positively correlated with the river's NO₃.

The results of the investigation of current status of the Namtha River show that three villages covered in the sampling points are within acceptable limits. Existing land uses adjacent and surrounding Namtha River could contribute to the degradation of water quality. With these realities, management strategies to save and sustain water quality of the Namtha River in particular and some other rivers in Lao PDR in general are recommended. These include the strict implementation and enforcement of the laws and regulations on comprehensive land-uses planning and wastewater management, empowerment of villagers and authorities about improved water and wastewater practices at the national and local levels.

SOPHEAK, SEM

Analysis of the dynamic of the Prey Lich Tick (flooded forest) degradation in the Prey Koh Biodiversity Conservation area, Kompong Chnang Province, Cambodia -- 2010

The various bio-physical and socio-economic causes of Prey Lich Tick (flooded forest) degradation in the Prey Koh Biodiversity Conservation Area (PKBCA) of Kompong Chnang Province in Cambodia have been examined in this study. Specifically, the biophysical features of the PKBCA, dominant species and species diversity in the Prey Lich Tick (flooded forest), socio-economic characteristics and the resource pattern of its inhabitants as well as their influence on the quality of Prey Lich Tick (flooded forest) ecosystem were determined such that recommendations on Prey Lich Tick (flooded forest) conservation could be proposed. Socio-economic data were collected through field surveys, focus group discussion and individual interviews while bio-physical data were collected through field observations and measurements. Statistical analyses were used to interpret data.

Ten species belonging to nine families of woody trees were recorded in the PKBCA. The most dominant species of Prey Lich Tick (flooded forest) was *Barringtonia acutangula*. Soil and water chemical properties were found to be suitable for its vegetation and aquatic lives. Meanwhile, majority of the settlements was comprised by fisherfolk whose the main livelihoods were fishing and farming. Majority (52%) of the respondents survived through fishing and while the rest (35%) depended both on farming and fishing.

Prey Lich Tick (flooded forest) non-forest timber products (NFTP) resource were used as cooking fuel, food, and materials to make fishing gears and build houses. Most of the respondents (92.3%) said they collected dead and raw wood for firewood. Branches and stem of the Prey Lich Tick (flooded forest) were cut to make brush parks.

Ecosystem rehabilitation programs is needed to address the threats to Prey Lich Tick (flooded forest). Establishing a community empowered to implement regulations in the area with support from government and other relevant institutions could form part of this rehabilitation program. Concerned government agencies could allocate budget for capacity building programs and local patrol units. Forest re-planting should be undertaken as well as promoting use of stoves that do not use much firewood. Community's willingness to pay for environmental services could form part of the fund for Prey Lich Tick (flooded forest) conservation. Public announcements about the conservation fund should be made to convince or encourage inhabitants to join the project.

SORIANO, MARISSA M.

Evaluation of the implementation of assisted natural regeneration (ANR) as an approach to reforestation : the case of Fuyot Springs National Park -- 1993

The Assisted Natural Regeneration (ANR) Project in Isabela was evaluated primarily to determine the efficiency of its implementation. Specifically, the study evaluated the following : 1) the overall operations and management of the Assisted Natural Regeneration (ANR) project; 2) the extent of ANR accomplishment in terms of establishment rate of woody vegetative cover, area planted with acceptable survival rate and species composition of ANR treated areas; 3) problems encountered in the implementation of ANR; 4) profile and extent of involvement of both the project staff and the project contractors; and 5) costs involved in its implementation, maintenance and protection. Primary and secondary data were used in the study. The project was the unit of analysis used. The project staff and the contractors served a respondents of the study.

Based on the findings of the study, the implementation of the ANR project was in accordance with DENR's procedures and standards. Implementation and management of the project were influenced by the following problems : bio-physical problems such as drought, adverse site conditions; management problems include delay in the release of funds and critical peace and order condition of the project area. The project provided employment to the community thereby improving their standard of living. ANR is effective in reducing the cost of reforestation by as much as 53% compared to the cost of any 3-year upland reforestation projects. Some degree of improvement on the performance of plantations were noted with the application of ANR in terms of stand density, species diversity, height and canopy development.

SORONGON, PATRICIA MARJORIE E.

Human cetacean interaction in Bohol, Philippines : an evaluation of compliance to code of conduct during whale watching and its effects on Cetacean behavior. -- 2010

The compliance to the Joint Administrative order no. 1 series of 2004, of tour boats to whale watching has not been investigated in the Philippines. To evaluate and help improve conduct of whale watching activities, conduct of trained and untrained tour boat operators was assessed with observations obtained from a one month survey of different boats from Balicasag and Pamilacan Island, Bohol during the peak month of cetacean watching. Data on boat approach,

proximity of boat from cetaceans, surface or observation time, number of boats per encounter per pod and human behavior towards cetaceans were recorded for each boat surveyed.

Results show that parallel approach was predominant in the whole region thus reflecting compliance for trained and untrained boat operators. Both also complied with the no touch, feed or swim human-cetacean interactions. Non-compliance was observed among untrained boat operators for the prescribed number of boats and both the trained and untrained boat operators did not comply with the prescribed distance from the pod. The non-compliance for the prescribed number of boats during whale watching had a greater negative effect on cetacean behavior. Results also imply that higher number of boats generates shorter surface time for cetaceans translating into avoidance behavior and undesirable boat approaches. Thus, this study proposes conduct of trainings on the Joint AO No. 1 throughout the region to augment management of whale watching activities in the Bohol Marine Triangle, including regulating number of boats operating in the area to achieve sustainability.

SUBADE, ANA LIZA A.

Development of an integrated methodological framework for environmental monitoring of coral reef ecosystem in Tingloy, Batangas, Philippines -- 2002

The study was conducted to develop an integrated methodological framework for environmental monitoring of the coral reef ecosystem of Tingloy, Batangas, Philippines.

Tingloy, composed of five islands is known for its rich coral reefs. However, these reefs are being threatened by man-made stresses and natural disturbances. Through coordination with different sectors the need to develop monitoring guidelines that can be used to assess their present status was identified.

The methodological framework was conceived by the combined efforts of the community and the different institutions such as the Kabang Kalikasan ng Pilipinas, Provincial Government and Environmental Resource Office, the academe and the local government unit in the area. The different stages in the development process were : review of secondary data, coordination with fishermen and institutions, presentation of the development process, reconnaissance, social survey, identification of problems and the identification and selection of monitoring indicators.

The problems identified were poverty, overfishing, habitat degradation, pollution sedimentation and storms or typhoons. The indicators for these problems include income, no. of fishers, human health condition, fish sizes and abundance, fishing effort, fish catch, coral cover, garbage, oil spill, and sedimentation. Due to financial constraint, only income fish sizes and abundance, coral cover, benthic lifeforms, garbage, oil spill and sedimentation were used as indicators.

The developed methodological framework was applied and condition of the coral reef ecosystem was determined. Among the five sites, results of the survey showed that only coral reefs of Makawayan and Caban were found to be in good condition with a 50-74.9 percent coral cover among the five sites. With regards to reef fish, Caban had the highest fish biomass and abundance among five sites. On the other hand, areas in Bonito and Sto. Tomas exceeded the DENR standard of 70 MPN/100 ml for total coliform. In general, the water quality of the coastal waters in Tingloy was still within the DENR standard for class SA marine water.

The unique feature of the developed monitoring framework is that it is a product of the integration of indigenous knowledge and scientific knowledge. It can be employed by other coastal communities in assessing and monitoring their own coral reef ecosystem.

SULISTIATY, ETTY

The effect of insect pest management and traditional crop protection practices on arthropod population density and diversity in cotton ecosystem -- 1992

The experiment was conducted at the Central Experiment Station (CES), UPLB and Pesticide Residue Laboratory, National Crop Protection Center (NCPC), UPLB. In the field two levels of treatment were conducted : cropping systems (cotton+corn+tomato; cotton+corn; cotton+tomato and cotton monoculture) and control measures (IPM, chemical and untreated). Diversity and density of arthropod in different cropping systems as affected by the different control measures were observed. As a consequence of crop protection, pesticide residue in atmosphere, soil and cotton were also analyzed. There were 32 arthropod families belonging to 12 orders found in the cotton ecosystem. The arthropod were classified as insect pests, transient insects and natural enemies. The mean lower diversity index of arthropod was observed in the cotton monoculture and in the chemically treated plots. Mean diversity index of insect pests was lowest compared to the diversity index of transient insects and natural enemies among cropping systems and control measures.

The build up of number of arthropod was very fast and fluctuating from 46 DAP to 88 DAP. The mean number of arthropod in the cotton+corn+tomato cropping system was significantly higher than the other cropping systems, while the mean number of arthropod in the IPM plot was significantly different from the other control measures.

SUMILANG, MIC IVAN V.

Land Conversion Effects on Selected Ecosystem Services of Rice Lands in the Landscape of Mount Banahaw, Tayabas, Quezon, Philippines -- 2014.

Tayabas, in the Province of Quezon, is a land-locked city in the foothills of Mount Banahaw has been a subject of urban land development since its Cityhood in 2007. Rice lands, one of the major land uses of the city, are targeted for urban land conversion. Converting rice lands into urban uses could affect its ecosystem services. With this problem at hand, the effects of land conversion to ecosystem services were assessed. Four ecosystem services of rice lands were taken into account namely rice production, flood water containment, ground water recharge, and cultural heritage. Environmental management options were formulated to ensure sustainable rice production.

The rate of converting rice lands into other uses in the city is at a slow pace. However, it still affects flood water containment, groundwater recharge and the cultural heritage of the community. Among the four ecosystem services of rice lands, only the rice production is the most affected by land conversion

Given all the technological intervention, dependable irrigation and efficient LGU agricultural extension service to ensure access to real time information and resource, lowered land tax, and assurance on the sufficient supply of rice and free supply of irrigation water, the farmers consider continuing producing rice and retaining their rice lands.

TABAYAG, SEVELLA G.

Environmental assessment of lahar deposition from Mayon Volcano by typhoon Reming on major land used in Lidong, Sto. Domingo, Albay, Philippines -- 2008

The landscape of Lidong, Sto. Domingo, Albay (altered by Typhoon Reming in 2006) presents a range of environmental opportunities and potential hazards. An environmental assessment was conducted in 2007 on the impacts of Mayon Volcano's lahar deposition on the major land uses in Lidong, Sto. Domingo, Albay that serves as an input to the formulation of the land use development framework plan.

Most of the lahar deposits (up to 1m high) were concentrated along and near Basud and Cagbahay rivers and their tributaries. The rivers had widened as a result of bank erosion. Among the land uses greatly affected by the floods and lahar deposition are the agricultural lands (which is 30 percent of Lidong 's total land area). Interviews and field verifications showed the areas were deposited with lahar and the crops were washed out by floods. Industrial areas comprise of about 9 percent of the total land area were spared from lahar. Ecotourism as a livelihood source of Lidong, is affected by the altered physical environment.

Vegetational analysis shows that Basud River system consists of 34 species under 17 families and Cagbahay river under 9 families. The most dominant species in the upstream, middle, and downstream segments of Basud river are *Alstonia scholaris*, *Colocasia esculenta*, and *Casuarina equisetifolia*, respectively. In the Cagbahay River, most dominant species in the upstream, middle and downstream segments are *Casuarina equisetifolia*, *Panicum repens* and *Imperata cylindrica*, respectively. Relative heights of plant species at the upper stream segment of Basud Rivers range from 0.63 to 14.27 percent, indicating that the species were mostly wildlings at the time of observation. Same behavior was observed at the middle stream segment. There is 23.7 percent similarity of vegetation between Basud and Cagbahay rivers.

Four strategies were identified for the land use development framework plan for Lidong, namely , 1) Land Use assessment; ii) Identification and maintenance of potential agricultural and production areas; iii) Environmental planning and monitoring of existing industrial/commercial and residential zones; and iv) Inter-agency coordination on the implementation of land use and management rules and regulations on the use of areas prone to flooding and mudslides. In connection with the identified strategies, the land use development plan has been divided into four components: 1) Resettlement of those residing in hazard prone areas; ii) Protection of riverbanks and natural waterways through buffers; iii) Development of Improved Agricultural Land Management; and iv) Priority areas for protection.

TABLA, ROSYL F.

Landslide vulnerability assessment along the Catanduanes circumferential road -- 2010

Landslide oftentimes plagued the island province of Catanduanes particularly the Catanduanes Circumferential Road Project (CCRP)-Bato San Miguel-Viga-Panganiban-Bagamanoc portion of the CCRP. Residents claimed that this is due to the continuous heavy rain that occurs every rainy season. Others attributed these to the deforestation and illegal logging activities done in the area. The communities along the road alignment face problems of becoming homeless and injured.

Landslide prone section of the road alignment were assessed and its vulnerability to landslide was determined. The landslide inventory map was generated using GIS (Arcview 9.2). Majority of landslide along the CCRP are of debris slides and debris flow types.

The socio-economic survey conducted indicated that there is an average of 4 landslide occurrences yr-1 along the study area. Moreover, a rainfall of 111 mm for three (3) consecutive days could trigger landslide along the road alignment of the CCRP.

Landslide vulnerability is the degree of loss to a given magnitude in an elements-at-risk resulting from the occurrence of a landslide of a given element-or a set of elements-at risk resulting from the occurrence of a landslide of a given magnitude in an area. An element at risk comprises the population, properties, economic activities and public services. When the element value is considered the area is highly vulnerable due to its intrinsic value; the human life. Assessing vulnerability by the type of damaged to the population and infrastructures shows that there is direct and indirect damage due to a number of casualties including a record of death, missing and injured; and temporary damage due to its effect on the socio-economic aspects of the people and temporary loss of houses along the CCRP. When establishing risks to elements that may change with time, vulnerability is expressed on scale of 1 meaning there is complete loss or destruction due to the occurrence of the event.

TAGUIAM, JOHN DARBY W.

Efficacy and production cost of Trichoderma microbial inoculant (TMI) and citronella essential oil as pest and disease control methods in hot pepper (*Capsicum annum* L.) cultivation – 2019

The potential of Trichoderma microbial inoculant (TMI) and citronella essential oil as alternative pest and disease control method to chemical pesticides in hot pepper cultivation were investigated. The major disease observed is chili anthracnose (*Colletrichum* spp.) while major insect pests are aphids (*Myzuz persicae* Sulzer) and whiteflies (*Aleurodicus disperses* Rusell). Combination of TMI and citronella essential oil (T3) significantly decreased the incidence of anthracnose (9.37%) while TM1 (T1), citronella essential oil (T2) and its combination (T3) significantly decreased the severity of anthracnose. There was a significant decrease in the mean population of insects in T0, T1, T2, and T3. In terms of financial analysis, T1 incurred the cheapest production cost (PhP 670/50m²). However, current farmers practice (T0) got the highest net income among all treatments (PhP 2,141.60/50m²). Assessment of the perception of hot pepper growers and consumers through focus group discussion showed that both consumers and producers are aware of risks associated with chemically-produced hot peppers. Most consumers prefer 'pesticide-free' hot peppers even if it incur more costs. On the other hand, most growers still prefer chemical pesticides and are skeptical in adopting new alternative methods despite scientific evidence of its efficacy.

TALUBO, JOAN PAULINE P.

Development of Landslide Vulnerability Indices (LVI) for Three Communities in Infanta, Quezon, Philippines using Agent-based Modeling. -- 2012

Four successive tropical cyclones hit the Philippines and brought damages to several towns in the provinces of Quezon and Aurora, between November 14 and December 4 in the year 2004. Infant, Real, and General Nakar, was severely damaged. Based on this event, this study developed landslide vulnerability indices (LVI) for Barangays Pinaglapatan, Ilog and Magsaysay, Infanta, Quezon Philippines, using agent-based modeling.

The study was based on the framework that landslide vulnerability is affected by the following factors: rainfall, biophysical conditions of the area, and the socio-economic profile of the communities. The area was characterized using biophysical parameters such as topography (slope and elevation), land-use and soil type. The socio-economic profiles of the clusters were determined based on the following: income, livelihood, social networks and existence of early-warning system (EWS). The weights of the indicators were computed through Analytical Hierarchy Process (AHP), which was incorporated within the modified agent-based model (MABM). A prototype agent-based model was used and this was modified to achieve the objectives of the study.

Out of all the respondents, there emerged two clusters based on socio-economic indicators: Cluster 2 has high vulnerability while Cluster 1 has low vulnerability. The clusters were further classified according to their barangay, as the biophysical characteristics were different for each area. Cluster 2 in Barangay Magsaysay has the highest LVI and is considered the most vulnerable among the six clusters, while the least vulnerable is Cluster 1 in Barangay Ilog.

TAMBAN, KARL VERNON G.

Dynamic Modeling of Rice Tungro Disease Epidemics under Changing Climate in San Jose, Occidental Mindoro – 2014.

The dynamics of tungro disease and green leafhopper population are modeled using Stella Modeling Software v.9.0.2. the parameters and variables that are incorporated in building the model include weather, i.e. egg, nymphs and adults, tungro incidence, plant age, susceptibility of the plant to green leafhopper (GLH) and virus, natural enemy, acquisition rate of the virus, inoculation rate of the virus, virus retention period, and plant-to-plant transfer rate of GLH. Sensitivity analysis which aimed to determine the behavior of model predictions on different disease pressures suggests that low to high level of disease pressure both lead to early onset of tungro epidemic.

Results of field validation suggest that the model can make predictions comparable to the real system. The discrepancies between the values obtained by the model and the field data were attributed to accuracy and completeness of information provided by farmer cooperators.

Model predictions under the 2011 DOST-PAGASA scenarios on seasonal average temperature reveal that the population of the green leafhopper will not be hampered and would in fact be favored at minimal rate. In the case of tungro development, model predictions account to an average increment increases of .45% in disease incidence. At lower average daily temperature (24 °C) the development of GLH population and tungro epidemic are delayed.

TAN, REYNALDO L.

A bioeconomic analysis of cage culture of tilapia in Sampaloc Lake, San Pablo City, Laguna -- 1987

The main concern of this study is three-fold. First, to document the grow-out cage operation in Sampaloc Lake, second, to determine and quantitatively assess the different determinants of cage culture of tilapia in a multidisciplinary fashion using a production function framework and third, to assess the profitability of the cage operation business on an industry average basis.

The explanatory variables found to have significant impacts on yield were number of pieces of tilapia harvested per kilogram, number of times of harvesting, fingerling size at stocking, depth of lake area occupied by cage structure, stocking density, mortality during stocking and total area of cages within 50 meter periphery. Supplemental feeds interacts with pieces per kilogram and total area of cages within the peripheries and becomes significant when the former was omitted and the latter included in the model. It is concluded that it is better to grow tilapia in the northeastern and/or northwestern parts of the lake particularly at the shallower portions regardless of the distance from shore given the existing ecological conditions. Overcrowding as measured through the number of cages within the immediate neighborhood was in general not a major factor affecting yield, primarily because of supplemental feeding. However, when no feeding is done, an overcrowding effect does register.

For the income analysis, the values of the financial feasibility indicators are strong manifestations that the industry is a lucrative investment opportunity. With an internal rate of return of 61 percent, a short payback period of 1.3 years and an earning capacity of one peso and forty centavos for every peso investment, this would explain why operators or new investors continue to enter in this business venture. And in an attempt to widen the extent of use of this study, all relevant informations related to cage operations were illustrated.

TAVANH KITTIPHONE

Landscape change of the resettlement site in Nakai District, Khammoune Province, Lao PDR -- 2011

The study presented the effect of establishment of the Nakai Reservoir of the NT2 Hydropower project on landscape change of the resettlement area. It focused on the structures and functions before and after the project, analysis of the various livelihood of the community as a form of adaptive strategies and proposed landscape management strategies to sustain the landscape services. Three resettlement villages of the Nakai District were selected for this study. Sop On, NongBoua and Done. Secondary data analysis and primary data gathered through survey and key informant interview are the research methods used in the study.

Then resettlement area was used to be forested plateau with Acrisols having low fertility and cleared for human settlement to accommodate the displaced communities in the implementation of a development project. The people originally came from the flood plain with fertile soils of the Nakai basin where lowland agriculture was the dominant livelihood. Households in the villages were situated along or nearby riverbanks. With the relocation to the resettlement area, their major livelihood was shifted from crop and livestock agriculture to fishery. The communities before were dispersed now become compact in accordance to the spacing and design of NT2. Nevertheless, the change in the livelihood of the resettled community has been addressed by the provision of the institutional supports designed to facilitate adaptation to their new environment. NT2, however, provided skills development training - from farmers to fisherman. Moreover, the provision of 0.66 ha farmlands for each household acknowledged not only the need to ensure the communities' self sufficiency for rice and vegetable production, but also in recognition of the need to maintain the agricultural production skills and knowledge of the villagers.

Changing landscapes also influenced their way of life. Understanding the ecosystem interaction promotes better appreciation of the necessity of landscape management to maintain the ecosystem services of the whole resettlement area such as planting of bamboo and vetiver grass to have a buffer between the reservoir and the community to prevent sedimentation. These are vital to the sustainability of the different livelihood activities of the community.

TENIO, KIT FELIAN C.

Water Quality, Fish Communities, and Land Cover Analysis of Lake Bito in Macarthur, Leyte, Philippines-- 2023.

Lake Bito is one of the major lakes located in MacArthur, Leyte, Philippines. Its main economic uses are eco-tourism and aquaculture production. Through the years, environmental problems have been observed for Lake Bito including a major fish kill incident in 2012. To understand its condition, water quality, fish abundance, key informant interviews, participatory rural appraisal and land cover analysis were conducted. Analysis showed physico-chemical parameters were within the limits of Class B of DAO 2016-08 and DAO 2021-19 except phosphates. Results showed pH (.0001), BOD (.0159), and DO (.0001) exhibited seasonal variation ($p < 0.05$). A total of 354 individuals of freshwater fishes from eight families and nine species were collected. A very low diversity index (0.37) was observed with no significant correlation found between the fish diversity and physico-chemical parameters ($p < 0.05$). Community-based land use maps showed significant changes in Lake Bito's watershed from 2002 to 2021. Lake Bito's watershed covers a total of 1,525.35 ha in which agricultural area dominates (58%). The study recommends the completion of diversion canals, water quality monitoring by EMB, policy recommendation of 10% of the total land area reserved for aquacultural activities and eco-tourism development of the lake as an alternative livelihood.

THANASACK, PHETSAPHONE

Stakeholder analysis of the Thinpia Irrigation Project in Hadxaifong District, Vientiane Capita, Lao PDR – 2016.

The study presented the bio-physical environment of the Thinpia irrigation project area described and analysed the key institutions and their functions and roles in irrigation water management, identified the annual irrigation water volume delivered and distributed; and formulated and recommended management plans for future irrigation water management. The study used a mixed method to explore the complexity of stakeholders' role and vertical and horizontal hierarchy function, and working relation in terms of irrigation water management. GIS and remote sensing, and other qualitative research methods and techniques to stakeholder analysis were used. The description of the bio-physical and social environment provided the context for the irrigation project components and stakeholders' social relation. A comprehensive identification of stakeholders, their interests and network of working relation was also made. This study categorized stakeholders as primary or those directly related with the interest, and secondary or those who facilitate and support in the irrigation water management.

In the analysis of the power relation, this study conceptualized irrigation water management power issue to promote the interests of stakeholders. The power issues are the following : 1) vertical and horizontal hierarchy stakeholders' collaboration, 2) capacity and potentials of Thinpia water user, 3) dramatic decrease in irrigated area during operation period, and 4) improper water resources management. The study provides the motivation for stakeholder collaboration as institution management plan, project operation management plan, and stakeholder's participatory plan to facilitate collaboration for future irrigation water management.

TICZON, VICTOR R.

Influence of shelter characteristics on reef fish assemblage and its implications in the establishment of marine protected areas (MPAs) -- 2002

A total of eighteen sites in Batangas and Puerto Galera were examined to establish relationships between wave exposure, reef characteristics (benthic cover, coral life form, shelter size and shelter abundance) and reef fish assemblage. These activities were conducted to identify important ecological criteria in selecting sites from Marine Protected Areas (MPAs), to optimize benefits derived from this management strategy.

Results indicate significant difference in benthic cover and predominant life forms between the exposed and sheltered reefs. The difference in reef complexity brought about by the difference in predominant life forms result in significant variations in shelter size and abundance between the exposed and sheltered reefs. Reef fish communities were also found to be highly associated with exposure to wave energy. Distinct groups of fish were identified to be highly associated with degree of wave exposure.

Correlation analysis between reef characteristics and fish assemblage show significant relationship between benthic cover and species richness and biomass of reef fish. Wave exposure, live coral cover, algal component and abiotic components were found to be strong structuring variables of the reef fish communities, hence, are important criteria in identifying sites for establishing reserves. In contrast, shelter characteristics have no structuring effect on fish assemblage.

Nevertheless observations during the survey show a variety of fish species utilize the reef as shelter, and thus, the importance of shelter feature as a selection criterion is not totally discounted. Resource valuation of reef fish in Batangas and Puerto Galera was significantly high at Php 81,876.06 for Batangas and Php 39,872.55 for Puerto Galera per 1,000 m² of reef area, respectively. The derived value for coral reefs may be much higher if other derivable goods and services are included. To date, the area does not yield its optimal economic benefits from fishery due to continued degradation and overexploitation. Hence, management strategies such as establishment of Marine Protected Areas or MPAs need to be implemented to rehabilitate and conserve this stressed ecosystem.

TINGSON, KESHIA N.

Lead Biomagnification in a Food Web of the Open Waters along Sta. Rosa Subwatershed, Philippines. -- 2014

Contamination of heavy metals in Laguna de Bay is of great importance since it affects water quality and aquatic communities in the lake. Lead is one of the significant heavy metals present in the lake waters and fishes. In this study, lead biomagnification in a food web of open waters along Sta. Rosa subwatershed was assessed. Water quality, aquatic communities and lead concentrations were analyzed during dry season (May 2013) and wet season (November 2012). The water quality in the open waters met the Class C standards of Department of Environment and Natural Resources Administrative Order No. 34 Series of 1990. Moreover, the lake water in the study sites was classified as mesotrophic. Assessment of phytoplankton communities revealed that Class Bacillariophyta, specifically *Aulacoseira* sp. dominated the lake. Zooplankton communities were dominated by order Rotifera during the dry season while Order Copepoda was abundant during wet season. Four fish species were captured namely *Arius manillensis*, *Clarias batrachus*, *Hypophthalmichthys nobilis*, and *Oreochromis niloticus*. Food webs were proposed for the observed for both seasons. However, biomagnification trend was restricted to zooplankton to fishes. This may be attributed to the ability of the fishes to detoxify and control toxicity, in which many aquatic invertebrates do not. Since lead was traced in fish muscles, safety of fishes human consumptions was evaluated. Based on the household surveys, locals prefer *O. niloticus* the most. Consumption advisory for *O. niloticus* was generated using Joint FAO/WHO Expert Committee of Food Additive (JECFA) Provisional Tolerable Weekly Intake (PTWI) for lead.

TINH, HUYNH QUOC

Relationship between environmental factors and structure of mangrove forest at protected zone of Mui Ca Mau National Park, Vietnam – 2007

The Mui Ca Mau National Park in Vietnam is a coastal ecosystem consisting of Protected Zone, Marine Conservation and Buffer Zone. Over the years, patches of mangrove communities have evolved in the Protected Zone. The formation of community patches may be a reflection of the variability of the environmental factors prevailing in the habitat at National Park. This study was conducted in order to understand the relationships of mangrove forests and their environment in Ca Mau National Park.

Eight sampling sites representing eight ecological communities were selected along gradients from the seashores to the inlands of the Protected Zone. At each sampling sites, two transects perpendicular to each other were laid out from which mangrove plant samples were taken. Samples of soils and surface water were taken from each sampling sites for physico-chemical analysis of abiotic variables. Species of aquatic animals were recorded from interview of people who are collecting unprohibited mangrove species. Policies on protected areas in Vietnam were secured from the Forest Protection and Management Board of Mui Ca Mau National Park. All these baseline data were subjected to statistical analysis.

Results show at least 10 mangrove plant species are present in the Park and about 95% of which consists of *Rhizophora apiculata*, *Avicennia alba* and *A. officinalis*. At 79.24% similarity coefficients, three distinct zones emerged out of 8 patches. These are : Southeastern Coast Zone dominated by *Rhizophora apiculata* and *Avicennia alba*, Western Coast Zone dominated by *Avicennia alba* and *A. officinalis*; and Inland Zone with *R. apiculata*, *A. alba*, *Bruguiera parviflora* as the dominant species. The floristic abundance and Ca Mau National Park is largely determined by the pH of dry soil, percentage sand and compaction of the soil.

There were 8 dominant animal species found in the Park. Their presence is favored by the combination of 4 physical variables, namely : soil compaction, organic matter, total nitrogen, and tidal inundated times, and by the abundance of *Bruguiera sexangula* and *Rhizophora apiculata* mangrove species.

Government policies on protected areas may have contributed to the stability of the National Park in at least two areas. The first one is on the strict environment of the law prohibiting poaching inside the Park. Second, the establishment of the Buffer zone prevented the influx of poor farmers to the Protected Zone. The implications of these findings to the environmental management of the Park have been discussed.

TIROL, RAYMUND PAULO C.

The Impact of Land Use Change on the Sedimentation and Delta Geomorphology of the Pagsanjan-Lumban Catchment. – 2021

Relative to its size, there is limited data on how the Pagsanjan-Lumban Catchment's (PLC) land use has affected its sediment export and delta morphology. The study used remote sensing, sediment modelling, and key informant interviews to model and assess how changing land use in the study area has affected its sediment dynamics and delta morphology from 2002-2020. Based on interpreted remotely sensed information, the PLC is undergoing agricultural expansion that resulted in accelerated delta progradation due to increasing sediment export to the stream network. There is also ongoing loss of forest cover in the upstream section of the catchment. Key informant interviews agree with this

observation and indicate that gully erosion may also be a significant contributor of sediment for the watershed. However, due to limitations imposed by pandemic restrictions, results of this study have inherent biases and must be treated as approximations. Nonetheless, the results may still be utilized to formulate recommendations to local governments in the watershed of the PLC for corrective measures on issues identified in this study

TISICO, ADELDAIDA S.

Biodiversity, productivity and socio-economic impacts of azolla utilization in rice production -- 1991

This study aimed to evaluate the impacts of azolla utilization in rice production. Biodiversity in the azolla inoculated and not inoculated farms was studied. Species diversity index of arthropods was not significantly affected by inoculation of azolla. However, it was found that the total population of rice pests tend to be lesser in the azolla users farm than in the non-users farm. The use of azolla tend to favor the proliferation of blue green algae (BGA) over the greens, euglenoids and diatoms. Nostoc and Anabaena responded well to the conditions accompanying azolla use in farms. With or without azolla utilization, the algal communities have similar degree of variability in terms of the number of taxa. Productivity in the fields of azolla users was higher than that of the nonusers.

Azolla users had an average yield of 100 cavans per hectare, while nonusers had an average yield of 82 cavans per hectare. In the comparative analysis between users and nonusers of azolla, the utilization of azolla did not have any effect on the levels of living of respondents in Pakil and Pangil, Laguna. Both users and nonusers of same belonged to the middle to above middle class. Azolla users however obtained an income of around P1,911.00 (US\$70.78) over that of the nonusers.

TIU, WELLA A.

Environmental assessment of coastal tourism in General Luna, Siargao Island, Philippines -- 2011

An integrated environmental assessment of General Luna's coastal tourism was conducted using the criteria of Global Sustainable Tourism. General Luna, a part of Siargao Island Protected Landscape and Seascape (SIPLAS), is one of the world class surfing destinations in the Philippines, and coastal tourism is starting to be a major industry.

Pressures of tourism and activities of local communities on the state of the coastal water quality, coral reef cover and sea grass and impacts on ecosystem services of tourist destinations were assessed. Semi-structured survey questionnaires were used in the interview of the local community, tourists and resorts and accommodation operators. Heads of offices involved in coastal tourism and SIPLAS were also interviewed.

Coastal water of the beach used for recreation is within Class SA of DENR water quality standard. The diverse coral reef is in fair condition and recovering from damage of illegal fishing activities. Sea grass beds in the coastal areas are diverse in species but slightly silted due to human activities in the adjacent build up areas. Even though General Luna is a part of SIPLAS, government and private sectors involved in the industry have adopted limited sustainable management practices of the Global Sustainable Tourism.

Even though the tourists were satisfied with the cultural ecosystem services, insufficient health and absence of bank services were identified problems of foreign tourists. Local community has positive attitude towards coastal tourism, but local environmental governance is inadequate to educate and encourage the people to participate in the protection and conservation of the coastal resources for sustainable tourism. Environmental management options were recommended for the sustainability of the General Luna coastal tourism.

TOLENTINO, ARLENE B.

Assessment of the impact of Land Use and Land Cover Change on the Hydrology of Mabacan Watershed, Philippines Using the Soil and Water Assessment Tool (SWAT) Model. --2017

The capability of Soil and Water Assessment Tool (SWAT) hydrologic model in predicting the impact of land use and land cover change without standard calibration was tested in Mabacan watershed, an ungauged catchment with limited data. The model was complemented with the use of remote sensing and GIS (RS-GIS) technology in characterizing the biophysical aspect of the watershed which can aid in parameterization process. SWAT modeling was performed in two phases: 1) initial model development using hydrometeorological data input measured from 2005-2014 and 2) final model set up and evaluation using longer and more recent input data. Pseudo-calibration was performed using manually computed surface runoff values based on water balance and SCS Curve Number method. The final model performed reasonably well in simulating surface runoff with NSE of 0.76 & 0.77 and R² of 0.96 & 0.96 in comparison with the two methods. Potential land use and land cover change (LULCC) scenarios were determined on the basis of 2% growth in built-up areas from 2010 to 2016, which originated mainly from agricultural land (65%) and mixed vegetation (35%). Four scenarios were formulated with a 20% increase in built-up areas in Scenario 1, 30% in Scenario 2 and 40% in Scenario 3. The 40% increase was retained in Scenario 4 but with the inclusion of agroforestry as a management strategy. SWAT simulation using the final model showed an increasing trend in a surface runoff and

an overall decline in streamflow as built-up areas increase. The introduction of agroforestry as a farming practice led to a lower surface runoff and higher average monthly streamflow despite the largest increase in built-up areas. Further analysis indicated that maximum average monthly surface runoff increases as the vegetative cover decreases. On the other hand, the minimum average monthly streamflow during the dry season decreases as vegetative cover decreases. Results of this study suggest that the SWAT model is highly applicable for predicting surface runoff and streamflow in ungauged watershed in the Philippines even with limited data and for assessing the impact of LULCC on hydrology.

TOLENTINO, GERI MAE A.

Environmental Concepts, Awareness and Attitude of Kindergarten Children and Teachers: Towards Developing Kindergarten Curriculum Content for Environmental Education in Selected Schools in Calauan, Laguna, Philippines. -- 2016

Early childhood education, which focuses on inculcating basic environment science principles, could be one of the most efficient strategies to achieve sustainable development since sensitivity to, concern for and positive attitude toward the environment is developed through time and should be instilled to people early in life. This study focused on the investigation of four groups of people from the municipality of Calauan, Laguna Philippines, an agro-industrial municipality south of Manila experiencing some environmental problems: (1) a public school kindergarten class, (2) public school kindergarten teachers, (3) a private school kindergarten class and, (4) private school kindergarten teachers. Through drawing sessions and interviews, results show that children view the environment as having more natural elements. There is generally no evidence of environmental issues awareness in their drawings. Students also reported positive environmental attitude towards consumption patterns, recycling-reusing and environmental protection. Negative environmental attitude were found in their living habits---playground and residential preferences. Teachers, who are proposed to be models of positive environmental attitude for children, had a more anthropocentric concept of the environment. Nevertheless, they are conscious of the existence of both global and local issues and also reported positive environmental attitudes toward consumption patterns, recycling-reusing, environmental protection and education.

TOPNO, SAMIR E.

Assessment of resilience and adaptive capacity of farmers to climate extremes in Allahabad District, Uttar Pradesh, India. – 2011.

This study was conducted to assess the adaptive capacity and resilience of lower caste farmers to drought in the three villages of Allahabad District in Uttar Pradesh state of India. Particularly, it aims to analyze the changes in the meteorological parameters, effect of meteorological parameters to farm production and level of use of production inputs, document and evaluate adaptation strategies used by the local people, and assess the resilience and adaptive capacity of the farmers to climate extremes like drought.

To achieve these objectives, primary and secondary data was collected. The 102 years of historical meteorological data show the fast decreasing trend of rainfall every year at 9.39 mm yr⁻¹. The temperature, vapor pressure, wet day frequency, cloud cover have changed significantly.

Drought incidence resulted to significant reduction in yield of rice, wheat, vegetables, potatoes and pulses by 1.23 and 1.25 t ha⁻¹, 0.66 and 0.32 t household yr⁻¹, and 41 kg household yr⁻¹, respectively. During the drought year, irrigation requirement for crops increased. The mean income of the respondents was also affected significantly. Despite autonomous and assisted adaptation strategies used by the respondents, the increasing intensity of climate extremes, particularly drought had left the farmers in debt because the buffer capacity of the individuals and the farms were low.

TORRES, ALFIE M.

Modeling Climate Change Impacts on the Spatial Distribution of Selected Dipterocarps in the Northern Sierra Madre Natural Park Using Maxent – 2015.

Currently, there is very little knowledge on how future climates can affect the potential distribution of forest tree species in the Philippines. Thus, this study determined the potential effects of present and future climates on the geographical distribution of selected dipterocarps in NSMNP using the Maximum Entropy Model. Seven models were generated for each species: (a) one Climatic-Only model, (b) four Partial models (based on the combination of four variable groups with climatic variables), (c) one Full model (based on 30 original variables), and (d) one Final model (based on 18 uncorrelated variables after a series of variable reduction methods). Models were evaluated using Area under Curve (AUC) and True Skill Statistics (TSS). Result showed that the Final model performed best for *S. palosapis* (AUC = 0.8763; TSS = 0.8176), *S. contorta* (AUC = 0.8768; TSS = 0.7686), *S. negrosensis* (AUC = 0.9038; TSS = 0.8970), and *S. polysperma* (AUC = 0.8626; TSS = 0.8332). Analysis of variable importance revealed that species distributions were largely determined by: (1) anthropogenic variables (34.06%), (2) climatic variables (33.68%), (3)

topographic variables (17.52%), (4) vegetation-related (8.13%), and (5) edaphic variables (6.61%). The top five predictors with the highest contribution are: distance to roads, precipitation of driest quarter, isothermality and distance to rivers and land cover. Comparison of present and future distributions showed that *S. palosapis* and *S. polysperma* were found to benefit from future climates with increased suitable habitat range. However, *S. negrosensis* and *S. contorta* will likely experience a decreased extent of suitable habitat. Lastly, the result of linear regression showed that elevation and change in probability is statistically significant at 5% only to *S. polysperma* (p -value = 0.0134) with R^2 of 0.2208. The other three dipterocarp species showed no significant results. No upward trend of changing suitability with increasing elevation was observed. The results of this study will provide practitioners with early warning estimates of how climate change may affect the distribution of endangered species. Furthermore, this will contribute to decision-makers especially in mainstreaming climate change in the NSMNP management plan to better conserve potential suitable habitats of priority species.

UMALI, LALAINÉ C.

Assessment of physico-chemical and socio-economic impacts of the existing landfill in Tingga Labac, Batangas City –1999

The advent of industrialization, rapid urban development, expected population growth, increasing solid waste generation and disposal problems in Batangas City, and the need to give enough consideration for environmental protection necessitated the assessment of the physico-chemical and socio-economic impacts of the landfill in Tingga Labac, Batangas City. The complaints of the nearby residents and the proposed expansion of the facility further give encouragement to pursue the study. The impacts were described based on : a) composition of wastes dumped in the landfill, categorized based on the wastes generated, b) laboratory analysis of Talon River water, groundwater and ambient air quality conducted and compared with standards, and c) perceptions and observations of residents and workers about its operation and effects, gathered through interviews. Sixty percent of the wastes dumped in the landfill are biodegradable, 30 percent non-biodegradable and 10 percent mixed wastes hence, only 10 percent should be dumped if properly sorted. Talon River can be classified as Class D inland freshwater conforming with EMB-DENR standards except for color, DO, Cd and total coliform count. All parameters, aside from pH, BOD, alkalinity, nitrate, temperature and total coliform significantly differ among sampling stations. Groundwater was contaminated in terms of color, turbidity, phosphate, cadmium and total coliform according to the National Standards for Drinking Water, hence the government should be alarmed and ready with precautionary measures especially for cadmium, a carcinogen and coliform bacteria, noted as carriers of waterborne diseases. All parameters varied in quantity among sampling stations except color, pH, total coliform, nitrate and cadmium. Ambient air quality signify contamination within the tolerance level.

The landfill affected the operation of commercial and institutional establishments, outdoor sports and recreational activities, farming and agriculture, junkshops and ambulant buyers and small scale homemade food industries in the area. Livelihood, health and sanitation and environmental effects threaten human health of the nearby residents and workers in the area triggering, complaints and opposition against the landfill operation. Despite the opposition and effects experienced, people still considered the landfill as solution to the city's solid waste disposal problem, source of livelihood and employment opportunities to some. Recommendations based on these findings include the immediate action of the government to address the problems related to the operation of the landfill and to develop an alternative site that is truly sanitary and well-managed to avoid impairment of human health and minimize environmental impacts.

URETA, JULIE CARL P.

A ridge-to-reef ecosystem-based valuation approach to biodiversity conservation in Layawan watershed, Misamis Occidental. – 2013

Over the years, ecosystem services have been undervalued and regarded as public goods. The low appreciation for the benefits provided by the ecosystem has led to the overutilization of resources, causing negative impacts to biodiversity and environment. In the Philippines, biodiversity conservation has not been given the priority it requires, and has been beset with various problems, insufficient funding among them. Payments for ecosystem services (PES) are becoming well-known in the country for their potential to address the financing needs of biodiversity conservation. This study aimed to estimate the value of biodiversity conservation in Mt. Malindang Range Natural Park (MMRNP) to households of Oroquieta city through contingent valuation method. The computed mean willingness to pay using parametric estimation for coastal conservation alone was PhP 30.39, PhP 33.02 for upland conservation alone, and PhP 43.58 for the ridge-to-reef approach. The respondents revealed the highest value in the ridge-to-reef approach for biodiversity conservation, wherein the estimated mean willingness to pay translates to 0.32% of their average income. Potential revenue to be collected annually using the ridge-to-reef approach would amount to PhP 7.5 million. In five years, the total collection could reach PhP 37.6 million, which is enough to make the biodiversity conservation activities in MMRNP sustainable. The estimation of this study could serve as basis for implementation of PES in the Layawan watershed for sustainable biodiversity conservation of MMRNP.

URIARTE, NESSE GRACE T.

Mobility of copper and nitrate in Luisiana and Sariaya soils -- 2004

Breakthrough curves from the miscible displacement experiment showed that nitrate solution applied to Sariaya sandy loam soil took 9 hours and 8 pore volumes (PV) of nitrate solution to stabilize at the relative concentration of effluent and applied solution (C/Co) value of 0.7. As for nitrate applied to Luisiana clay soil, the stable C/Co value of 0.9 was achieved at 13 hours and 10 PV. Copper in Sariaya soil stabilized at C/Co value of 0.3, after 100 hrs and 160 PV, while copper in Luisiana soil took 325 hours and 500 PV to stabilize at C/Co value of 0.8. This means copper requires about 20 to 50 times more pore volume to reach a maximum C/Co an indication of a much larger retardation factor for copper. In the soil, copper is practically immobile when compared to highly mobile nitrate.

The C/Co values did not reach 1 as expected. Mass balance calculations showed input to always be greater than output. This may have been due to nitrate transformation to nitrogen gas under reduced conditions in the soil. Copper could have precipitated, lessening the concentration of the applied solution. Furthermore, copper may have adhered to a sink in the soil preventing it from moving down.

Soil column experiments showed that NO₃-N leached down the soils and its peak concentration (0.2-0.5 C/Co) was observed at 16-20 cm below soil surface levels while Cu⁺⁺ ions were retained in the upper 0-2 cm layer of the soil, with peak concentration ranging from 1 to 2 C/Co. These indicated that nitrate, as it is greatly affected by mass flow, moved deeper into the soil at a very fast rate and may eventually reach groundwater while copper moved very slowly and had a tendency to accumulate in the soil. Downward movement of nitrate was faster in Sariaya soil compared to Luisiana soil, thus Luisiana is the better buffer against nitrate movement.

The solute movement model developed using Stella generated value close to that observed data. By changing the values of the diffusion coefficient and retardation factor, the model predicted, with acceptable accuracy, the concentration of solute as a function of time and depth of soil layer. The model can also be used as a tool for sensitivity analysis for different factors affecting contaminant mobility.

URQUIOLA, JOAN P.

Social Vulnerability and Adaptation to Climate Variability and Extremes of Farming and Fishing Households in Puerto Princesa City, Palawan, Philippines -- 2015

Climate-sensitive livelihoods are in the frontline of sectors which will be affected most by the changing climate. Poor condition of resources, coupled with high dependency of people on them, would increase the vulnerability of resource-dependent communities to climate-induced stress. Hence, this study aimed to assess the differential social vulnerability between farming and fishing households residing in northern barangays of Puerto Princesa City, Philippines. Sustainable Livelihoods Framework was used in developing separate social vulnerability indices for drought, typhoon, and early onset of rains. A total of 236 farmers and 209 fisher folks served as the respondents of the household survey. Unbalanced weighted approach through Principal Component Analysis (PCA) was employed in assigning weights to the significant variables. Majority of the farmers and fisher folks exhibited low vulnerability to drought while moderate vulnerability to typhoon. In terms of early onset of rain, majority of the farmers were moderately vulnerable while most fisher folks had low vulnerability. Results of independent t-test statistics show that farmers were more vulnerable both to typhoon and early onset of rain as compared to fisher folks; while fishers were more vulnerable to drought. Meanwhile, livelihood diversification remains as the most prevalent livelihood adaptation strategy in the study site.

UY, BROOKLYN BERNADETT V.

Biodiversity of Micro Land Snails in the Northeastern Slope of Mount Makiling, Philippines as Indicators of Land Use Change – 2017.

Studies on the diversity and ecology of micro land snails (<5 mm) are very limited in the Philippines. To address this information gap, the diversity and community composition patterns of micro land snails, plant-micro land snail association, and the knowledge of the local community in Brgy. Bagong Silang, Los Baños on micro land snails were determined at the northeastern slope of Mt. Makiling, Luzon Island. The area was divided into seven (7) elevation gradients, wherein 5 quadrats (25 m²) were randomly set for each. From a total of 103 individuals sampled, 10 micro land snail species were identified belonging to four families (Ariophantidae, Diplommatinidae, Helicarionidae, and Subulinidae). The most abundant species was *Kaliella* sp. (21), while *Lamellaxis claviculum* (4) was the least. UPLB Forestry Site 2 had the most number of individuals (60), species richness (9) and diversity ($H' = 2.0$). Among the study sites, UPLB Forestry Site (UFS) 7 was the least in terms of species richness (1) and diversity ($H' = 0.00$), while UFS 4 had the least number of individuals (2). Species accumulation curve revealed efficient sampling (completeness ratio = 0.95). The canonical correspondence analysis (CCA) showed the relationships between species, environmental variables, and sampling sites. Among the environmental variables, soil pH and calcium were identified as the significant limiting

factors affecting the community assemblage of micro land snails. Using generalized linear mixed modelling (GLMM), soil pH was discriminated as the main predictor for abundance and leaf litter depth for species richness. Also, base from the key informant interview (KII), the local community do not have any awareness on the existence of micro land snails.

VALDESTAMON, ROXANNE REI L.

Assessment of Community-Based Mangrove Rehabilitation and Nursery Project in Calatagan, Batangas, Philippines. – 2021

Barangay Balibago of Calatagan, Batangas was engaged in a community-based mangrove rehabilitation and nursery establishment project from 2010 through 2019. This Thesis assessed the efficiency of this project through a cost-benefit analysis of costs incurred from preparations, implementation, and monitoring phases of the project as well as of benefits based on carbon stocks of standing mangrove trees and outplanted seedlings. The mangrove community structure indicated a relatively young mangrove forest with very low diversity index ($H' = 0.9159$), dominated by *Avicennia marina* species. Results further showed that the project did not initially accrue benefits until the sixth year but that these were gained from the 7th to the 20th year. On the other hand, the net present value (NPV) without the project was positive from years 0 to 19 and became negative by year 20 when the mangroves were assumed to be cleared. The internal rate of return (IRR) with the project was equivalent to 16.49%, which was higher than the 10% discount rate used in the study, and that benefit-cost ratio (BCR) was at 1.36, indicating that the project was successful.

VALENTON, JIZALYNE JANETTE B.

Environmental investment for cleaner production in a printing ink company -- 2002

Cleaner production of printing ink company was assessed to determine the feasible environmental investment to reduce production cost and pollution and to improve the work environment of the employees. ASA Color and Chemical Industries Inc., a printing ink company, was the cooperator for this study. Structured interview was conducted on top management's and employee's perceptions and attitudes toward the environment of the company, existing environmental management practices, and future change in the environmental management of the company. All members of the top management and 50% of the employees from each department were interviewed using a structured questionnaire. Environmental performance of the company was assessed and the profitability of cleaner production option was determined.

The company has difficulty in acquiring DENR permits. The operation does not comply with the ECC conditionalities. Amended ECC and permit to operate for air pollution source and control installations have just recently approved. The permit to operate wastewater treatment facility is still on hold due to the required wastewater facility works to be accomplished.

The solid gaseous and liquid emissions of the chemicals used in the printing ink production affected the work environment of the employees. Gas masks and goggles are the only protective gears of the employees and exhaust fans are used to reduce the air pollutants in the workplace. Environmental management system including the cleaner production technologies is proposed with estimated investment of P1,175,490 for five year period to improve the environmental performance of the company.

The pay back period for environmental investment in cleaner production is 2 years. In the succeeding years, the cleaner production system has lower operating cost and higher net profit than the existing production system.

VALIENTE, ESTELLA P.

Waste Management Practices and Groundwater Quality in Dairy Buffalo Farms in Two Cities of Nueva Ecija, Philippines. – 2020

Water is an essential nutrient required by all humans and animals to survive but is prone to contamination by different sources such as livestock wastes. The waste management practices of dairy buffalo farmers in the cities of San Jose and Muñoz, Nueva Ecija were documented. The groundwater quality of wells in these farms during the rainy season and mid-dry season was assessed using water quality index (WQI) and Geographic Information System (GIS) in relation to waste management.

On manure management, 80% of the respondents stockpile manure near the dairy animal shed. For this composted manure, they apply it as fertilizer for their rice farm, forage area or vegetable farm during the land preparation for planting season, sell it, or give it to their neighbors and relatives. Only 12% practice vermi-composting. Most of them (56%) pile their feed refusals with the manure while some of them (17%) burn it and a few of them (7%) pile it near the shed to decompose. On the other hand, they dispose the animals' liquid wastes via open channel going to rice fields, river or creek, irrigation canals, forage areas, or vacant lots. They either bury, burn, throw in a vacant area, reuse, sell or give to

garbage collectors their non-biodegradable dairy farm wastes. The number of adult buffaloes being raised was the only significant predictor of waste management practices among the dairy buffalo farmers.

The EC, total coliform and E. coli of the wells were beyond the PNSDW and WHO standard limit while the pH, TDS, temperature, salinity and nitrate were within the prescribed limit. The computed WQI showed that majority of the wells have WQI rating of >300 or unfit quality for drinking especially during the mid-dry season when water recharge was very slow.

The factors that significantly contributed to the groundwater quality during the rainy season and mid-dry season were EC and cement-tube type of well, while manure and wastewater managements of the dairy farms were not statistically significant due to the small scale of the dairy farms under study and the respondents' practice of diverting liquid wastes to different disposal site. Despite the statistically not significant result, the concerned agencies must revisit and evaluate the policies and programs related to dairy farm waste and water managements towards protection of the environment and attainment of sustainable dairy buffalo production.

VALLENA, MABEL G.

Understanding the Disaster Recovery Process of a Farming Community in Zambales, Philippines after the 1991 Mt. Pinatubo Eruption Using the Community Capitals Framework (CCF). – 2021

Barangay Burgos, a farming community located in the western foot slope of Mt. Pinatubo, Zambales, Philippines was one of the communities devastated by the 1991 eruption. Despite being devastated and displaced, this community has recovered and adapted to the disaster-altered environment.

This study examined the processes that the community has taken to recover from the disaster, through the lens of the Community Capitals Framework (CCF), i.e., human, natural, social, political, financial, built, and cultural capitals.

The results of this study have shown that central to recovery effort is human capital. Their ability to adapt to disaster-altered environment have proven that the recovery of a farming community is deeply rooted in their knowledge and skills in farming. The community's close ties with the Municipal Agricultural Office enhanced their human and political capital. MAO facilitated the various skills enhancement trainings for farmers and served as the "power broker" for farmers to create linkage with local and national government. The financial capital of farmers is ensured by their application of a diversified farming system (i.e., planting wide variety of high-value crops and possession of various livestock). The recovery of physical capital (i.e. infrastructure facilities) which required substantial amount of funds was largely dependent on the policies formulated by the national government. The cultural capital of the community is embedded in farming activities which is viewed as a "way of life".

This study has proven that community capitals are essential in disaster recovery and that recovery cannot simply return to its original state. It also provided insights on the interconnectedness of community capitals to drive disaster recovery. Since the study was conducted at a community level, it is recommended to conduct further studies at household level to better understand the process of recovery.

VASQUEZ, LEILANI S.

Socio-economic correlates of the swidden strategies of the Iraya Mangyan in Puerto Galera, Oriental Mindoro -- 1998

The study attempted to attain the following objectives : (1) to describe the biophysical and socio-economic-cultural environment of the Iraya Mangyan community. (2) to determine the manner and extent that certain socio-economic conditions among the Iraya Mangyan are affecting their traditional swidden practices, and (3) to identify and understand the swidden farming strategies employed by the Iraya Mangyan. The socio-economic factors that were hypothesized to be affecting the swidden practices of the Iraya Mangyan are : (a) population, (b) deforestation, (c) land tenure, (d) institutional support, and (e) income. To determine the relationship of certain socio-economic variables with the swidden practices of the Iraya Mangyan, primary and secondary data were gathered, and contextual analysis of secondary data was likewise done. Descriptive and inferential statistics were used in measuring the relationships.

The results of the study show that the current farming practices of the Iraya show a propensity towards short-cycled fallow periods, expansion of swidden plots and the use of the intercropped annual-intercropped perennial cropping combination. These swidden strategies were, over the years, adopted by the Iraya in an effort to sustain the viability and integrity of their swiddens despite the socio-economic changes obtaining in the environment.

Among all the variables measured, there were three relationships that were found to be significant. These are : (1) membership in organization and fallow period, (2) household size and cropping combination, and (3) length of cultivation and cropping combination. The significance of these three relationships highlight the strong influence of family and kinsmen on the Iraya crop production process. The types of crops the Iraya prefer to cultivate are, likewise, influenced by familial concerns, i.e., household size which is translated to available farm labor, and the tenurial arrangements and/or perception on land ownership. These relationships, similarly, underscore the great importance the Iraya place on their family and kinsmen as the basic unit of production and consumption. Cultural factors have played a definitive role in their crop production process as these direct and control the farming process. Although these were the only relationships that were found to be significantly affecting each other, this does not mean that the other relationships

are not occurring. The statistical results may not be able to show the real situation as the computations might have been unduly affected by the study's operational limitation, i.e., the relatively small sample size used and the homogeneity and non-variability of the Iraya's responses.

VEDRA, SONNIE A.

Analysis of the Anthropogenic-Based Disturbances Among the Indigenous Goby Population in Mandulog River System, Northern Mindanao, Philippines. – 2012.

The biology and ecology of indigenous freshwater gobies might be affected by water pollution resulting from human activities, which posed changes in the water quality of the river. Hence, a study was conducted in the upstream, midstream and downstream parts of Mandulog River system, Iligan City, Northern Mindanao in quarterly basis for one year to determine the species composition, abundance, morpho-meristic characteristics, sexual dimorphism, body proportionality, GSI estimates, water quality, climatic conditions, and human-related activities. Total number of individuals of all goby species was 1590, with 895 (56.28%) and 695 (47.72%) gobies collected during dry and wet seasons, respectively. There were 141 (15.75%), 559 (62.45%) and 195 (21.78) individuals of all goby species recorded in the upstream, midstream, and downstream parts of the river during dry season, while 147 (21.15%), 372 (53.52%), and 176 (25.32%) were recorded during wet season. Ten goby species were found in three families namely, *Belobranchus belobranchus* (4.78%), *Giuris margaritacea* (10.25%), *Oxyeleotris lineolata* (31.76%), *Awaous melanocephalus* (13.46%), *A. ocellaris* (12.14%), *Glossogobius celebius* (8.99%), *G. giuris* (8.68%), *Periophthalmus barbarus* (3.52%), *Sicyopterus lagocephalus* (5.28%), and *Rhyacichthys aspro* (1.13%). Generally, the morphometric and meristic attributes did not differ significantly for each goby species. Only four out of ten species exhibited sexual dimorphism, namely: *G. celebius*, *P. barbarus*, *O. lineolata* and *G. margaritacea*. Body proportionality measures were highly correlated to all species, which connote a well-proportioned body structure. A decreasing trend of gonadosomatic index was observed from species found in the upstream towards downstream, that in turn, may indicate a slight sensitivity to water pollution. *R. aspro*, which can only be found in the upstream and midstream, may be the only species that is sensitive to water pollution, although the water quality of Mandulog River is still within the DENR standards that could support the goby population. This study revealed that the current domestic (i.e. toilet use, kitchen wastes, laundry and bathing), agricultural (application of pesticides and fertilizers), quarry and small-scale mining activities done within the river and its periphery did not pose any serious threats to goby population in terms of the level of pollution generated. However, it is imperative that the river must be protected from overexploitation and pollution impacts for the economic and ecological benefits, particularly on providing sustainable fishery resources for the present and future generations. The increasing level of awareness based on the knowledge, perception and attitude of the residents towards the riverine and terrestrial resources might probably empower themselves and be mobilized through a concerted and holistic effort on biodiversity conservation and sustainable development programs of the LGU and other institutions.

VERIDIANO, RIZZA KAREN A.

Analysis of Aboveground Carbon Sequestration Potential of the REDD+ Demonstration Site in Southern Leyte, Philippines. -- 2014

Tropical forest harbor 70-80% of the world's terrestrial carbon budget but is also accountable for 18-20% of the global carbon emissions due to deforestation. An emerging performance-based mechanism termed as reducing emissions from deforestation and forest degradation plus (REDD+) is the main strategy proposed to address climate change mitigation. Progress has been made since 2010 when the Philippines started on implementing readiness activities. The study was a novel initiative for it was the first demonstration site to account for a reference emission level (REL) that can be used as an interim one for national use. It aims to assess the baseline carbon stocks and potential carbon sequestration of the different REDD+ options in the Southern Leyte REDD+ site incorporating uncertainties as part of adhering to the IPCC guidelines. In coming up with the REL, emission factors were derived from 156 plots established within the study site and activity data were derived from the national land cover change analysis. The results suggest that the project area is indeed a carbon sink for having a conservative and aggressive baseline net emission removal of 0.33 M tCO₂ eq/yr and 1.06 M tCO₂ eq/yr, respectively. Additionally, specific for the project site, the resulting aboveground biomass were relatively close to that of the international and national aboveground estimates and further validities that the estimates are within the range of biomass values generated from studies conducted on a national scale, demonstrating that sub-national projects in the Philippines are capable to conduct Tier 2 level for carbon estimation, as per IPCC 2006 Guidelines. Although the site is considered as carbon sink, It should be noted that emissions from degradation ranging from 0.17 M tCO₂ eq/yr (conservative) to 0.66 M tCO₂ eq/yr (aggressive) due to an annual degradation of 1 209 ha, accounted for almost half of the total emissions; hence efforts to address or decrease the annual degradation in the area must be taken into consideration as well. From this baseline scenario's a suite of REDD+ mitigation options was analyzed and revealed that mitigation options having higher reductions on emission from degradation and higher percentage of enhancement of carbon stocks will have the highest net emissions

removals, ranging from 0.46 (conservative) to 1.54 M tCO₂_{eq}/yr with corresponding financial benefits worth 2.30 to 7.69 M US\$/yr. aside from the carbon accounting aspect, the study also took into consideration the different socio-economic issues identified within the project area that are related to safeguarding this aspect under the REDD+ mechanism including key drivers of deforestation such as forest products extraction, agricultural expansion and infrastructure expansion. Underlying causes of deforestation were also identified such as weak policies and governance, poverty and population pressure, market demand and economic development and technological and biophysical factors. Bearing these results in mind, the current national statistics for deforestation rates and the identified drivers for deforestation and degradation, it would be an opportune time to re-assess where efforts should be concentrated to give realistic results through this mechanism.

VILLA, DEBORAH M.

Management of the coral reef resource for tourism purposes in Barangay Sabang, Puerto Galera, Oriental Mindoro -- 1995

The study aimed to determine the management system of the coral reefs in terms of its physical and technical characteristics (such as the jointness of the resource, degree of excludability and the indivisibility of the resource) and institutional arrangements (such as national and local policies, livelihood activities, the technologies/institutions for appropriating, monitoring and regulating the resource use, the direct and indirect uses of the resource and users' values and attitudes). The reefs and the local community of Barangay Sabang of Puerto Galera, Oriental Mindoro, were the subject of the study. The physical and technical attributes analysis indicates one person's use has not yet subtracted from the use of others; the exclusion of use is not possible because of its location facing the open sea and is easily accessible from Metro Manila; it is impossible to exclude indirect use from tourism establishments within the area; and, private property cannot be demarcated. The institutional arrangements and consequences are the following : the area has been declared as a reserve and a tourist zone; there is at present no regulation that protects the reefs from non-toxic liquid effluent into the sea; the Philippine Coast Guard provides little threat to violators; and, trends show that values and attitudes differ with different users.

Management of the resource is partially ineffective because of the interactions of the two. As a biosphere reserve and tourist zone, special schemes are required. However, the inability to exclude unwanted outsiders and because private property cannot be demarcated, accessibility poses problems, tripled by ineffective coast guarding by the detachment to protect the reefs.

Relationships between those directly and indirectly involved in the reef resource determine the modes used in its allocation. The cooperative strategy between concerned citizens of the community protect the resource from its quick deterioration while free-riding practised by those who indirectly use the resource is prevalent in Sitio Sabang. Recommendations include : prohibition of spear fishing for recreational purposes, tourism establishments that continue to dispose of waste water and solid wastes into beach and sea should be fined, the local government should develop a comprehensive environmental policy, and, present legislation must be strictly implemented.

VILLANUEVA, ELAINE LOREEN C.

Setting Localized Conservation Priorities of the Useful Plant Species of the Alangan Mangyan of Mt. Ilong, Halcon Range, Mindoro Island, Philippines. – 2018

This study aimed to set priorities for conservation among useful plants of the Alangan Mangyan of Mt. Ilong, Halcon Range, Mindoro Island, Philippines. Information on plant ecology of Mt. Ilong and traditional knowledge of the Alangan people were utilized for local conservation priority setting of species. The useful plants of the Alangan people were documented from interviews among 60 key informants and verified by the elderly key informants. This study recorded 199 local names of plants (wild and cultivated types) with varying uses. Patterns on plant use indicate that there were more cultivated than wild plant species for food, fodder, medicine, and firewood use categories, while more wild than cultivated species were recorded for construction and lumber use categories.

The plants were verified in the field during a study of the vegetation structure and dynamics of tree species in Mt. Ilong, Halcon Range. Hierarchical cluster analysis in unweighted pair group arithmetic mean (UPGMA) algorithm (using Bray-Curtis similarity index) was performed to identify major plant communities in Mt. Ilong, namely; Zone I (agroforest), *Lansium* - *Artocarpus* - *Swietenia* - *Ficus* - *Nephelium* - *Mangifera* zone; Zone II (forest zone), *Cyathea* - *Astronia* - *Syzygium* - *Garcinia* - *Ficus* - *Psydrax* - *Diplodiscus* zone; and Zone III (forest zone), *Agathis* - *Suli* - *Alitugba* - *Ardisia* zone. Furthermore, ordination using canonical correspondence analysis (CCA) was performed to analyze the relationship between the tree species and selected environmental variables. Temperature and elevation were the greatest influencing environmental factors that affected the species distribution in Mt. Ilong.

An evaluation index for species level was devised to set priorities for conservation. The conservation priority index is a point-scoring procedure, composed of seven criteria encompassing ecological, socio-cultural significance, and present threat assessment which are important considerations when setting conservation priorities for conservation. Seventy-two wild plant species identified from field survey and vegetation analysis were

evaluated using the devised index. From this evaluation, 17 species were identified as species of medium priority for conservation. Furthermore, a nonlinear principal component analysis was also done to identify which among the criteria have influenced in conservation priority setting.

The results of this study can be useful in conservation management in the local level, as the index promotes the involvement of the local people in conservation. Moreover, the methodology used in setting conservation priorities of plants species can be simulated to other localities in the Philippines.

VILLANUEVA, JERIC C.

Influence of Environment on the Diversity of Bioactive Constituents, Bioactivity and Heavy Metal Content on the Leaves and Fruits of Calabash (*Crescentia Cujete* L.). – 2022.

The environmental and biochemical studies on calabash (*Crescentia cujete*) and its essential benefits to human health were investigated in this study. Correlation analysis on heavy metals of flesh part showed that Zn ($r = 0.676$) had strong and positive correlation to the annual amount of rainfall while a strong and negative correlation of Cu ($r = -0.690$) and Zn ($r = -0.920$) with the average temperature. This indicates that increased rainfall can contribute to the increased amount of zinc in the fruit while temperature increase can contribute to decreased amount of Cu and Zn. Consumer awareness survey showed that 82% of the respondents had prior idea on the uses of calabash tree specifically for treatment of cancer, diabetes, high cholesterol level, and hypertension.

The results of the survey supported the experimental findings of this study. Phytochemical composition revealed the presence of sufficient amount of phenolics, flavonoids and condensed tannins in flesh and leaves. Flavonoids showed the highest positive correlation to phenolic content (flesh, $r = 0.913$; leaves, $r = 0.966$) which indicates the possible significant contribution of flavonoids to the total phenolics of calabash. Favorable temperature and organic farming approach played a significant role in the accumulation of TPC, TFC, proanthocyanidin content and strong antioxidant activity. Phytochemicals from the crude extract exhibited high activity in lowering blood pressure with up to 94% ACE inhibition, moderate inhibition of pancreatic lipase (57%), and good inhibition of cholesterol micellar solubility (65%). Lastly, protein profiling and characterization of *C. cujete* fruit were performed. Results from ACE and cholesterol micellar inhibition assays showed high values with no significant difference between crude and purified protein digests. The similarity of activities is attributed to the release of bioactive peptides and other compounds in trace amounts in crude samples. Proposed peptides such as PT, YP, AP, YA, NY, SY, TE, YE, YN exhibit ACE and dipeptidyl peptidase IV inhibitory activities based on BIOPEP database. Therefore, peptides isolated from *Crescentia cujete* fruit showed tremendous potential in lowering blood pressure, inhibiting pancreatic lipase to reduce obesity problems and reduction of cholesterol level.

VILLANUEVA, SALVACION P.

Impact analysis of a community-based agroforestry farm development projects in Atimonan, Quezon -- 1995

Environmental impacts assessed and analyzed in this study includes change in vegetation cover, change in soil fertility and productivity and change in environmental condition, whereas socioeconomic impacts includes distribution of benefits, community capability for self-reliance and change in income. Findings of this study show that extent of participation in planning, project implementation and benefit-sharing are significantly related to environmental impacts. Farmers' participation increased the vegetative cover and soil fertility and productivity of the project. Similarly, environmental condition was improved. Change in environmental condition and change in soil fertility and productivity were significantly related to decision-making.

Farmer-respondents increased their income after the project. Their extent of participation in decision-making and implementation is significantly related to change in their income. Furthermore, participation in planning, decision-making, implementation and benefit-sharing are significantly related to distribution of benefits and community capability for self-reliance. Moreover, some farmers improved their capability for self-reliance through the farmers' organization developed by the project. Recommendations given include intensive adoption of agroforestry technologies, equity considerations, maintenance of unity and cohesiveness among farmers, assistance and supervision by the DENR in agroforestry farm development and strengthen monitoring system.

VILLARUEL, MC JERVIS S.

Spatio-Temporal Variations of Plankton in Lake Tadalak Los Baños Laguna Philippines. – 2018

Phytoplankton and zooplankton communities at Lake Tadalak were characterized from October 2014 to March 2015 to provide information on the lake's trophic status and assess the effectivity of its rehabilitation since 2000. Also, willingness to pay (WTP) of the stakeholders was also determined to evaluate how much they willing to pay if ever fee will be implemented for the restoration of restoration of the water quality of the lake.

A total of 14 of phytoplankton and 26 zooplankton species were recorded throughout the sampling period. Chlorophyta (71.42%) largely dominated the phytoplankton community, followed by Bacillariophyta (14.29%) and Cyanophyta (14.29%). Zooplankton community was dominated by Rotifera (71.43%) followed by Cladocera (17.86) and Copepoda (10.71%). Among the phytoplankton taxa, *Melosira* was the most abundant followed by *Coelastrum* and *Eudorina* for the whole sampling period at 7 stations. *Brachionus forficula* was the most abundant zooplankton taxa followed by *Bdelliod sp. 1*, and *Brachionus havanaensis*. Significant differences in phytoplankton and zooplankton species were noted among sampling months ($p < 0.05$) while no significant variation was noted in plankton density between sampling sites ($p > 0.05$). Canonical correspondence analysis revealed that phytoplankton communities in the lake were highly influenced by nitrates, phosphates, pH, temperature, and conductivity, on the other hand, zooplankton community were influenced by dissolved oxygen, biochemical oxygen demand, pH, transparency, and temperature. High density of the plankton species recorded indicates that the lake is still experiencing eutrophication since they are all eutrophic indicators. Physico-chemical parameters, specifically the nitrates and phosphate concentration support this finding as it satisfies the value for eutrophic body. Furthermore, the biological indices further confirmed the eutrophic condition of the lake. As for the WTP, the stakeholders ascribed a mean WTP of Php 95.88/household/month (1USD = 51.00 Php) for the water quality restoration of the lake.

VO THI BACH THUONG

Improved GHG Calculation for Rice Cultivation in Different Agro-Ecological Zones of the Mekong River Delta, Vietnam. – 2018

This study was conducted in Mekong River Delta (MRD) which has three agroecological zones namely: (i) alluvial soils/acid-sulfate soils, (ii) deep flooded, and (iii) salinity intrusion. These zones have largely distinct biophysical conditions that effect Greenhouse Gas (GHG) emission. The objective of the study was to assess the GHG emission in the MRD with improving the reliability of result by using a new data set: (i) crop management data obtained from the survey of two sources namely farmers and extension staff and ii) emission data derived from survey data that entered into GHG calculator using previously published zone-specific Emission Factors. Given the large spatial and temporal variability of agriculture, statistical analysis with the confidence interval of 95% was applied to measure uncertainty. Results showed that i) the comparison of data from farmers vs. extension staff resulted in significant differences in the percentages of given crop management practices; ii) the computed GHG emissions results among the zones show significant, specifically, higher emission from deep flooded zone, followed by alluvial/acid-sulfate and saline zone, iii) the total GHG emission of the MRD accounts for 18.478 and 16.673 million tCO₂e based on extension staff and farmers' information, respectively which showed insignificant differences (approximately 10%). However, this variation in total emissions has to be seen against other uncertainties that are inherent in such calculations, namely spatial and seasonal variability has been discussed in the preceding study on Emission Factors.

The findings of this study highlights that: i) information coming from extension staff can still be deemed a good proxy for activity data in the case of resources limitations in conducting farmer survey for GHG assessments in Vietnamese context; ii) the term 'AWD' in questionnaire results in different AWD adoption rate which effects the result of GHG emissions estimates, iii) The newly derived EFs and crop management data has addressed a critical gap for more reliable GHG assessments by providing information which is rather parse in Vietnam currently. Therefore, GHG calculations need for multidisciplinary approaches. Field measurements alone will not lead to significant improvements as long this data is not combined with targeted surveys on crop management and proper procedures for upscaling of emission rates. Besides, developing a questionnaire that can avoid ambiguous information is an important step in GHG assessment process which can affect the overall GHG inventory.

VONGMANY, OUTHEVY

Assessment of the Flood Vulnerability and adaptation of rice production system in Champone district, Savannakhet province, Lao PDR – 2014.

Flood vulnerability of three rainfed lowland rice producing villages near the meandering Xe Champhone River on the flood plain of Champhone District, Savannakhet Province of Lao PDR was assessed. Flood vulnerability is the level of exposure to heavy rainfall during monsoon storm resulting to flood occurrences affecting rice production livelihood system.

Hydrologic analyses of the rainfall of several stations outside the project sites and Hydrology Engineering Center River analysis version 4 (U.S. Army Corps of Engineers, 2001) were used to determine the extent of flooding at different rainfall return periods. Household survey and key informant interviews were conducted in the study sites. The normal flood according to the respondents is equivalent to flood of 50 year rainfall return period which usually occurred in September and October.

With projected higher monthly rainfall in July to September, the flooded area with 100-200 year return period of rainfall would probably occur. Non-flood tolerant rice varieties were grown. Rice security of the community was severely

affected by flooding. The community had low level of education, low income, is dependent mainly on rice production livelihood system, and has inadequate social services. This makes the community socially and economically more vulnerable to flood. Adaptation strategies were suggested to reduce the impact of flooding and to have a resilient community.

VONGPHACHAN KHAMPOG

Environmental Assessment of Sanitary Landfill Site Facility in Vientiane Capital, Lao's People Democratic Republic (PDR). – 2012.

Increasing volume of solid waste is one of the emerging issues that currently confront Lao PDR. To address the issue, Lao PDR has been employing landfill as final disposal site for its solid waste. This study examined the performance of the new Vientiane Landfill particularly on the criteria used in the selection of the site, amount and type of waste generated and accommodated and impact on the physical and social environment. The decree on Environmental Impact Assessment (EAS) was only implemented in 2010 after the construction of facility in 2008. Results of the assessments were used in the formulating proposed strategies that can contribute to the improvement of the operations of the existing landfill.

Location of the Vientiane Landfill complies with the engineering criteria, but the plans and designs of the landfill failed to incorporate some critical components adversely affecting the operations. About 40% of waste generated was collected and disposed into the landfill. The remaining waste were sold for recycling, burned, and dumped illegally. The soil quality was affected by sewerage overflowed to the rice field and contributed to the high level of pH, N, P and K. The water quality of Houay Thupthai Creek exceeded

WILSON, DAVID M.

An Assessment of The Potential For Payment For Ecosystem Services To Support The Sustainable Management Of Gabayan Watershed, Bohol, Philippines -- 2014.

The Gabayan watershed is a heavily degraded multi-use landscape covering over 5,000 hectares in eastern Bohol, Philippines. The principal livelihood activities of subsistence agriculture - particularly rice and maize production - as well as livestock management and aquaculture, are closely bound to the ecosystem services provided by the watershed. The degraded nature of the watershed, which has been largely deforested and replaced with extensive agricultural and grasslands, has led to alternate flooding and drought episodes, an accelerated level of soil erosion as well as downstream sedimentation, all of which impact the livelihoods of local communities.

Alternative land-use practices which continue to offer livelihood benefits are required to tackle these environmental problems but remain nascent and technical capacity low. Incentivising these land use practices using a Payment for Ecosystem Services (PES) mechanism has been identified by local stakeholders as a potential solution and this study employs interdisciplinary techniques from participatory mapping to hydrological modelling to determine whether PES is a viable solution in the Gabayan watershed. Through a combination of scientific, policymaker and local ecological knowledge (MEK, PEK and LEK) the most important ecosystem services are identified, quantified and mapped. A series of simulated scenarios determine the relationship between land management practices and ecosystem services and a set of indicators for determining the viability of a PES scheme is offered. Finally, the architecture of a potential PES scheme in the Gabayan watershed is proposed.

WIN HTEIN

Life cycle assessment of tomato, eggplant, cucumber and string beans production systems in Nagcarlan, Laguna Province, Philippines -- 2012

Increasing population brings high demand for agricultural products which has given rise to adverse environmental impacts during both production and transport. Environmental burdens of vegetable production of tomato, eggplant, cucumber and string beans by smallholders in Brgy. Bukal, Nagcarlan Municipal, Laguna were identified by using the Life Cycle Analysis (LCA) approach. The study aims to assess the environmental impacts of materials and energy flow through production systems within the system boundary, from land preparation to transport to market. The impact categories, global warming potential, acidification potential, eutrophication potential and human toxicity potential, were computed based on function unit of 1 kg of vegetable and 2000 m² production area. The inventory analysis involved collection of data on raw materials energy consumptions and emissions.

The highest emission of 1.94 E-02 kg CO₂-eq of GHG was obtained from the tomato production system while string beans production showed the least of 1.60 E-02 kg CO₂-eq kg⁻¹ of vegetable. Similarly, the highest and least acidifying compound emission from fuel combustion were also found in tomato and string beans production, values obtained were 9.99 E-04 gm SO₂-eq and 7.93 E-04 gm SO₂-eq kg⁻¹ of vegetable, respectively. 1.05 E-02 kg PO₄-eq of eutrophication compound was recorded as the highest discharge obtained from the eggplant production system; the

lowest value was from string beans production system at 7.8 E-03 kg PO₄-eq per kg of vegetable. Eggplant production has the highest human toxicity potential in terms of 1 kg of vegetable both in air and soil, 4.61 E+ 00 g 1,4 DCB-eq and 1.7 E+03 g 1,4 DCB-eq. Tomato production shows that the BCA value more than 1 while the other show less.

Most impacts are directly due to farmer's production practices. The LCA approach on vegetable production provides informative feedback that can help decision-makers to select the product or process that result in the least impact to the environment and human societal. The study provided improvement of crop management practices to reduce environmental impacts as well as to increase the productivity and economic viability.

XIHUI, AI

Indigenous people's participation in the management of the Wuliangshan nature reserve in Yunnan, China -- 2001

The study was conducted to determine the environmental condition of the Wuliangshan Nature Reserve and its adjacent area : the utilization and conservation of forest resources; and sustainability and efficiency of resource use pattern of two indigenous communities in Wuliangshan Nature Reserve in Yunnan, China. Field survey including farmers' interviews using schedule questionnaire was conducted in Yakou and Huiying village, both are typical communities in the vicinity of Wuliangshan Nature Reserve. Yakou village is dominated by Yi people, while Huiying is dominated by Hui (Muslim) people. Indigenous knowledge on ecological perspective of forest resource management practices and relationship between the traditional and state laws on natural resource management was evaluated. Forest utilization of Yakou and Huiying is predominately for fuelwood, timber, fodder, bamboo, mushroom, edible plants, herbal medicine, decorative plants, rattan, cultural plants, and others. Fuelwood is the largest ecological product from the forest of the communities. The quota for fuelwood per person is 0.5 m³. The consumption of fuelwood has declined through the years because of alternative sources of energy such as natural gas, coal briquette, and electricity. Indigenous people's favorite tree species include *Pinus kesiya*, *Lithocarpus echinophorus*, *Schima*, *Keteleria evelyniana*, *Cyclobalanopsis glaucoides*, *Schima argentea*, *Rhododendron delavayt*, *Myrica esculenta* and others.

Results showed that the use of patter of forest remains the same after the establishment of nature reserve. About 60 percent of the respondents stressed that the nature reserve had no impacts of their life. Others claimed that the establishment of nature reserve limited the pasture area for their livestock, thus affected their life significantly. Indigenous people of Yakou and Huiying have developed a set of customary laws and practices in order to conserve the nature resource for their subsistence. They are complementary to the legislative laws on natural resource. The forest resource use pattern of local communities tends to be sustainable and efficient. Indigenous people can derive an understanding of ecological processes as a part of indigenous knowledge, known as "proto-science". The proto-scientific ability of human is brought about by their dependence on nature for their survival. The study further suggested that both ethnical and legal aspects of the forest resource use pattern are necessary elements for effective indigenous people's participation in nature reserve management.

YACAPIN, NEUYEDA C.

Participatory implementation of the territorial use rights in fisheries in Panguil Bay, Misamis Occidental, Philippines -- 1995

The study assessed and analyzed the effects of participation of the members of the fishermen's cooperatives in the implementation of the territorial use rights in fisheries on the socio-economic condition and the ecological condition of the Panguil Bay. Age, occupation, status of occupation and length of residence of the members were directly related to their participation in the implementation of the TURFs. Community characteristics such as the position and physical distribution of the houses, distance of residence from the fishing ground, accessibility of residence by transportation, women's participation, ownership of the land, old residents in the area, cohesive community, attitude and perception towards the implementation of the TURFs, involvement of the institutions, and social equity were directly related to the participation of the member respondents.

The study also showed that participation was directly related to the perceived socio-economic variables such as increased fish catch and reduced resource use conflict in the use of the bay. The perceived ecological variable on improvement of fish production was directly related to the participation of the fisher respondents. The respondents indicated a favorable perception but an unfavorable attitude towards the implementation of the TURFs as an alternative fishery management tool. The extent of their participation was low which could be attributed to the low level of knowledge about the TURFs, lower level of their educational attainment, participation of the nonfishers, dissatisfaction of the technical and support services as well as inadequate benefits which hindered them to actively participate in the program.

YONGHE, ZHOU

A study on the impact of plastic mulch on selected crop agroecosystems in Yunnan Province, P.R. China -- 1994

The study was conducted to evaluate the environmental impacts of plastic mulch on four crop groups in northeast and central Yunnan, P.R. China. The results of the study revealed that under different cropping systems, plastic mulch significantly raised the soil temperature and soil water content remained stable. The soils were also observed to be loose, friable and well-aerated condition. Microbial activity was also enhanced. Quick-effective N.P.K. and other soil nutrients were released quickly. Subsequently, crops grew fast with high yields of crops. Plastic mulch significantly improved corn yield of corn, especially in the areas with high elevation. It also improved the yield and quality of tobacco, vegetables and rice.

Weeds and some insects were effectively controlled by mulch. Soil salt accumulation, soil erosion, labor force input, irrigation water were all reduced. Plastic mulch increased the effective areas for crop production and subsequently the total production that helped improve farmers' farm income. Due to this direct benefits, the farmers became more active in participating training programs and other community activities. Plastic mulch also caused such environmental problems as the drop of soil fertility and plastic residues in the soil. The drop of soil fertility has been compensated by increasing manure and chemical fertilizers. It was found out that the plastic residues in the soil do not have serious impacts yet on the yields of crops but have some negative impacts on the soil properties such as bulk density and porosity. The proper waste plastic disposal means can mitigate or eliminate the negative impact of waste plastic residues remaining in soil on the growth of crops and soil properties.

YURONG, LI

Sustainability analysis of soil conservation techniques for the sloping lands in Guizhou, China -- 2003

The sustainability of different soil conservation techniques for sloping lands of Luodian, Longli and Pingba Counties in Guizhou Province, People's Republic of China was analyzed. The determinants of farmers' decision to adopt the alley cropping system were assessed. Strategies to improve the sustainability and acceptability of the alley cropping system among upland farmers were recommended.

Primary data were collected using survey approach and key informant interview. The survey was conducted in Dajiang, Shangjie, Xiazhai and Nadang Villages in Luodian County, Yuanbao Village in Longli County, and Yunpan and Sicun Villages in Pingba County, Guizhou Province, People's Republic of China. Respondents were randomly selected for personal interview. Focus group interviews with leaders of the villages were also conducted. The data were analyzed using descriptive statistics.

Experimental results obtained by the IBSRAM-SDC project in 1992-2000 for both experimental and demonstration sites, statistical documents, published scientific papers, books, and research papers were used as sources of secondary data. Time series data (1992-2000) on soil loss, agricultural data, and related issues of the study sites were gathered from the China Statistical Yearbook and the Bureau of Agriculture.

Among the soil conservation techniques, alley cropping reduced soil erosion rates considerably and increased soil water holding capacity of upland farms. Alley cropping stabilized the slope of upland farm because the soil accumulated along alley crops. This technology is more acceptable among farmers because it is simpler, easily understood and required lesser amount of labor and material inputs than hillside ditches. Using the sustainability indicators as criteria for selection of appropriate soil conservation techniques, the alley cropping system has the highest benefit-cost ratio, crop productivity and soil fertility build-up, and least soil erosion and runoff rates.

The technology has already been applied to more than 700 hectares of upland farms in Guizhou Province and is currently being piloted in selected counties. The technology provides new opportunities for farmers to improve farm productivity and sustainability in mountainous areas of Southern China where stone for rockwalling technique are not available.

Government support is important. Introducing of mitigation measures such as reforestation activities, vegetable production in the lowlands, orchard establishment and generation of employment opportunities are important that should be considered by the government to reduce the increasing pressure on steep uplands. Planting of alfalfa for animal feeds and livestock industry is one of the interests of upland farmers to improve their meager from subsistence upland farming. The alley cropping technology is suitable and acceptable, hence, its application should be expanded to other mountainous areas.

ZAMORA, GLAIZA J.

Ex-Ante Assessment of SARAI-Enhanced Agricultural Monitoring System (SEAMS) in Selected Municipalities in Occidental Mindoro, Philippines. – 2020

SEAMS is one of the climate-smart technologies developed through Project SARAI. It is a decision support tool that provides site-specific monitoring and forecast information to municipal agriculturists and farmers.

This study assessed the potential impacts of SEAMS in selected municipalities in Occidental Mindoro. Representative barangays in municipalities of Abra de Ilog, San Jose, and Sta. Cruz were chosen as study sites because these are top-corn producing areas in the province.

Specifically, the study determined the value of seasonal forecast for farmers through Rapid Climate Decision Analysis. Results revealed that provision of information on seasonal rainfall forecast would be valuable for farmers to help them decide to plant or not to plant corn especially under wetter climatic condition.

Costs and benefits of SEAMS in corn production were also measured using Cost Benefit Analysis. Establishing SEAMS was found to be feasible in all sites at a discount rate of 10%. Sensitivity analyses however showed that increasing the discount rate has varying effects on the viability of the intervention in three municipalities.

Willingness of municipal agriculturists and farmers to use SEAMS was investigated. Municipal personnel suggested the adoption of SEAMS. Likewise, a large number of farmers are willing to utilize SEAMS but there are factors to consider in the deployment of SEAMS on the ground.

Municipal offices should be equipped and familiarized on the tool. Necessary equipment, especially laptops and reliable internet connection should be made available. On the side of farmers, results of Gender Analysis showed that husband farmers will make the decision on selecting and adopting SEAMS. Furthermore, through Logistic Regression Analysis, age, marital status, monthly farm income, land ownership, availability of internet-capable mobile phones, access to climate information through mobile phone internet and agricultural extension workers were discovered to be positively connected to the farmers' willingness to adopt SEAMS.

These findings impart that information format should be comprehensible, source credibility should be established, and dissemination channels through smartphones should be considered. The presence of agricultural extension workers would be useful as well to encourage farmers adopt SEAMS through understandable trainings showcasing success stories on the use of SEAMS.

ZAMORA, JESUS F. JR.

Municipal solid waste management plan for the city of Danao, Cebu, Philippines -- 2001

The problem on municipal solid waste management is one of the major concerns of the City of Danao. A study on the formulation of a municipal solid waste management (MSWM) plan to guide the local government of Danao City was conducted. The volume and the kind and characteristics of solid waste generated by the residents, commercial and industrial establishments were determined. The existing solid waste management system was analyzed to determine the action plan to be undertaken by the local government. The volume of solid waste generated is approximately 30.5 cubic meters or 24.4 tons per day for a population of 52,502 in the service area of the solid waste management system. The per capita solid waste generated is about 0.46 kilograms per day. The cost of collecting and disposing this municipal solid waste is equal to PHP 3,703,309.83 as of 1999. Danao City spend PHP 0.21 per person per day to collect and dispose the solid waste. The disposal site of the municipal solid waste is at the 2 hectare open dumpsite at Barangay Guinacot, Danao City located about 5 kilometers from the City Hall.

The solid waste management strategies identified were : (a) waste reduction - reuse, waste segregation, collection charges, removal of the drop-off garbage receptacle and materials exchange, (b) recycling - establishment of deposit centers for materials to be recycled, composting and community organization, (c) solid waste collection management - collection of segregated materials, enhancing sidewalk collection, (d) information, education and communication - enhancing the waste management education in learning institutions, information and awareness program, establishment of waste information network, solid waste database, technical missions, study tours, (e) disposal and residual management - monitoring and evaluation of the utilization of disposal site, continuing identification of waste disposals system. The action plan was based on the resources and conditions of the study area. The plan defined specific actions and activities to be undertaken for each strategy. To implement this strategy a Solid Waste Management Council is proposed. This Council will formulate and recommend policies and directions for the solid waste management. A Solid Waste Management Office should be created to directly undertake the activities outlined for the solid waste management of the city. This office should be responsible to implement the action plan, policies and directions that the council will formulate. It should also be responsible for the monitoring and evaluation of the program in consultation with the community.

ZUNIGA, JOHN BENRICH M.

Environmental factors affecting the Recruitment, Growth, and Survival of Mangroves in Abandoned Brackish Water Fishponds in the Philippines. – 2023.

The low success of mangrove rehabilitation initiatives due to species-site incompatibility compels the refocusing of efforts on suitable sites like Abandoned Brackish Water Fishponds (ABF). However, information on the conditions in these modified habitats are limited and harmonized guidelines on reversion are still needed. This study was conducted to determine conditions that favor the initial establishment of mangroves in ABFs. A total of 16 ABFs from 16 provinces in the Philippines were assessed in terms of recruitment, growth, and survival. Some ABFs have lower

soil nutrients and higher water solutes compared to natural mangrove forests. Multiple regression analysis shows that recruitment is influenced by elevation, water pH, salinity, and proximity to natural stands. Natural regeneration is recommended in higher elevations (>0.43 masl) while lower areas require interventions like active planting with *Avicennia marina*. The suitable and optimal air temperature (26.6-30°C), water temperature (30-37°C), and phosphorus (1-19.50 ppm) contributed to favorable growth rates of planted seedlings. High seedling survival (39- 88%) was also observed. The complementation of natural regeneration and active planting further contributes to the improvement of the protocols on Ecological Mangrove Restoration and Assisted Natural Regeneration with planting. This promotes an ecological and sustainable, yet practical strategy for mangrove rehabilitation.