DISSERTATION
(PhD Environmental Science)

As of January 2024 / Compiled by : Evangeline L. Alcantara

ABANTO, RUSTY A.

Natural and artificial regenerations in the rock dumpsite of abandoned mining area in Larap, Jose Panganiban, Camarines Norte, Philippines -- 2010

Regeneration of mined-out area is not far fetched but possible although poses herculean challenges in terms of resources - both technical and financial. This study assessed/evaluated the natural and artificial regenerations in the rock dump site of abandoned mining area in Larap, Jose Panganiban, Camarines Norte and was premised on the hypothesis that natural and artificial regenerations of mined-out areas can significantly contribute to rehabilitation and carbon sequestration.

Field measurements of natural regeneration were conducted using quadrat method and identified 8 species belonging to 8 genera and 7 families. Diversity indices yielded no significant difference using t-test. Carbon sequestration analysis showed that natural regeneration has 2.78ton/ha C stored in the biomass and 22.55 ton/ha of C sequestered in the soil while the artificial regeneration showed varying amounts of C sequestered implying potential for rehabilitation and carbon sequestration.

Results further imply that growing J. curcas in marginal and degraded site in general requires more efforts and inputs in terms of soil amelioration, and overall silvicultural management especially if the objective of management is the production of alternative fuel. Both natural and artificial regenerations indicate that regreening the mined soil is possible if natural process of ecological succession is allowed and revegetation through artificial means is done. When properly managed and protected, both the natural and artificial regenerations offer enormous opportunity not only for rehabilitation, carbon sequestration, but as potential source of income for the community as well.

ABELLA, GELLA PATRIA L.

Systems Approach to comprehensive Land Use Planning Integrating Disaster Risk Reduction and Climate Change Adaptation in San Jose City, Philippines -- 2017

A model-based systems approach in optimizing land use spatial allocation integrating disaster risk reduction and climate change adaptation was developed in the study and operationalized in San Jose City, Philippines. Land use planning and analysis system (LUPAS) framework, developed by Roetter, et al. in 1998, was adopted and modified in the study. Land area of the city was divided into 73 land management units, subdivided into 1-ha 17203 grids. Ight objective functions emerged from alignment of development goals from national to household level: (1) maximize tomato production; (2) maximize ampalaya production; (3) maximize rice production; (4) maximize onion production; (5) maximize farmers' income; (6) maximize agricultural employment; (7) minimize disaster risk; and maximize residential suitability. Current condition and 2035 scenarios were constructed. Climatic scenarios were reflected in crop suitability rating by conducting land evaluation; extreme events scenarios were manifested in hazard index scores. Disaster risk assessment was conducted. Gurobi, a multiple goal linear programming (MGLP) software, was employed.

Results showed that under current condition, the city can meet its crop production (tomato-268293 mt/yr; ampalaya-156 mt/yr; rice-88279 mt/yr; onion-10018 mt/yr), increase total farmers' net income to Php 7B, allocate agricultural labor to 354,862 persons, minimize disaster risk of the city to 0.53 and allocate sustainable residential area of 567.87 ha, by optimally allocating those grids to sustainable use. Under 2035 scenario, the city can still meet its target crop production (tomato-242177 mt/yr; ampalaya-192 mt/yr; rice-89572 mt/yr; onion-10164 mt/yr), increase total farmers' income by Php by 6B, allocate agricultural labor to 341,547 persons, minimize disaster risk to 1.45 and allocate suitable residential areas of 970.05 ha to additional populace, despite change in crop suitability, increase in hazard susceptibility and increase in population.

Systems approach is indeed vital in optimal land use allocation, guided by LGU's development goals, constrained with available resources and subjected to climate change and disaster risk.

ACEDERA, MARI ANN M.

Ecotourism and Community Participation in the Conservation of the Mabini Marine Protected Area in Batangas, Philippines. – 2013

The study aimed to determine the influence of ecotourism in the conservation and protection of the marine protected are (MPA), analyze the nature of community participation in ecotourism and conservation of the MPA, and assess the role of LGU in ecotourism and MPA management. The study was conducted in the two coastal barangays San Teodoro and Bagalangit of Mabini, Batangas, which have jurisdiction over the marine protected area. The influence of ecotourism on conservation was measured with respect to the development of conservation policy/strategies, promotion of attitude towards conservation of coastal resources, conservation education/public awareness, management and operation of MPA and conservation of coastal resources/environment. Based on the weighted mean scores (4.40 to 4.89) for all of the five components, results indicate that ecotourism had a considerable degree of influence in the protection and conservation of the MPA.

During the planning phase, 61% of the respondents exhibited pseudo participation, about 60% had genuine participation in implementation and 53% had pseudo participation in the M&E phase. The overall perceived contribution of ecotourism for sustainability of the community corresponded to a high rating. Of the three dimensions, the environmental dimension had the highest mean score. The respondents' nature of participation in all phases of ecotourism activities has significant relationship with their perception of the contribution of ecotourism activities to the sustainability of the social and economic dimensions. Respondents exhibiting genuine participation had higher mean scores compared to those with pseudo-type of participation in all dimensions of sustainability. There is also a strong relationship between nature of participation and perceived state of well-being of the community and coastal resources.

ACHONDO, MARION JOHN MICHAEL M.

Socio-Ecological Assessment of Avian and Floristic Diversity Within Agroforestry System: A Case in Binahon Agroforestry Farm at the Foothills of Mt. Kitanglad Natural Park in Lantapan, Bukidnon, Philippines.—2024.

The Binahon Agroforestry farm (BAFF), situated at the lower slopes of a biodiversity-rich Mt. Kitanglad Natural Park (MKNP), is a model for sustainable agriculture. Using the socio-ecological approach, this study was conducted to investigate if this agroforestry farm could be used as a strategy to conserve biodiversity, particularly supporting birds, and its habitat. A combination of ecological surveys, secondary data analysis, GIS techniques, and social surveys were employed to gather data for the analysis. A total of 49 bird species showing high diversity were documented, which include 24 endemics and two threatened species. Forest dwellers, insessorial, and insectivores dominate in terms of species count, which is also shown to be comparable to the community of birds in MKNP. The plant survey on the other hand, revealed a very high diversity wherein a total of 167 plant species were documented including 12 endemics and eight threatened species. In terms of vegetation structure, species with the most importance value were the planted and cultured trees. Results on the spatiotemporal analysis also indicated that there was a prominent change particularly on the land cover drop of grassland and shrubland and the gradual increase of dense vegetation. The analysis on the human dimension also provided an overview on the development of the farm and the importance of knowledge transfer from different individuals and institutions. The social survey also showed strong knowledge, positive attitude and perception towards local biodiversity particularly on birds in their community. The socio-ecological information gathered in this study could be crucial for policy makers and government agencies to advocate for the establishment of more agroforestry farms. And for these farms to be used as a strategy for biodiversity conservation,

AFUANG, LETICIA M.

Diversity among ranid frog (amphibia : ranidae) populations from three conservation priority areas in the Philippines -- 2003

The diversity and degrees of relationship of 10 common ranid frog species from three conservation priority areas in Occidental Mindoro (Mt. Calavite and Mt. Iglit) and Luzon (Mt. Makiling) were determined through morphometric and isozyme analysis. Morphometric analysis using Principal Component Analysis and Canonical Variance Analysis of 272 specimens showed morphological and habitat related clusters. Platymantis corrugatus, Platymantis dorsalis and Occidozyga laevis, is the closest cluster, followed by Rana vittigera and Fejervarya cancrivora, then Limnonectes macrocephalus are outgroups. Site and site-sex dendrograms showed Iglit and Makiling groups to be closer that Calavite groups.

Analysis of Acid Phosphate (ACPH), Alkaline Phosphatase (ALPH), Esterase (EST) and a Glycerophosphate Dehydrogenase (a - GPDH), resulted to 14 preseumptive loci with 54 genotypes.

Heterozygosity ranged from 0.1895 (a - GPDH 4) to 0.6552 (EST 2). Average observed heterozygosity is 0.5524, and expected heterozygosity is 0.6080. Intra-population heterozygosity ranged from 0.3662 in Rana erythraea (Iglit) to 0.4128 in Rana mangyanum (Calavite). Polymorphism is 100%.

Dendrograms, genetic identity and distance separated the Mindoro and Makiling groups. Rana similis and Playmantis dorsalis as outggroups. The site dendrogram showed the Iglit and Makiling samples to be closer compared to Calavite. This result is similar to the morphometric analysis. The scatterplots and dendrograms indicate inter-species and inter-site differences, supporting diversity among the species and sites thereby warranting equal merit for conservation.

ALAMBAN, RAUL B.

Environmental assessment of farm household wastewater for vegetable production in Maria Paz, Tanauan City, Batangas, Philippines -- 2005

Environmental assessment on the potentials of using farm household wastewater for irrigating radish crop was conducted for two croppings in Maria Paz, Tanauan City, Philippines to address the scarcity of water for irrigation during the dry season. Maria Paz is an upland Conservation Farming Village, which is located within the Taal Lake Protected Landscape.

The wastewaters were obtained from two most common water-consuming household chores in the area : laundrying, and cleaning of pigpens and bathing of the swine. The field experiment consisted of nine treatments that include types of irrigation water, combination of the two kinds of wastewater, and varied concentration of mixed wastewater and methods of irrigation. The farm household wastewaters are potential sources of irrigation for radish. The yields of radish irrigated with domestic water and the wastewaters were not significantly different. The nutrient contents of the roots, leaves, and stems were not significantly different among treatments. The nutrient analyses cover N,P,K, Ca, Mg, Na, Zn, Cu, Fe, Mn, Pb, and SO4.

Wastewater irrigation had no significant effect on soil chemical environment and earthworm population. The levels of the elements (Na, Ca, NH4-N, NO3,B,P,K,Mg, Cl, Pb, and Cd) in the soil declined one month after the harvest of the second cropping at the onset of the rainy season. The analyses of these elements were done in accordance with the DENR Administrative Order 34 series of 1990. The application of an improvised micro irrigation technique has water application and water use efficiencies of 82 percent and 78 percent, respectively, as compared with the conventional hand watering. The use of wastewater for irrigation improved farmers' productivity and income in terms of cost of water saved is P1,500 per ha per cropping. The use of the improvised micro irrigation with mixed wastewater increased the saving to P2,200 per ha per cropping. This advantage contributed to social acceptability of the technology to the farmers of Brgy. Maria Paz.

ALCAZAR, STEVE MICHAEL T.

Diversity of Cave Bats in Cebu Island, Philippines: Status, Threats, and Opportunities. – 2017.

The diversity of cave bats was analyzed including their status, threats and opportunities in order for the authors to provide baseline information to resource managers and LGUs in Cebu. Results showed that majority of the caves in Cebu are highly disturbed. Cebu caves developed horizontally than vertically and it is relatively simple.We account for two potential new species to Cebu; namely, *Rhinolophus sp and Myotis sp.* and three new distribution records; namely, *Rhinolophus philippinensis, Eonycteris robusta*, and *Megaderma spasma.* Shannon index suggests that Balay'g Agta and Kantayong caves were more diverse with 1.3. The PCA correlation matrix at alpha=0.05, showed that arthropods richness has positive but low correlation with bats richness (r=0.09).The length of passages is correlated with mean water temperature(r=0.53); the length of passages is correlated with bats richness (r=0.74); the number of passages is correlated with bats richness (r=0.59); the height of cave ceiling and bats richness has correlation with r=0.59; and the number of chambers is correlated with bats richness(r=0.66). The mean water temperature is also correlated with bats richness(r=0.56). Several established literatures revealed that many bats use caves because of stable microclimate condition such as temperature and humidity, thus a correlation of (r=0.53) and (r=0.58) respectively.

ALIBO, VAN LEEAH B.

Carbon storage of the Caimpugan Peatland in Agusan marsh, Philippines and its role in greenhouse gas mitigation. -- 2011

Globally, peatlands are considered to have a high potential in mitigating climate change, but no study has been done in the Philippines. This study estimated the amount of stored C in the Caimpugan peatland and determined its role in mitigating GHG emission, classified the peatland soils, evaluated the

environmental disturbances that threaten the peatland integrity and determined the perceptions of stakeholders to its ecosystem functions and services.

Integrative environmental methodologies were used. The aboveground C stocks were measured in standing trees, understorey and herbaceous vegetation and litter and belowground C stocks in peat soils at different horizons of Tall Pole Forest, Intermediate Forest and the Pygmy Forest covers in two locations within the peatland. Non- destructive sampling was done for trees 5 cm dbh using allometric equations (Brown, 1997). The carbon contents of the understorey and herbaceous vegetations and litters were estimated by multiplying oven dried biomass by 45 percent. Total soil organic carbon was determined using Flash Elemental Analyzer. A two way ANOVA was used to compare estimated stored C among selected vegetation types with location as the replication.

The estimated aboveground C stock of Caimpugan peatland in Agusan Marsh was 22.8 million tons of C within its 5, 487 hectare peatland. The estimated mean belowground C stock (4,569.06 tC/ha) was much higher that the mean aboveground C stock (52.53 tC/ha). Caimpugan peat soils are classified as Typic Troposaprists and C emissions occurred during its formation. Anthropogenic disturbances were more dominant than the natural factors that threated the sustainability of ecosystem service on C sequestration. This ecosystem service was least recognized by the stakeholders of peatland. Environmental science based management option were recommended for environmental sustainability of this peatland.

ALLAM, ROLANDO JR. G.

Developing a value chain-based approach in assessing typhoon impacts on the corn industry of Isabela, Philippines. -- 2019

This study evaluated the yellow corn industry in the province of Isabela, determined financial performance of value chain players and quantified typhoon impacts in yellow corn industry. The 2018 national yellow corn production was 5,626,612.30 metric tons with 997,242 metric tons (18%) coming from the province. The yellow corn industry is composed of input suppliers, farmers and traders. The industry supports feed millers through yellow corn grains for animal feed production. In the cost and return analyses, the average annual net income in the absence of a typhoon of a trader was estimated to be ₱7,454,896.88. An input supplier had an average annual net income at ₱611,409.38 while a farmer was found to have the lowest annual net income at ₱16,938.22. On profits for every kilogram of yellow corn grains, farmers earned ₱2.88, the traders had ₱0.82 while input suppliers earned ₱0.08.

Typhoons frequent Isabela and as such affect the yellow corn industry. Typhoon Lawin damages resulted to 12.6%, 93.9% and 3.2% reduction in annual net income of input suppliers, farmers and traders, respectively. Industry-wide typhoon impacts were valued at ₱1,452,485,103; most of the damages were from farmers (₱1,353,864,353), the other damages were from traders (₱87,185,000) and input suppliers (₱11,435,750). A value chain-based approach in typhoon damage estimation provided a holistic picture of typhoon impacts in yellow corn industry in Isabela, Philippines.

ANACIO, DANESTO B.

Environmental and cultural changes and their implications in the practice of the I-Sagadas' Begnas ritual, Northern Philippines. – 2017

Understanding the dynamics of environmental and culture change is crucial for addressing numerous issues plaguing our society. To contribute to this field of knowledge in environmental science, this study focused on the *begnas* ritual in Sagada, Northern Philippines by analyzing how various change affected culture and environment relationships. The *begnas* (bəgnas) is an indigenous ritual, associated with traditional agrarian calendars, performed several times a year in different villages of Sagada, Mt. Province. Using an interpretative qualities research framework, it determined that the *begnas* is an ecosystem-based ritual composed of environmental and cultural elements, used for fulfilling three board purposes: (1) for making agricultural activities, (2) as a means of thanksgiving for the well-being of the community, and (3) as a means for cleansing misfortunes within the village. However, various changes stemming from American Episcopal missions, state-sponsored technologies and policies, and the media and tourism industry affected culture and environmental systems in Sagada. These changes resulted to various issues, highlighted through changes in the structure and components of the *begnas*. This study also illustrated how culture plays a major role in the manifestation and management of changes and its impacts in Sagada. Lastly, the impacts of such changes to any socio-ecological system were also analyzed.

ANCHETA, ARLEN A.

Power and claims-making in the social construction of solid waste in Metropolitan Manila. – 2006.

The study on social construction of solid waste was conducted in Metro Manila. It focuses on claims, claims-makers and claims-making using social construction in the analysis of power relations among claims-makers. The objectives of the study are to : describe the social, geographic and political changes in Metro Manila overtime as context in the solid waste issues; describe the claims-making strategies of MMDA, Miriam PEACE and Mother Earth Foundation on solid waste; analyze the power relations among claims-makers; and analyze how claims-makers effect change in the solid waste disposal practices of the people in Metro Manila. The selected claims-makers were the SWMO-MMDA, the Miriam PEACE and the Mother Earth. The selected claims-makers gave different claims on the emergence of solid disposal problem and offered different strategies to reduce its impacts. The research methods used were key informant interview, site observation and review of documents.

Results showed that the three claims-makers have different objectives and functions based on the nature of their organizations. Given their historical and organizational backgrounds, they developed different strategies in solving disposal problem in Metro Manila. The MMDA uses disposal strategy, the Miriam PEACE uses educative strategy while the Mother Earth invokes recovery strategy. Based on the analysis of power relations among the three claims-makers, the SWMO-MMDA appeared to be the most powerful claims-maker. It has legitimate authority being under the Office of the President, more media exposure, greater funding for activities and projects, more organized personnel and a larger pool of technical experts.

However, the MMDA as change agent is not successful in effecting change on the disposal practices of Metro Manila. People continue to litter, dump in vacant places and pollute the river system. Communities, barangays and some LGUs continue to violate RA 9003 in spite of the provisions against open dumping and non-segregation.

An emergent framework was presented to achieve the objectives of the study. The emergent framework added a fourth claims-maker to include the LGU and invoked collective action among claims-makers and incentives for collaboration. The new framework advocates participatory approach, strengthens networking and closer social space between claims-makers and target audience. Moreover, the claims-makers as change agents have to consider timing and priorities of strategies to achieve their common objectives.

ANCOG, RICO

Vulnerability indices for Mangyan indigenous communities in Baco, Oriental Mindoro, Philippines -- 2011

Existing threats on the coupled socio-ecological systems of the indigenous communities is seen to be compounded with climate change and its impacts. Vulnerability of the indigenous peoples to climate change needs to be studies especially that their livelihood and productions systems are directly related to changing environmental services. Critical to these needed analyses is the identification of vulnerability assessment frameworks and approaches that are applicable to the Philippine local conditions and specifically appropriate in the context of the indigenous peoples. Thus, this study developed and compares vulnerability indices applying several methods. Data gathered through a series of surveys from a total of 169 households from two Alangan-Mangyan communities living at the foothold of Mt. Halcon, in Baco, Oriental Mindoro, Philippines, were utilized to construct a data set of 31 variables that were grouped into a total of nine vulnerability components namely, Number of typhoons (T), Plant diversity (PD), Health (H), Food (F), Water (W), Socio-demographics (SD), Livelihood strategies (LS), Social networks (SN) and Swidden Farms characteristics (SF) for the composite index approach. These nine sub-components were also regrouped into three major components, namely : exposure (E), sensitivity (S) and adaptive capacity (AC) to compute vulnerability following the IPCC framework. Using the same data set, the principal components analysis was ran to represent the unequal weights approach.

The study has successfully tested various methodological frameworks in implementing vulnerability assessment applicable in the context of indigenous communities in the Philippines, however, comparisons of the calculated vulnerability index scores of the Alangan-Mangyan communities in Banilad and Lantuyang yielded varying results. This led to the difficulty in identifying the most applicable index to be used and thus further refinements to be done are highlighted. Moreover, the developed indices confirmed that weather extremes particularly typhoons, was found to have direct impacts on the Alangan-Mangyans' vulnerability level. Both Principal Component Analysis and regression analysis confirm that education, high literacy rate and monthly income would reduce the degree of vulnerability of the Alangan-Mangyans both in Banilad and Lantuyang.

To significantly increase their adaptive capacity and reduce their vulnerability, programs that value the Alangan-Mangyans vast yet untapped indigenous knowledge systems (IKS) in conjunction with interventions that would enhance their livelihood strategies are needed. The importance of the plant

resources among the Alangan-Mangyans' agro-ecosystems totalling to about 130 species accounting of about 1,255 individuals belonging to a total of 44 families provide support mechanisms as food, medicinal, indigenous infrastructure, weaving and adornments purposes could not be understated.

ANDRADE, ZENAIDA L.

Natural wastewater treatment facilities using facultative stabilization pond and constructed wetland for Laguna de Bay, Philippines -- 2010

The socio-demographic, economic and bio physical profile of the Municipality of Paete were properly investigated as well as the characteristics of the wastewater, to determine the type of wastewater treatment facilities that will be designed and installed in the area. The Physico-chemical and microbiological parameters of the water from the nine irrigation canals and from the Paete river measured and analyzed were: Turbidity, pH, TDS, DO, temperature, conductivity, salinity, TSS, PSD,TKN, TP,BOD, surfactant, oil grease, Total and Fecal Coliform.

The results of the analysis indicated that the effluent standard for class C were met, except for oil grease, and BOD in one site and the Total and Fecal Coliform measured in all sites. The results confirmed the observed scenario in which floating human wastes goes with wastewater. The presence of significant numbers of coliform is evidence that the water is contaminated by fecal material and any pathogens that leave the body through the feces can be present. The excessive amount of oil and grease is an indication of oil pollution which may interfere with the water treatment efficiency. It can interfere with the biological life in the surface of water and create unsightly floating matter and films. Statistical analyses show significant mean differences of most of the parameters per sampling site and sampling season.

Result showed that flow rate of the wastewater was being altered by the deposition of solid waste in the irrigation canals and in the river.

This study revealed that the Natural Wastewater Treatment using Facultative Stabilization Pond and Free Water Surface type of constructed wetland is appropriate in the area. The existing aquatic plants will be utilized as phytoremediators in the constructed wetland. Hence the design of the facilities revealed large area requirement a pilot plant should be constructed first to come up with the established facility specifications as bases for expansion. Appropriation of funds for the pilot project did not materialize early; hence the study was focused only on the pre- construction phase. However, the recommended activities for the construction and operation phase from the original project design were included.

ARDALES, GREGORIO Y. JR.

Adaptive Capacities to Floods of Public Schools in the Municipalities of Los Baños and Bay, Laguna, Philippines. – 2015.

Floods have cause problems on the education sector. The study was done to: (1) determine the relationship between rainfall and floods events; (2) describe the impacts of floods on the delivery of education services and the schooling of children; (3) examine the adaptation measures employed by schools; (4) determine the factors that influenced their adaptation to floods; (5) assess School Adaptive Capacity Index (SACI); and (6) develop guidelines to improve resilience of the cooperating schools. Climate, lake water level data, and existing records on past flood events were gathered and analyzed. Surveys with teachers were administered. Key Informant Interviews and Focused Group Discussions were also conducted.

Rainfall parameters were positively correlated with depth and duration of floods. However, destruction of watersheds, occupancy and unsound development of natural waterways and poor waste management were identified as major contributory factors to the occurrence and persistence of floods in the area. Lack of time to finish all lessons, lack of classrooms and lesson and teaching materials, poor motivation or concentration of students, and difficulty in preparing lessons were the problems encountered in the delivery of education services. Attendance and class performance were adversely affected while drop-out rate was not affected by floods contrary to previous studies.

Teachers and school heads from flooded and non-flooded but affected schools employed all possible measures they can, given their capabilities and limited resource. Preferences were on proactive measures like assigning of school disaster management teams, securing equipment and materials in the second floor rooms, and improving students' awareness on climate related hazards. Scheduling classes in shifts, conducting home visitations, make-up, remedial and tutorial sessions were among the many other measures used. Tagumpay Elementary School restored their classrooms with flood resilient fixtures through cooperative efforts. The school-based management approach, the *Bayanihan* and *Damayan* spirit among Filipinos were among the facilitating factors while lack of funds, school obliged to serve as evacuation centers and poor implementation of environmental laws were among the constraining factors in adapting to floods.

High schools have higher SACI with better human and physical assets due to more matured students, more elevated classrooms and more means of receiving information than elementary schools.

SACI of school groups were basically the same. Guidelines recommended to improve flood-resilience of public schools were based on the nature of floods, its impacts on education, the adaptation used and factors affecting adaptation and differences in adaptive capacity. The study recommends the use of existing simple but effective practices and the measures suggested by the study participants directed to DepEd and LGUs to increase flood-resilience by building up adaptive capacity of schools that include the construction of flood resilient school buildings and permanent evacuation centers, continuous capacity building of school personnel, fostering cooperation with stakeholders and different agencies, developing a more responsive curriculum and providing higher budget for schools, among others.

ATIVO, ARIES O.
Sustainability of Rubber Agroforestry Systems in North Cotobato, Philippines -- 2017

The study assessed the sustainability of rubber agroforestry systems (RAS) in North Cotabato on the basis of ecological, economic and social sustainability focusing on the documentation, characterization, and analysis of the different RAS models and technologies; determination and examination of the uses of non-rubber components; determination of the factors affecting farmer's adoption; analysis of the socio-demographic characteristics of the farmers; and recommendation of actions to improve existing RAS systems. It was done through farmer interview, field observation, and soil testing. The result shows five types of RAS being practiced in the study areas namely agrisilvicultural, agrisilvopastoral, silvopastoral, aquasilvicultural and taungya. The main use of the nonrubber component in RAS is for sale, next is for home consumption. The majority of the respondents are married, male with an average family size of 5 to 8 individuals. Farmers adopt RAS because it can provide for their needs by offering additional income. Sustainability of RAS using ecological, economic and social indicators was rated at 2.33 or moderately sustainable. The use of organic fertilizers, enrichment planting of understocked farms using improved rubber clone varieties, sound farm management practices, and intercropping of food crops are highly recommend to improve its sustainability.

AYE, SEINN LEI
Strategic Solid Waste Management Planning for Yangon City, Myanmar -- 2005

Yangon City in Myanmar needs proper environmental planning primarily on solid waste management in the face of rapid population increase and urbanization. The study focused on the analysis of the City's problems and issues of solid waste management and the ensuing formulation of a Strategic Solid Waste Management Plan. The current waste generation rate is 0.465 kg/capita/day in Yangon City with a bulk density of 250 kg/m3. Kitchen wastes and garden trimming constitutes 65 percent of the total wastes while plastic, paper and cardboard 18 percent, and the rest (17 percent) composed of glass, cans, textile, leather and rubber.

The existing solid waste management system in Ynagon City is basically labor-intensive, the service-area does not cover the entire city, and the final disposal sites are not sufficient for the volume of wastes. The quantity of daily wastes collected is about 671.5 tons out of the total generation of 1912 tons, or collection rate of 35 percent. Financially, the cost incurred by Pollution Control and Cleansing Department (PCCD) in collecting and disposing of solid waste in 2003-2004 was Ks 4,93/ton (0r US$ 4.9) or about Ks 2.3/person/day(or US$ o.oo23). The Strategic Solid Waste Management Plan has been developed following the concepts of basic planning hierarchy and participatory planning. The strategies are envisioned for 20 years (2006-2026) covering: 10 public awareness and education, 20 waste minimization, 30 waste collection and transportation, 40 waste treatment and disposal, and 50 cost recovery and financial sustainability.

The Action Plan, which includes the Implementation Plan, Organizational Plan and Investment Plan, is formulated for the first five years of the planning period (2006-2011). The implementation plan defines specific actions and activities to be undertaken far all the strategies identified. To fully operationalize the strategic plan, the organizational restructuring of PCCD has been proposed. The investment plan requires Ks 13,000 million (US$ 13 million) for the implementation of the initial five years of the Action Plan. The study recommends that the Strategic Plan should be supported with enabling policies and legislations as sufficient budgetary allocation for effective and successful implementation.

BAACO, ALLAINE T.
Framework for flood risk management strategies in selected Barangays of Calamba City, Laguna, Philippines. – 2015.

For the last decade the frequency and impact of flood events increased over time. With climate change as another major factor, it can lead to increased rainfall and consequently, increased flood

generation. In order to deal with the negative impacts of flooding, there is a need to develop an approach to manage these flooding impacts, hence this study. This study was conducted in the flood prone areas of Calamba City with the aim of analysing flood risks and institutional arrangements in order to develop alternative framework to examine flood risk management. Three barangays were considered in the study, namely Halang, Bucal and Pansol. The framework developed was based on the historical analysis of flooding and its orientation to the geological, social and economic conditions of the study site. It will help in assessing the feasibility of implementing a sustainable flood risk management approach that can be adopted at a local level.

BABILONIA, DELIA R.R.

Biology, Ecology, and Socio-economics of the Mangrove Snapping Shrimp (Alpheus euphrosyne de Man, 1897) Fishery in Alabat Island, Quezon Province, Philippines -- 2019

This initial study seeks understand the nature of the mangrove snapping shrimp (Alpheus euphrosyne) in Alabat Island, Quezon Province, particularly on the biological traits, habitat, ecological requirements and utilization that are potentially affecting the shrimp's population. The qualitative data gathered from observations, interviews and focus group discussions were analyzed and discussed in complementation with descriptive and inferential data from field observations and analyses.

The mean body measurements of 7.8 cm (length) and 12.3 g (weight), are significantly different on a monthly catch ($P<0.05$); but, there is a low relationship between the season and the body length and weight (ETA $R^2 = 2.82\%$). However, the occurrence of ovigerous females was significantly affected ($P <0.05$) and highly dependent (R2 = 54.02%, high relationship) on month and monsoon winds. On lunar phase, the full moon period favored the breeding or egg production of the shrimp (t-test 2-tailed, $P <0.05$; ETA R2 = 2.81%). Results of analyses on the volume of eggs revealed positive significant correlation ($P <0.05$) on the body weight, body length and carapace length (r = 0.23, r = 0.17 and 0.08, respectively). The Gonadosomatic index (GSI) and fecundity (F) of A. *euphrosyne* significantly vary with month ($P <0.05$); however, their dependency is low (ETA R2 = 14.06% and 14.59%).

Further, the population density of the shrimp is significantly associated with mangroves (P thus, it could be inferred that A. euphrosyne is mangrove dependent but not species-specific. The number of catch is significantly associated with burrows but not with the soil particle type ($P<0.05$). Similarly, the monsoon winds and the lunar phases significantly influence the catch per unit effort (CPUE); but, with only low relationship.

Takla (A. euphrosyne) harvesting in Alabat Island is being performed by males of varied ages. Their knowledge and familiarity on the snapping shrimp's biology were only based from their extensive engagement with this species; as made apparent with their lack of awareness on the interconnectedness of the coastal ecosystems on the population of takla. Regulatory policies for the management and conservation concerning takla population, habitat protection, harvesting and marketing were recommended.

BALANGEN, DOMELSON F.

Dynamics of Benguet Pine (*Pinus kesiya* Royle ex Gordon) and Broadleaved Forests in Relation to Highland Vegetable Ecosystem in Ampusongan Watershed, Benguet, Philippines – 2015.

Systems analysis enables sound understanding of the connectivity of the process and functions associated with the problem of the landscape components over time. This study focused on understanding the dynamics among three major ecosystems namely: Benguet pine forest (pine), broadleaved forest (broadleaved) and vegetable farms in the Ampusongan Watershed. The rate of forest degradation and landscape structure pattern from 2002 to 2014 was determined. Moreover, the underlying drivers of forest degradation associated to farming assessed forests' plant diversity, landscape functionality and soil physico-chemical properties as influenced by patch size and elevation was also determined. Forest lost to vegetable farm was almost 6-tomes higher in pine than broadleaved ecosystems. Forest fragmentation due to vegetable farming was higher in pine than the latter. Socio-cultural, economic, political/governance, technological and natural factors aggravate farming and forest degradation. Plant diversity in both forests was influenced more by elevation than by patch size. Diversity index was higher in broadleaved especially in tree community having several dominating tree species as compared to only one, *Pinus kesiya*, in pine. Plant species occurred in broadleaved was more than twice in pine, with only few species common to both. Broadleaved had higher total soil surface assessment functionality than pine in some patches due to higher infiltration and nutrient cycling indices in several patches. Soils in broadleaved were more acidic, higher in organic matter, and phosphorus than in pine at mid elevation. Variations on biophysico-chemical properties were attributed to feedback effects of trees, fire influence and large heterogeneity. Vegetable farms and roads have profound influence on the

rate and pattern of forest degradation and that various drivers influencing farming and ecological functions of forests should be considered for effective forest conservation and sustainable vegetable production.

BARACOL, LORELLE A.
(no copy)

BASILIO, CARLOS S.
Environmental performance of sweet potato (pomea batatas L. Lam.) production in Lahar-affected areas of Moncada, Tarlac, Philippines -- 2006

A Streamlined Life Cycle Assessment (SLCA) was conducted to determine the environmental performance of sweet potato production in lahar-affected areas of Moncada, Tarlac. Key informant interviews, focus group discussions and farm household survey were used. Nutrient balance, global warming, eutrophication and atmospheric acidification potentials and resource energy were estimated. T-test was used to compare the environmental performance of the farms of the members and non-members of the cooperative. One ton of sweet potato is the functional unit. The systems boundary was from planting to the trading post. Quantitative estimates of average environmental burdens generated by sweet potato production in terms of global warming and atmospheric acidification potentials from diesel fuel and eutrophication potential from nitrates and phosphates were estimated for both groups. The estimated surplus nitrogen (29.54 kg/ha) and phosphorus (28.84 kg/ha) were higher in farms of cooperative members than that of non-members (1.75 kg N/ha and 7.95 kg P/ha). The farms of both had negative balance in terms of potassium. Farms of cooperative members had significantly higher eutrophication potential than that of non-cooperative members, but the amounts were low.

They were not significantly different in global warming potential. The atmospheric acidification potential was higher in the farms of cooperative members than that of non-cooperative members. The soil in the study site is moderately susceptible to soil erosion. The low genetic diversity of sweet potato varieties in the area makes the crop vulnerable to biotic and abiotic stresses and hence to genetic erosion. The study recommended crop management practices to improve the environmental performance of sweet potato production and to address existing and emerging environmental issues and challenges that constrain its productivity and economic viability.

BERGONIO, EMERSON L.
Socioecological Analysis of Otolithes ruber (Bloch & Schneider, 1801) Fishery Under Varying Institutional Arrangements in San Miguel Bay, Philippines -- 2019

San Miguel Bay is the only fishing ground of the croaker Otolithes ruber (Bloch & Schneider, 1801) in the Bicol Region. Otolithes ruber is one of the major fish catch in the Bay, with corresponding high market price, and fish processing is a seasonal livelihood among coastal villages. The Bay is being challenged by a multitude of interconnected problems, issues, and concerns. Thus, using a socioecological approach, this study investigated and characterized O. ruber fishery at the present condition of San Miguel Bay and particularly under prevailing institutional arrangements, considering that the entire Bay has been declared as part of municipal waters by the seven local government units (LGUs).

Results of fishing trips from September 10 to November 19, 2018 showed that O. ruber was commonly caught from the middle to the mouth of the Bay off Mercedes and Siruma, using bottom-set gill nets. Fisherfolks also employed different methods, i.e., the “timbog” (“tupak”) method was commonly practiced as this was considered effective, although large catches were recorded when the “patalang” method was employed. Fishing for O. ruber typically involved two to three fisherfolks together out at sea for up to 7 hours, and fresh catch were either brought immediately to nearby fish ports for local auction (“bulungan”) or sold directly to middlemen or fish vendors. The analysis of 434 composite O. ruber samples bought from the fishing trips identified 222 and 212 female and male fish individuals with mean total length (TL) of 19.14 + 0.11 cm (range 11.0 to 30.2 cm) and body weight of 70.76 + 1.46 g (range 20 to 315 g). Majority were already mature to spawning stages; histopathological analysis of gonads revealed that O. ruber were in normal condition, i.e., that gonads had no apparent lesions, and the population"s reproductive capacity may be realized was, as evidenced by numerous spermatocytes or oocytes.

Otolithes ruber occurred year round and were found abundant from January to May, based on landed catch data from 2015 thru 2017. The increased fishing effort and presence of fish ports may probably justify the high landed catches recorded in the municipalities of Calabanga, Tinambac, and Cabusao. The species contributed less than 3% to the total landed catch and to the catch from gill nets and trawls. Time series analysis revealed ~2% decrease in catch every year when projected from 2018 to 2022. Dry processing of O. ruber seemed to offer potential source for additional income, employment, and livelihood

to fisherfolks because of increasing demand and high market price especially of from dried split and “biti” (swimbladder).

San Miguel Bay is under lateral institutional arrangements as agreed upon by the seven LGUs and MFARMCs, which are being assisted by several social groups. The San Miguel Bay IFARMC serves as the venue for inter-municipality and multi-stakeholders collaborations and tackles baywide issues and management. However, a unified ordinance and concrete management actions still need to be drafted, in order to address the decline in fish stocks and catch in San Miguel Bay, including O. ruber. The uncoordinated initiatives and weak regulatory measures among LGUs have led to the prevalence of illegal and destructive fishing activities and inequalities and conflicts between and among resource users. Multi-stakeholder engagements and fisherfolks" participation would be vital to enhance and strengthen the presently applied fisheries management and policies.

BINH, MAC NHU

Sustainability of Polyculture Model for Small Aquaculture Farmers in Phu Vang District, Thua Thien, Hue Province, Vietnam. – 2014.

The study was conducted to assess the sustainability of polyculture aquaculture model in five communes in Phu Vang district, Thua Thien Hue province Vietnam. Water quality parameters included in the study were: pH, temperature, salinity, DO, BOD, COD, TDS, NH3, NO3, turdibly, phosphates and heavy metals. Socio-economic situations of the respondents and natural conditions of the study area in Phu Vang district, Thua Thien Hue province were described and assessed.

The study showed that the quality of water for aquaculture in Phu Vang such as: pH, salinity, DO, BOD, TDS etc., were within Vietnam’s Water Quality Standards for Aquaculture purposes. COD concentration, however, exceeded the permissible level.

A polyculture model for sustainable aquaculture for small farmers in Hue province, Vietnam was developed from the results of the study. Three species selected for the polyculture model were: Tiger black shrimp (*Penaeus monodon*), Rabbitfish (*Siganus guttatus*), and Kinh (*Siganus canaliculatus*). Using the model has significantly increased profit margins to more than 200 million VND/ha for small aquaculture farmers and has also contributed to the development of sustainable aquaculture in Phu Vang district.

BORNALES, ROMEO G. JR.

Adaptation and vulnerability of Subanen community to the environmental conditions in Mt. Malindang National Park, Philippines -- 2004

The study was conducted in barangay Lake Duminagat, which is located within Mt. Malindang National Park, of Don Victoriano, Misamis Occidental, Philippines. It sought to examine the adaptive mechanisms and assess the vulnerability conditions of the Subanen community to the adverse environmental conditions in the area. Data were gathered in April and may 2003 through a combination of various research techniques such as the use of key informants, focus group discussions, survey of thirty heads of the family, transect walk and participatory mapping. Eight residents who have been in the barangay for a long time and are mostly local officials/leaders served as key informants. Twenty men and women aged 35 to 77 years participated in the focus group discussions.

Secondary data were used to supplement the primary data collected. These were analyzed using descriptive and inferential statistics. Vulnerability ranking among respondents was done using the average rank of dependency ratio, capital and income. Relationship between selected variables and the vulnerability rank was established using the Spearman Rank Correlation and Regression analysis.

Findings revealed that the combined effect of continuous and heavy rain, strong winds, pests and diseases, and soil degradation caused a significant decline in agricultural production which resulted to low income. In response, the people employed several adaptive strategies such as shift in agricultural crops, land and crop rotation, expansion of area of cultivation, out-migration, family planning, formation of organization, and change in food consumption from rice and corn to rootcrops.

Despite the adaptive strategies employed by the Subanen people, they remained vulnerable to the impacts of environmental conditions in the area. Their vulnerability is indicated by their low income, low and declining agricultural productions, low educational attainment, lack of skills to shift to other livelihood activities, and the lack of internal and external institutions to assist them. Statistical analysis revealed that household income, capital, farm size, and education, are significantly correlated to their vulnerability. These factors explained 82 percent of the variation of the vulnerability index.

BRANZUELA, NYMPHA E.

Assessment of Climate change Impacts on Domestic Water Supply Availabilty in Talomo-Lipadas Watersheds, Davao City, Philippines – 2015.

The groundwater of Talomo-Lipadas Watershed in Davao City, Philippines supplies almost all of the drinking water of the urban population. Surface and groundwater resources are vulnerable to climate change, with wide-ranging consequences for society and ecosystems. The study assessed the impacts of climate change on domestic water supply availability in Talomo-Lipadas Watershed in three times slice periods: 2020, 2050, and 2080. Downscaling of climate scenario was undertaken using Statistical Downscaling Method (SDSM) under A1B and A2 scenarios. Groundwater recharge and discharge rates were simulated using Brook 90 hydrological model. Projected water demand was analyzed through per capital method

Findings revealed that both groundwater recharge and discharge are vulnerable to climate change. There is a progressive reduction in recharge and discharge rates in three times periods. Recharge reduction of -18.63% in 2020, -23.08% in 2050, and -25.84% in 2080 and discharge reduction of -18.81% in 2020, -23.21% in 2050, and -25.90% in 2080 relative to the baseline rates. On the other hand, projected water demand will double and triple in 2050's and 2080's, respectively.

Groundwater mining coupled with reduced surface flow will potentially lead to severe water deficit by the 2050's. To address this challenge, possible adaptation strategies have been identified

BUNCAG, MARK JOSEPH J.

Sustainability Analysis of Mangrove Forest Management Systems in Tagpait, Aborlan and Bacungan, Puerto Princesa City, Palawan, Philippines -- 2020

This study evaluated the sustainability of mangrove forest management systems by the local community in Tagpait, Aborlan, and Bacungan, Puerto Princesa City using applicable criteria and indicators of sustainable mangrove forest management that identified through FGDs. There were seven applicable criteria and 35 indicators used. Then, the formulation of the verifiers through the rating scale for each applicable indicator conducted through FGDs and KIIs. The formulated verifiers were used to evaluate the sustainability of mangrove management systems in both communities using HHI, FGDs, KIIs, and secondary data analysis. The results show that the Overall Sustainability Index value of Bacungan is 0.35 (moderately sustainable) while Tagpait has 0.33 (moderately sustainable). Hence, Bacungan has better management, but by looking at the Sustainability Index for Individual Criteria, each community has its strengths and weaknesses in sustainable management. Keywords: Mangrove Forest Management, Applicable Criteria

BUSTOS, ANGELINA R.

Environmental Enteric Dysfunction and Nutritional Status of 36-59 Months Old Children in Quezon Province, Philippines -- 2019

Stunting remained a global health priority. Scaled-up nutrition; and water, sanitation and hygiene (WASH) interventions resulted to a small to moderate impact on linear growth. Studies suggested that a subclinical disorder of small intestine known as Environmental Enteric Dysfunction (EED) may have caused stunting among children. A cross-sectional study design was used to examine relationship of nutritional status and EED among 120 children aged 36-59 months in Quezon Province. EED was diagnosed via glucose hydrogen breath test (GHBT) with a cutoff of >20 ppm increase over baseline.

Very high rates of underweight (34.1%) and stunting (40.0%) in Quezon were observed. Results of GHBT demonstrated no increase in breath hydrogen >20 ppm over baseline. Hence, no case of EED was detected based on SIBO as biomarker of EED. Test of association showed that mean change in expired hydrogen levels by 90 minutes from baseline tended to increase as the children become stunted (p=.005). The variables tended to be associated with increased expired hydrogen were presence of Ascaris (p=.010) and type (p=.009) and service level (p=.045) of drinking water. Nutrition interventions together with use of anthelminthic or deworming drugs, provision of clean water, environmental sanitation, and promotion of hygiene practices be intensified. Further research may consider a case control study design among stunted school children and explore the use of Stable Isotope Assays once validation on the use of 13C sucrose breath test has been completed.

CABATAC, NEYRMA N.

Plant diversity, food availability, and resilience in the indigenous agroforestry system of the Erumanen Ne Menuvu of Cotabato. Philippines -- 2008

The general aim of the study was to assess the resilience of the indigenous agroforestry system of the Erumanen ne Menuvu in Barangay Palacat, Aleosan, Cotabato. Resilience refers to the ability of the system to adjust to changing socioenvironmental conditions. Employing qualitative research methods, the study: 1) reconstructed the Menuvu's local socio-environmental history; 2) described the indigenous agroforestry system in terms of its stages, temporal and spatial cropping patterns, and plant diversity; 3) analyzed plant diversity and food availability shifts; and 4) assessed the resilience of the indigenous agroforestry system.

The study employed qualitative research methods specifically, interviews, participant observation, and rapid plant appraisal. The study contended that the effects of socio-environmental changes are most apparent in shifts in plant diversity-food availability relations, and that these dynamics are most noticed by the community experiencing them. Analysis of the Erumanen's accounts revealed that they have been through various social-ecological disruptions that led to changes in their indigenous agroforestry affecting plant diversity-food availability shifts.

Results showed that in relation to seasonal changes, increase in plant diversity did not always reflect an increase in food availability (dietary diversity); multiple ecological, biological and social factors came into play. Trends of plant diversity and food availability (cultigen diversity) through time suggested a direct relationship. Thus, as plant diversity increased, options for food likewise increased despite the disruptions encountered. The study revealed that the system possessed buffers, strategies and elements necessary for its continued existence. A lag existed in the response and recovery between social and ecological systems. The study offered recommendations for further studies on capacity building for resilience and the use of qualitative research
methods in the investigation of human-environment interactions.

CABILI, TITO M.

Livelihood strategy and conservation of small-island ecosystem in Capul, Northern Samar, Philippines -- 2008

This study analyzed the effects of the Abaknon's major livelihood strategy on the conservation of small-island ecosystem in Capul, Northern Samar for one whole year. Employing qualitative and quantitative research methods, the study : 1. Described the social and biophysical environment of Capul; 2. analyzed the major livelihood strategy of the Abaknon, 3. determined relationship of the livelihood strategy to the conservation of the island ecosystem in terms of the : a) quantity and quality of runoff and sediment load; sea grass diversity and net primary productivity; mollusks species diversity and fish productivity. Significant change in socio-biophysical environment of the upland subsystem did not significantly affect the coastal subsystem. The meager sediment loaded to the coastal zone increased the seagrass NPP during rainy season, an indicator of efficient farming practices. Mollusk diversity is high. High fish productivity was observed during rainy season. The main threat to the coastal subsystem was exceedingly high coliform count.

The Abaknon's livelihood strategy contributed significantly to conservation of the whole island ecosystem. However, municipal ordinances and programs must be promulgated, especially in relation to environmental health. The use of human environment interaction approach, with emphasis on local knowledge, is relevant in designing future studies on small-island ecosystems.

CABRERA, EMIL JOHN C.

Potential contribution of nutrio® biofertilizer on environmetal preservation and improvement of farmers income in laguna, philippines – 2020.

The potential effect of Nutrio® foliar biofertilizer on the yield of rice and chemical properties of the soil with or without inorganic fertilizer was investigated. The study was done in a rice farm in Victoria, Laguna for wet and dry seasons (2019-2020). One-half (1/2) FP + Nutrio® showed that grain yield was increased over the FP in the dry season. This treatment has the potential to reach the highest NPV of Php 939,346.90 above the other treatments. The use of Nutrio® in combination with 1/2 FP proved to be highly productive and economical to the farmer. The practice of using 1/2 FP + Nutrio® has a long term contribution to the increased rice yields and environmental preservation.. The study showed that 1/2 FP + Nutrio® treatment had the tallest plants at harvest. Tiller and panicle numbers are not significantly increased in all fertilization regimes. The soil chemical properties in all the fertilizer treatments were not altered but seasonal variations were observed. The perception survey showed respondents are not aware of biofertilizers and do not know

the benefits they can get from them. Results of the study need to be disseminated to farmers in order to increase rice yields and reduce environmental pollution. The long-term potential use of Nutrio® in agriculture is promising in reducing chemical pollution and therefore save the environment.

CALPE, ADELAIDA T.
Assessment of the impacts of probiotics in shrimp (Penaeus monodon Fabricus) culture -- 2005

The impacts of using probiotics in shrimp culture was studied. Shrimps were cultured in tanks using a completely randomized block design with two treatments. Four tanks were treated with probiotics and the other four tanks served as control. Water quality parameters were monitored in the tanks and in the discharge canal from July to December 2003.All the water quality parameters fell within the optimum water quality standards for shrimp culture and only pH was significantly different between treatments. Counts of luminous bacteria, total Vibrio, yellow colony bacteria, and green colony bacteria were not significantly different between treatments. Shrimps treated with probiotics showed a significantly improved growth rate and survival rate.

The DGGE profile of the commercial probiotic (BZT Aqua) using the said 341fGC/534r primer pair and a 20-60 percent denaturing condition was obtained. Bands that were successfully sequenced revealed that the closet phylogenetic relatives of the species present in the commercial probiotics included Enterococcus sp, Bacillus sp., Bacillus licheniformis, Streptomyces sp., and an uncultured bacterium clone. Probiotics also contributed to the change in species composition and improved shrimp production. The use of probiotics in shrimp farming was found to be profitable with a return on investment of 89%.

CALZETA, EDUARDO C.
Development of flood risk assessment tool and early warning system for the municipality of Bay, Laguna. – 2013.

An integrated approach was used in analysing flood risk in low-lying areas of Bay, Laguna. The study was specifically undertaken in Bay/Cambantoc, Calo and Molawin watersheds where rainfall-runoff monitoring was conducted to develop a unit hydrograph and calibrate the United State Department of Agriculture – Soil Conservation Service (USDA-SCS) runoff model as an input in estimating flood hazard.

The derived 30-min 1-cm UH curve showed that Bay/Cambantoc watersheds has the highest peak discharge of 41 m3/s compared of 14 m3/s and 10 m3/s for Calo and Molawin watersheds, respectively. However, shorter time to peak was notice in Bay/Cambantoc watershed which only took 0.5 to 1 hour while the other two watersheds had 1.5 hours. The computed initial abstraction ratios of 0.0307 for Molawain watershed., 0.0053 for Calo watershed and 0.003 for Bay/Cambantoc watershed were used to calibrate SCS runoff equation. Obtained values were far below the 0.20 coefficient used by USDA-SCS but very close to the results of recent studies which ranged from 0.01 to 0.053. Higher percentage of rainfall converted to runoff was noted in Molawin watershed with 44% compared to only 8% in Bay/Cambantoc and 24% in Calo watersheds.

Result showed that Tagumpay emerged as the most risky barangay to flood with 0.26 index among the 10 barangays assessed. It is followed by barangay Maitim with 0.20 index. Barangay San Isidro, Dila, San Agustin, San Nicolas, San Antonio, Puypuy, and Calo have moderate levels of risk with index ranging from 0.10 to 0.17. On the other hand, the least risky barangay is Santo Domingo with only 0.08. A flood hydrograph calculator was developed for real-time monitoring of water level of Bay river which is part of the proposed science-based early warning system for the municipality of Bay.

CANDO, EVARISTO NIÑO III T.
Capital-Based Assessment of Resilience and Adaptation Strategies to Weather-Related Disasters of Selected Rice-Farming Communities in Butuan City, Agusan del Norte, Philippines -- 2017

Rice-farming is a major contributor to the Philippine economy. Climate change caused erratic changes in temperature, precipitation, and the intensity of weather-related disasters affecting the performance and the food security aspect of the rice-farming communities in the regional and community levels. In this study, the resilience of the top six rice-producing barangays in Butuan City was assessed and measured based on the community's five capital assets. A structured interview schedule that included the hypothesized indicators was developed. There were 330 households selected randomly for the socioeconomic survey. Series of FGDs and KIIs were conducted to identify the different coping and adaptation strategies employed in the community level. The generated data were standardized using Shapiro-Wilk Test, Pearson's Correlation and Pearson's Chi-Square at 0.05 level of significance. Results revealed that the communities were exposed to typhoons, flooding and drought which deteriorated their

livelihood, health, public welfare and the productivity of their farmlands. Livelihood diversification, soil and water conservation, capacity-building and early warning systems were the adaptation strategies availed by the communities. Results showed that resiliency was moderately correlated with age (0.013), and household size (0.002) while strongly correlated with gender (0.018). Meanwhile, results showed high access to the physical (0.794), financial (0.780), natural (0.637) and human capitals (0.631) and moderate access for the social capital (0.561). The calculated overall resilience index (ORI) of the rice-farming communities in Butuan City was classified as relatively high (0.681).

CARANZA, JAYSON Q.
Recreational Value, Sensitivity and Disturbance Assessment of the Capisaan Cave System, Nueva Vizcaya, Philippines -- 2020

Three assessment studies were conducted to understand the socio-ecological condition and management requirements of the Capisaan Cave System in Kasibu, Nueva Vizcaya. The value of recreation services generated by the caving activity was estimated through the zonal travel cost method, the sensitivity of the different cave resources to human degradation was measured, and the levels of surface and sub-surface anthropogenic disturbance sustained by the different cave resources were evaluated using standardized cave sensitivity and disturbance indices. The indices as instruments to capture relevant components of the cave system were adapted from existing tools and were modified, enhanced and tested for their effectivity, leading to the development of a localized sensitivity and disturbance index for the Capisaan Cave System. The local community was engaged in scenario development activities to foresee future tourism possibilities of the CCS considering the current conditions of the cave system and the future choices and programs of the community. Spatial & biophysical description and life zone measurements of nine cave entrances were also done. The recreational value of the CCS ranged from PhP1,703,500.00 to PhP5,700,100.00 per year with a total access value of PhP8,351,298.00 to PhP12,347,898.00 for year 2018. The computed sensitivity of resources found in CCS can be broadly classified as “slightly sensitive,” indicating that the CCS generally suffered a disturbance degree of “minor disturbance.” Among the sensitivity parameters, biota was found to be the most sensitive followed by speleothems and hydrology resources, and sectional sensitivity of CCS ranged from being “critically sensitive” to “considerably sensitive”. For the disturbance parameters, biota population density & richness decline and forest fragmentation were the top disturbances in CCS. The utilization of the instruments and methods used in this study is proposed to complement existing cave classification procedures in the country in providing a comprehensive assessment of the management needs of caves

CARINGAL, ANACLETO M.
Analysis of the Human and Nature Interaction in the Philippine Teak (*Tectona philippinensis* Benth. & Hook.f.) Forest Landscape, Batangas, Philippines. – 2018

The Philippine teak forest (PTF) is a formation with endangered *Tectona philippinensis*, an endemic species to the province of Batangas, Philippines. The study determined the floristic composition, vegetation structure, zonation and environmental factors that influence the existence of PTF. The classic methods of vegetation analysis generated data for diversity indices using *PA*leontological *ST*atistical (PAST) software while R Stat software version 3.4.2 (Vegan Package) was used in Canonical Correspondence Analysis. The regeneration dynamics based on abundance data of woody plants were described using diameter-based and height ensemble classification for tropical trees. The ecological values (ecoval) of woody plants were determined through multi-criteria scoring analysis for functional diversity while the conservation priority for the woody plants was assessed thru spatial (global, local) standing including social and economic benefits of each species. Focused-group discussion (FGD) and key informat interviews (KIIs) were conducted to appraise the local importance as well as to identify local conservation practices and anthropocentric change drivers to the PTF. The study yielded 128 morpho-species with general plant diversity ranging from very low to moderate (Shannon-Wiener: 0.8675 to 2.681).

Diameter and height ensembles of trees characterize a secondary forest. Edaphic and physiographic factors exerted influence on the four zones and distribution patterns of woody species in the PTF landscape. From the viewpoint of environmental influences, the Philippine teak (*T. philippinensis*) can be considered as edaphic-endemic capable of adaptation in xeric habitat at low altitude, forming a unique forest formation consisting of other indigenous tree flora interfacing with human-propelled agroecosystem. The population structure of 44 indigenous trees including *T. philippinensis* consisted of abundant wild seedlings (3,798 individuals) which was higher than saplings (260), poles (387) than adults (93 individuals for combined standard and veteran classes), suggesting an overall “good regeneration status” of the woody vegetation.

The PTF consist of woody plants with moderate ecological importance (ave. 12.06 / 25 points). Edaphic quality (OM and NPK levels) was medium to moderately high (2.5-4/5; ave. 3.09). The local conservation priority level of 47 woody plants ranged from low (7-8), medium (9-15) to high (18-22). The endemic *T. philippinensis* and its indigenous ally *Vitex parviflora* were assessed to be in "high conservation priority" (HCP) level due to their local endemicity, global and national threatened status (VU-EN-CR), and high threats of harvesting and anthropogenic disturbances.

CARMONA, ANA ROSA.
Hydrologic regionalization of the major watersheds in Negros Island, Philippines: Flood and erosion susceptibility and vulnerability assessment – 2017.

This study was conducted to determine the natural flood and erosion susceptibility of thirty-three watersheds in Negros Island by integrating geomorphological, geological, pedological, and land cover characteristics. Four composite indices were aggregated from twenty-four indicators to come up with flood and erosion susceptibility indices. A flood social vulnerability assessment was also conducted to ascertain the level of exposure, sensitivity and adaptive capacity of the population found in the watershed's flood-prone area. Information from watershed characterization, flood social vulnerability assessment were used in the hydrologic regionalization analysis of the watersheds leading to the classification of watersheds into nine clusters and prioritizing them into four classes. More than half of the watersheds showed moderate to very high flood and erosion susceptibility which could be attributed to their catchments' soil and geologic characteristics, while population showed low flood vulnerability owing to their high adaptive capacity. The study confirmed that spatially close watersheds exhibit similar characteristics and watersheds belonging to the same group have close hydrologic response. The estimated susceptibility and vulnerability conditions among watersheds leading to he identification of potential priority watersheds for management of soil and water resources and people at risk.

CARNICE, PEARL APHRODITE B.
Quantification of Carbon Storage, Peat Chemistry, and Micro-Nutrient Status of Leyte Sab-A Peatland and its Implication to Management. – 2019

Leyte Sab-A Basin is the second largest peatland in the Philippines that comprises 3,088 ha. The principal objective of the study is to estimate C storage capacity of the four (4) ecotypes identified in the peatland, its peat chemistry, micro-nutrient status, assess possible threats that cause degradation and social awareness for peatland protection and conservation.

The peatland could store 36.63 Tg of C and could sequester 134.47 Tg of CO2. Mean peat soil N (%) were 1.5 ± 0.04 for SF, 1.47 ± 0.06, 1.47 ± 0.13, 1.36 ± 0.12 for ML, AL and AF respectively. Peat C/N ratio across all depths was highest with ML (30.14 ± 1.47), followed by AF (28.04 ± 1.52), SF (24.72 ± 0.77) and then AL (23.88 ± 0.7) which are all significantly different with each other. A uniform depth trend of !13C was observed across ecotypes that ranges from -26‰ to -27‰ which is considered to be little to no fractionation of !13C.

The highest mean !15N was rendered by AL (2.35 ± 0.2‰), followed by AF (1.29 ± 0.32‰), ML (0.61 ± 0.14‰) and lastly SF (0.24 ± 0.3‰). Highest mean carbohydrates (%) was rendered by AF (46.26 ± 3.11%), AL (42.68 ± 7.94%) and ML (37.08 ± 1.90%). Aromatics (%) behaved differently were ML rendered the highest 25.18 ± 0.43%, followed by AF with 24.97 ± 0.67%, and lastly with AL with 24.86 ± 0.67%. All micro-nutrients such as Mg, Al, Ca, Mn and Fe (total dissolve) rendered very high values across all ecotypes.

Moreover, ecosystem threats were analyzed using the Driver-Pressure-StateImpact-Response (DPSIR) Framework. Further, it has become clear that the poverty of the surrounding community and the demand to increase the productivity of the peatland has given enormous pressures in the system. Most alarmingly, if the function of the peatland as a sink of carbon will be a shift into being a source that could pose higher carbon emission into the atmosphere. Given the current state of the land with high carbon content and high standing water, more threats and issues will arise in the future if not addressed today.

CASAL, CHRISTINE MARIE V.
Environmental analysis of fish introduced into the Philippines -- 2007

There are 278 fish species (from 51 families and 171 genera) introduced to the Philippines since 1905, aquaculture (10.5%), ornamental (89.5%), mosquito control and fisheries (less than 1%). Several (14%) of these fish species have now been reported to occur in natural waters.

Regulating the entry of probable invasive species is the most economic way of preventing the potential establishment of these species. Since species characteristics determine their establishment potential, these can be used to provide a quantitative risk assessment protocol for the country.

Analyses of the species which have established in the country were found to have : come from a similar climate, higher degree of parental care, smaller with relatively shorter life spans, higher resilience and reported establishment elsewhere. The high incidence of species which have unknown establishment in the country also show similar characteristics implying either : 1. the species are already established however they have not been reported because of the paucity of available information or 2. they have the potential to establish in the very near future.

CASAS, EULITO V., JR.

Environmental zoning for biodiversity conservation in Lawaan, Eastern Samar, Philippines. -- 2005

The study combines ecological and social criteria in land use planning in order to identify "hot spots" areas and subsequently prescribe policies and management options. It demonstrates that biodiversity corridor approach would conserve biodiversity better than the present concentric zoning paradigm. The flora and fauna surveys used protocols on research design and sampling. Areas at lower elevation have slightly greater biodiversity that higher elevation as reflected by biodiversity indices (BI) values. Although BI values were from alpha diversity level, findings underscored the importance of preserving plant and animal species especially "hot spot" areas.

The social survey used interview schedule, questionnaire and focused group discussion. Environmentally aware stakeholders were perceptive in preserving biodiversity, creating corridors and effectively delineating land for Man and land for Nature. Majority of stakeholders respondents (83-96) viewed the biodiversity corridor as very important. They proposed 50m on both sides of river/creeks as riparian corridors. At the farm level, 90 percent of PO/FEC respondents indicated willingness to reserve portions of their farmlots for biodiversity conservation. GIS mapping revealed the hot spots were at lower elevation areas and considered very critical. This is where biodiversity is high but also absorbs heaviest human pressure. If concentric zoning paradigm is applied it shall have extirpated 21 avifaunal species, 8 mammalian fauna and threatens 28.3 plant species among which are 196 tree species and 128 endemic species. Reorientation of biodiversity project implementors is needed on the importance of restoration and preservation of some natural habitats which are high in biodiversity at lower elevations. It is recommended that environmentally zoning be adopted.

CERO, DAVID L.

Environmental assessment and management of the groundwater resources in the coastal area of Tanza, Cavite, Philippines -- 2005

The extent of saltwater intrusion in the coastal aquifer of Tanza, Cavite was assessed to formulate environmental management strategies for sustainability of groundwater quality. The groundwater quality of twenty-three (23) shallow and deep wells within a 2 x 7 - kilometer coastal area was studied for nine months. Interviews of key informants and stakeholders were done to assess their awareness, concerns and perceptions of the groundwater quality. Institutional arrangement among national and local government agencies involved in groundwater resources of the groundwater was analyzed.

Mean groundwater salinity values were 24.2 and 23.9 pss for deep, shallow and all wells, respectively. However, four (4) wells - two shallow and two deep wells, in the Quaternary Alluvium had extreme salinity values. The disposal of used seawater from the fish hatchery and proximity of shallow wells to creek contributed to high salinity of the groundwater. Overpumping of two deep wells for domestic and industrial uses also caused salinity build-up.

Groundwater of deep and shallow wells located within 100 m and 262 m from the shore, respectively, had salinity values approximating that of saltwater (25 pss). Salinity decreased with distance from the shore. Some groundwater quality parameters exceeded existing water quality standards. Estimated groundwater deficit is 7.7 MCM/year. Comprehensive institutional and technological approaches to effective environmental management of the groundwater were proposed.

COLADILLA, JESUSITA O.

Systems approach to exploratory analysis of agricultural land use options at the municipal level. -- 2006

To resolve land use analysis and planning issues towards sustainable resource management at the municipal level, Land Use Planning Analysis System (LUPAS) framework developed at the provincial level

was modified and applied in Bay, Laguna as the case study area, to test its capability and applicability at municipal level planning.

The Systems Approach for Land Use Analysis and Planning (SALUAP) framework used consists of five components, four databases and one auxiliary component, (GIS). Goals and objectives of Bay to increase farmers' net income, ensure food security and manage natural resources in the next ten years subject to 723 ha agricultural land conversion, 3.1% annual population growth, available water, current production rate and prices of inputs and output was developed into a multiple goal linear program (MGLP) model. Objective functions were optimized for year 2005 and 2015 development scenario. Considering the agricultural modernization and intensification impacts to the environment, the high cost of agricultural inputs and the low price of outputs, the social acceptability and other concerns, analysis and evaluation of the resulting land use options and allocation show that Bay's development plan to modernize agricultural production and massive hybrid rice introduction will not meet its goal and objectives. Instead, promoting and supporting the current land use types that requires less fertilizer and pesticides, inputs, optimizes available labor, locally acceptable, provide higher net income, and enhance ecological services of the production systems should be promoted. These land use types consists mainly of ornamental productions (237 ha) and fingerling production (159 ha) in the lowland areas and coconut-based multiple cropping systems (891 ha) in the upland area. Rice production should not be totally ignored as it provides some food security blanket to the locals but ecologically appropriate and economically profitable technology should be introduced.

Results show that SALUAP framework could be used in the exploratory land use option analysis at the municipal level. Decision makers and planners in making a more objective agricultural land use planning could use the quantitative result of this study not only in making agricultural land use plan but also in making comprehensive municipal land use plan.

CUESTA, MICHAEL A.

Measuring community and household resilience to flood disasters and food insecurity in the Sta. Rosa Silang Subwatershed, Philippines.

The study was developed an approach to assess community and household resilience to flood disasters and food insecurity. Applied in the context of the Sta. Rosa-Silang Subwatershed, it evaluated the level of community and household resilience based on a set of biophysical and socioeconomic indices and identified geographic and thematic areas where policy intervention is most critical. The results show that building community resilience requires improving housing conditions and safety, participation and volunteerism, disaster awareness and preparedness, income diversity, savings formation, and strengthening the capacity of the community to conduct participatory disaster risk reduction planning and implementation. At the household level, resilience was negatively related to exposure level to a hazard and positively related to household economic capability and community standard of living. The results also show that building household disaster resilience is a very good strategy to address food insecurity. The approach developed by the study becomes essential for policy-makers and development practitioners seeking to evaluate the conditions of a target population.

CUI, LOUCEL E.

The Spatial Distribution of the Diminutive Freshwater Fishes in Relation to Water Quality of the Sta. Cruz River System, Laguna, Philippines – 2016.

The ecology and biology of the diminutive freshwater fishes in the Sta. Cruz River System might be affected by the water pollution, which posed changes in the water quality of the River System. Diminutive freshwater fishes are small vertebrae species, maturing at sizes equal or less than 50-100 mm. The spatial distribution of the Sta. Cruz River System was assessed in upstream, midstream, and downstream sections of the river from December 2013 to June 2014. Species composition, abundance, morpho-metric characteristics, water quality, land cover, and climate were evaluated.

A total of 1,508 individuals belonging to 18 species, 14 genera, and 12 families was collected. Of the 12 families, Gobiidae was the most abundant followed by Poeciliidae and Eleotridae. There were 9 species each of native and introduced fishes that recorded for native and introduced species respectively. Generally, morphometric and meristic attributes were significantly different for each of the species collected. *Glossogobius aureus, Glossogobius iliimus, Nomorhamphus pectoralis,* and *Zenarchopterus philippinus* collected in upstream, were found to be significantly bigger and longer due to pristine condition of the station. While, *Barbodes binutatus* is significantly bigger and longer in Calumpang station due to nutrients present.

Water quality parameters were within the standards set by DENR for Class C waters. However, the midstream and downstream exceeded the standard for DO and BOD. This is due to the piggeries in the midstream and the direct disposal of liquid and solid waste of downstream residents.

On the whole, the native fishes were more dominant than the introduces fishes in the upstream due to its pristine condition. The introduced fishes however were more dominant in the midstream due to the nutrients coming from the piggery farms and residents in the area. Endemic fishes of the Laguna de Bay such as *Gobiopterus lacustris, Leiopotherapon plumbeus* and *Micropys branchyrus brachyrus* are found in the downstream station. Recommendations for the conservation and protection of the native fishes should more on preventive approaches over restorative actions at the local government level and should reach down to the grassroots level.

DAMDRONGSADSIRI, KANLAYA

Land use change and its impacts on watershed function and food security in Huaynamphung sub-watershed, Thailand -- 2010

The study was conducted in the 66,073.59 ha Huaynamphung Sub-watershed in Thailand covering four districts having different topographies i.e., mountainous on the western side and relatively flat on the eastern side. The study assessed the land use change from 1989 to 2008, determined the factors affecting the farmers' decision-making, predicted the impact of land use change on watershed function and food sufficiency, and prepared recommendations for land use management in the Sub-watershed. Satellite imageries of the area were interpreted to create land use maps for 1989 and 2008. Factors affecting land use were determined thru interviews of farmer-respondents who were chosen purposively based on the dominant crops planted in the area.

Data were analyzed using descriptive statistics and linear regression analysis to find out the factors affecting farmer-respondents' decision to change crops to plant and the relationship among these factors. FALLOW model was used to predict the impacts of land use changes after 25, 50, 75 and 100 years on soil physical quality, sediment loss, water yield, base flow and food sufficiency. The simulations were run in five scenarios : Scenario 1 (original land use), Scenario 2 (teak plantation and agricultural crops), Scenario 3 (tamarind and rubber and agricultural crops), Scenario 4 (agroforestry system with agricultural crops), and Scenario 5 (Only agricultural crops).

Results showed that the areas of natural forest and field crop changed the most among all land uses. However, the land area for natural forest decreased, while that of field crop increased. As to factors affecting land use, nearly half (101) of the 204 respondents changed crops to both biophysical and socio-economic factors. Price of produce, management, government advocacy, and diseases, insects and pests were the most important factors cited for the farmers' decision to shift to other crops.

Simulated land use change using the original land use map in 2008 showed the shifts to higher stages of tree plantation. The most obvious change happened when the plantation area became an agroforestry systems after 25 years of simulation.

Among scenarios, Scenario 3 (tamarind and rubber plantation) showed the highest increase in simulates soil physical quality, and the highest decrease in water yield and sediment loss. Other scenarios display similar results in simulated water yield, base flow and sediment loss. Scenario 4 (tamarind-based agroforestry system) showed better soil physical quality than Scenarios 1 (Original land use) 2 (teak plantation), and 5 (only agricultural crops). Food sufficiency was pronounced in Scenarios 1 (original land use) and 4 (agroforestry system), while the remaining scenarios exhibited food deficiency only after 13 years.

Recommended land use management in the Sub-watershed for the mountainous, lowland and upland areas to support the government in encouraging the farmers to plant crops that would help improve socio-economic status and conserve the environment in the Sub-watershed. In the mountainous areas, it is recommended that farmers are encourage to plant rotation of vegetables suited to low temperature to break cycles of pests and diseases as well as applied organic fertilizer. Tamarind and rubber based-agroforestry system should be promoted in the upland and lowland area of the Sub-watershed as it helps conserve the environment, maintain watershed functions and provide food security to smallholder farmers in the Sub-watershed.

DAYAP, NANCY A.

Copper transport and dispersion in Tayabas Bay, Philippines -- 2003

The study addressed spatial pollutant transport of copper mine tailings from Marinduque to Tayabas Bay. Water sampling stations were established along Tayabas Bay using a Garmin Global Positioning System (GPS). Samples were analyzed for total copper content and total suspended solids (TSS). Seawater chemistry data such as temperature, salinity, and density were taken using a Seabird SBE19 CTD. The Princeton Ocean Model (POM) was used to simulate copper dispersion from two major sources : near the tailings discharge pipe of Consolidated Mining Inc. (CMI) and Calancan Bay where Marcopper Mining Corp. (MMC) dumped its tailings. The simulations showed copper tailings dispersion with southwest (SW) winds, northeast (NE) winds, and when no wind and only tides were considered in he POM simulation.

Seawater temperature, salinity and density at the sampling points during the SW monsoon ranged from 27.1 - 29.8 C, 33.4-34.2 ppt, and 20.6-22.0 psu respectively. The NE monsoon readings were : 25.8-31.6 C, 33.8-34.1 ppt and 20.8-21.8 psu for temperature, salinity and density, respectively. Tayabas Bay has characteristics typical of tropical waters. TSS of the water samples taken during the SW and NW monsoons showed no distinct dispersal pattern. Total copper levels were within DENR WQS except for samples taken near CMI and Calancan Bay which exceeded DENR WQS.

Sediments collected from mangrove areas around Marinduque and coastal towns in Quezon Province fronting Tayabas Bay showed total copper levels allowable under USA and Canadian sediment standards. POM showed that dispersion of tailings from CMI is towards northeast when SW winds are applied and west of Marinduque when applied with NE winds. Tailings from Calancan Bay flow eastward of Tayabas Bay with SW winds, and flow westward with NE winds. There was no dispersion when only tides were inputted into the simulation.

Based on the POM simulation, there is a possibility that copper mine tailings from Calancan Bay in Marinduque can reach the coastal areas of Quezon Province during the SW monsoon. For the protection of our aquatic environment, there is a need for a review of existing policies or the formulation of new ones that stipulate for regular pollution monitoring of interisland waters.

Another recommendation is that, for EIA of projects to be established along lakes, rivers and coastal areas must include dimensions of the flow of pollutants such as : chemical forms of heavy metals released, transport paths and speciation potential of these chemicals.

ARAGON A. DECHIMO JR.

Bioresource Use Pattern in Northern Negros Natural Park, Negros Island, Philippines. – 2022

There is an ongoing threat to the forest environmental quality of Northern Negros Natural Park (NNNP) which can be attributed to social, economic and institutional factors. This study attempted to make a bioresource use analysis particularly, on the biophysical and socio-economics systems in NNNP. Specifically, this study aimed to (1) assess the biophysical components of NNNP; (2) evaluate the plant bioresource utilization in NNNP; (3) make scenario projections for plant bioresource use in NNNP; (4); estimate the economic value of plant bioresources in NNNP and (5) propose contextualized policy recommendations for conservation and management of plant bioresource use in protected areas of the Philippines. Household survey, key informant interview, focus group discussion, standard vegetation analysis and data mining were utilized in the data collection process. Results showed 242 species in 19 genera under 72 families. About 112 species were reported threatened, 35 of which are Philippine endemics. The diverse species of NNNP are distributed in two altitudinal zones identified using cluster analysis: Zone I for plots within 643 to 1256 meter above sea level (masl) dominated by *Crypteronia paniculata, Acer laurinum, Weinmannia hutchinsonii, Syzygium sp., Viburnum glaberrimum, Alphitonia excelsa, Shorea contorta,* and *Ficus sp.* and Zone II for plots found within 1421 masl to 1470 masl dominated by *Dacrydium cf. beccarii*. At Euclidian distance 150, Zone I was further subdivided into three subzones: Subzone IA (643 masl to 985 masl); Subzone IB (822 masl to 1182 masl) and Subzone IC (908masl to 913masl). Incidentally, the elevational zones determined corresponded to the forest formations of the park: tropical lower montane rain forest (600 masl to 1300 masl); and tropical upper montane rain forest (1300masl to 1850 masl). Zone I, the tropical lower montane had higher species diversity (H'= 4.845) compared with Zone II, the upper montane rainforest (H'= 3.37). Canonical correspondence analysis illustrated that environmental factors (N, Altitude, and human disturbance) has strong influence on the species abundance data (basal area).

DE GUZMAN-MORTILLERO, ARNICA

Sustainability Pathways for Freshwater Management in Puerto Princesa City, Palawan, Philippines through Institutional Resource Logics. – 2021

The study explored the use of Institutional Logics in identifying sustainability pathways for freshwater management in Puerto Princesa City, Palawan. With the alarming water crises being experienced in the City, the call for sustainable resource management is deemed necessary. To understand the complexity of the issue, sustainability pillars were used as the framework in analyzing the factors behind the water crisis in the area: Environment- which referred to the watershed conditions including climatic changes; Economic- which explored industries that highly depend on freshwater; and Social- which focused on population and its demand. It was noted that the water crises were an interplay of the different factors. For the environment component, it was found out that despite the seemingly recovering state of the Irawan Watershed in terms of land cover, there was an increased surface run-off and decreased groundwater recharge. For the climatic projections, the situation can be further aggravated due to lower total annual rainfall for Puerto Princesa and Palawan. SRES climate model with A2 and A1B scenario both showed decreasing total annual rainfall while

RCP climate model with 3.5 and 8.5 radiative forcing showed even lower possible total annual precipitation. Meanwhile, estimations and projections on freshwater demands for the growing tourism industry in the City also showed that the supply is not enough. This implies that water abstraction from the ground is still left unmonitored which may later pose irreversible problems being an island ecosystem. For the social component, it was evident that the average consumption and the consumption trend for freshwater continuously increases, adding more pressure to the limited resources being tapped by the local water district. To efficiently manage the resource sustainably, institutions that are major decision-makers on freshwater were included in the study. In capturing the Institutional Logics and understanding their sustainable pathways, methods recommended by Reay and Jones (2015) and STEPS Framework of Lindahl (2016) was adopted. It was found out that the institutions covered in this study had the following logics: (1) Securing Stable Supply [of freshwater]. (2) Securing Legislative Needs and (3) Science and Research-Based Decision-Making. These logics was found to have their own preferred sustainability pathways to achieve the overall end goal of having safe and secured water for all but also showed some commonalities. These can then be considered as the possible complementation and supplementation of the logics, creating an integrated pathway earning the support of all the institutions involved with higher chances of attaining sustainability. These findings on the intricacies of the Institutional Logics can further be utilized in understanding how institutions and people under them work along or against each other. It was therefore recommended that further studies be conducted covering more institutions to have a better view of the institutional dynamics. A framework integrating Institutional Logics with natural resource management is proposed which can be useful in crafting policies that are more stable and can earn more support from among stakeholders and institutions

DE GUZMAN, ASUNCION B.

Analysis of fishery benefits of biomass spillover from a community marine reserve in Northern Mindanao, Philippines -- 2004

The potential of a community marine reserve in Baliangao, Misamis Occidental in enhancing the coastal fishery of Danao Bay through spillover of fish biomass was evaluated through an ecological assessment and an analysis of fisheries economics. Research results indicate a significant improvement in the ecological condition of the marine reserve and of the reefs outside through increase in mean live coral cover (36.9% - 46.2%), species variety of corals (92 species) and finfish (325 species), and standing stock biomass of fish after more than a decade of protection and community-based management. Fish biomass, particularly of target food species inside the reserve, is more than twice the amount found on adjoining reefs. High biomass to density ratio inside the marine reserve (25:1), especially of target food fish (159:1) indicate that fish inside are significantly bigger than in surrounding reefs.

Observed patterns of fish movement in and out of the protected area suggest that the potential of adult biomass spillover into adjacent fished areas is relatively high (~12.43 percent). Analysis of economic costs and revenues from fishing indicates profitability of less capital-and manpower-intensive gears particularly those that incur small operating costs. Fish corrals and bamboo traps capture most of the rents from the Danao Bay fishery which amount to a net present value (NPV) of more than a million pesos that may be received in perpetuity under effective management.

A simulation model was developed using the Stella software (ver 4.01) to predict systems behavior in possible future scenarios or approaches to marine protected area (MPA) and fisheries management. The management approach that combines increasing the size of the MPA, improved protection, regulation of fishing effort and environmental management brings about a sustainable coastal fishery and possibly higher economic benefits to fishers. The establishment of MPAs is not a "stand alone" strategy to achieve sustainable fisheries management but must be part of a broader framework of pragmatic but scientifically sound management. Critical factors in the successful implementation of this management framework are active participation of local government units, multisectoral cooperation and an empowered community.

DE VERA, IRENE A.

Rice waste utilization and its effects on soil properties and carbon dioxide emission in selected farm in Pangasinan, Philippines. -- 2010

Rice waste utilization as a result of farmers' practices and lifestyle has consequences on the environment, economy and communities. This study assessed the rice waste utilization and its effects on soil properties and carbon dioxide emission in rice farms in Pangasinan, the third top rice producing province in the Philippines.

Rice straw and rice hull were the rice wastes that farmers disposed. Farmers practicing Organic Agriculture (OA) and Low External Input Sustainable Agriculture (LEISA) farmers fully utilized rice wastes since they were aware of the environmental consequence of rice wastes utilization. OA farmers who

practiced rice straw composting significantly helped reduce the carbon dioxide emission by 54 percent. The carbon dioxide emitted from rice hull conversion to carbonized rice hull (CRH) by OA and LEISA farmers were 2,538.60 kg and 2,567.40 kg, respectively. Meanwhile, the carbon dioxide emitted from utilizing rice hull as fuel for cooking by LEISA and CA farmers were 99.38 kg and 739.24 kg, respectively. The soil pH, phosphorous and potassium of OA and LEISA farms showed improvement through constant application of rice straw compost (on-site and off-site). OA and LEISA farmers' income increased by 64 percent and 31 percent, respectively. Conventional Agriculture (CA) farmers did not use rice straw and hull that brought no change in their farm income. Alternative uses of rice wastes were then presented, i.e. use of rice straw in vermicomposting; selling rice hull for use as fuel by food firms; and retrieving the rice hull ash from these food firms for use as soil ameliorants.

The study recommends validation on the calculations of equivalent carbon dioxide emissions form burning rice straw and rice hull. Training farmers on the various ways of utilizing rice waste coupled with support and incentives from the Department of Agriculture, Department of Environment and Natural Resources and the local government units could create an impact to farmers' socio-economic conditions, the farms' soil properties, and the atmospheric quality.

DESTURA, MA. THERESA V.
Occurrence and persistence of red tide in Sorsogon Bay, Philippines -- 2010

The study was conducted to gain a better understanding of the occurrence and continuous persistence of Red Tide in Sorsogon Bay, and come up with policy recommendations to enhance LGU's ecological governance with respect to Red Tide. Specifically, the research aims to: (1) establish the existence of Red Tide in Sorsogon Bay in terms of its a) seasonal occurrence over the years, b) extent of occurrence, and c) density of Red Tide-causing algae and toxicity; (2) examine the association of ecological conditions of Sorsogon Bay and anthropogenic factors, which may be effecting or contributing to Red Tide positive occurrences in the Bay; (3) determine the management strategies being undertaken by the concerned LGUs to effect convergence of agriculture and environmental management concerns with regards to Red Tide; (4) determine the level of awareness of the local communities on the issue of Red Tide; and (5) formulate policy recommendations that may be useful to ascertain factors that influence good ecological governance in the management of Red Tide.

Primary data as well as secondary data were used in the study. Primary data on shellfish poisoning of Red Tide were gathered from 13 monitoring stations strategically situated in Sorsogon Bay over a period of three years. These were correlated by data on climatic and biological factors, and human activities. The latter were obtained through interviews and Focus Group Discussions (FGD). The results showed that the presence of Red Tide in Sorsogon Bay is real. A number of factors appear to influence the presence of Red Tide. These are temperature, rainfall, wind speed and salinity. Red Tide in 2007 was significantly correlated with rainfall amount and wind speed in 2006 indicating some time lag in Red Tide occurrence.

Taking Red Tide as the dependent variable and climatic factors as independent variables, the regression of Red Tide in 2008 with temperature in 2006 and rainfall in 2008 were significant only at 90 percent probability level. Considering the fact that the data base used were obtained under natural field condition, a significant regression at 90 percent probability level may be good enough. This suggests the necessity of conducting follow up experiments on Red Tide in more controlled conditions in the laboratory to define its causal factors. A theory is presented to explain the Red Tide emergence and persistence in Sorsogon Bay. The high level of awareness of local communities on the presence of Red Tide and its link to human activities is a positive sign that adoptive measures with respect to Red Tide may be favored by the local communities and the Local Government Units.

DIAZ, ELVIE V.
Environmental performance of independent oil palm plantation in Sultan Kudarat Province, Philippines -- 2007

Environmental performance of an oil palm plantation is a measurable result of plantation practices, products and/or by-products that have significant environmental impacts. The management and operational performance of small, medium, and large independent oil palm plantations were assessed in Sultan Kudarat Province. Key informant and personal interviews of selected respondents of independent oil palm plantations were conducted. Significant environmental aspects of independent oil palm plantations and environmental indicators were identified. The current plantation practices were compared with good agricultural practices of sustainable oil palm plantation formulated by Unilever in 2002.

The small oil palm plantations had lower management performance than the medium and large plantations. Nitrogen and potassium fertilizer efficiencies were comparable among different oil palm plantations. However, phosphorus efficiency of large oil palm plantations was higher than that of small oil

palm plantations. The nutrient balances were not significantly different among independent oil palm plantations. The potential eutrophication of small oil palm plantations was higher than the medium and large plantations. Least toxic pesticides were used but pesticide management was low. The current plantation practices need some improvement for environmentally sustainable production.

DOCTO, RAMON M.

Human-Nature Interactions in Relation to Protection and Conservation of Mt. Mantalingahan in Sothern Palawan -- 2002

The study was done to gain an understanding of the human-nature interactions in Mt. Matalingahan and its surroundings within the framework of sustainable development. The general objective of the study is to generate baseline information on the mountain's ecosystems as result of human interventions, in developing a parameter for the protection and conservation of Mt. Matalingahan, in Southern Palawan. The study was conducted in the 1,219.84 hectare Mt. Matalingahan in Southern Palawan, specifically in the mountain ranges near sitio Tabod and sitio Dumalag in barangay Panitian in the municipality of Quezon. The area is proposed Wildlife Conservation and Research Center to be co-managed by the Palawan State University (PSU), the Local government of Quezon, Palawan and the local people in the area. Seventy-five residents consisting of 33 indigenous and 42 migrant dwellers were the respondents in the study. Key Informants were the barangay officials, the chieftains of the indigenous dwellers, and personnel from LGU and DENR. Results of the interview/survey were substantiated with focus group meeting and secondary data.

Results revealed that the indigenous and migrant communities had both positive and negative impacts on the mountain's forest cover and wildlife population. Logging and kaingin farming are the main activities in the forest. Timber and rattan are common forests products gathered by the migrants while the indigneous dwellers make use of the forest as source of food and firewood. Sometimes these products are sold in exchange for some basic commodities such as salt, sugar and coffee. In contrast, the migrant dwellers make use of the forest as source of timber. The situation further revealed that the indigenous and migrant occupant, and outside poachers put increasing pressure on the mountain and forest resources, threatening to rapture the delicate ecological balance and symbiotic relationship between flora and fauna in the area.

A result of statistical analysis indicates that the present vegetation of Mt. Matalihngahan is closely associated with the cultural practices of the residents in the area, such as charcoal making, land conversion, and year of stay in the area. The longer the residents stayed in the area, the more the vegetation is negatively affected. In spite of the existence of policies, laws and decrees for the protection of Mt. Matalingahan, loss of forest cover and wildlife continue. This might be due to the poor law enforcement. The changes in the ecosystem's condition in return affect the dwellers specifically those living within and in the mountain surroundings. Some of the negative effects of clearing the forest are: loss of water supply, inadequate stream of flow for downstream use, loss of biodiversity, and reduced agricultural activity. The respondents believed that for the conservation program to be effective, there must be a cooperative effort between the government and the local community, and that no conservation strategies will succeed without government support and participation from the community.

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 olivaceae and Sardinella sp. Were the dominant species of all the twenty-seven (27) identified 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 type 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 a highest pond patches (2) 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 73 percent used of mangroves as a source of construction materials, 2 percent depended on mangroves for fuel with 22 percent 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 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.

ELCA, JULIENNE B.

Passivity as Resistance to the Community-based Mangrove Management Approach: Analyzing the Discourse of a People's Organization in Infanta, Quezon, Philippines. – 2022.

Developing viable livelihood alternatives is especially important in sustaining local participation in the Philippines' community-based mangrove management (CBMM) implementation because Republic Act 7161 prohibits mangrove-based people's organizations (POs) from benefitting from the trees they plant. This study sought to understand why POs part of the state's Community-based Forest Management Program (CBFMP) tend to resist CBMM by neglecting this responsibility, being active only when there is external assistance. Stories of CBMM participation were collected from the Binulasan Fisheries and Aquatic Resources Management Association, Inc. (BFARMA), a PO in Infanta, Quezon that is struggling to sustain collective action during its self-initiated livelihood development activities. Using a discourse analytic approach informed by Sikolohiyang Pilipino, the study analyzed and interpreted BFARMA's shared narrative within the institutional and socio-cultural contexts in which it occurs. The results indicate that BFARMA makes sense of CBMM as a continuous struggle for social justice involving: (a) Pakikipagsapalaran (taking risks) to achieve greater economic security; (b) Pakikipaglaban at Pakikisama (fighting and getting along) with its larger community to ensure fair benefit distribution; and (c) Pagtitiwala sa Sarili (trusting their collective ability) to take on the responsibilities of a natural resource manager. However, having been conditioned by the CBFMP's significantly greater support for mangrove rehabilitation to passively accommodate externally-funded reforestation projects through which they identify as hired labor, many members feel ill-equipped to take these struggles on with the additional obligations that livelihood development is likely to require. The results imply that POs like BFARMA are more likely to embrace their resource management role and participate in livelihood development efforts: (a) if they perceive that the costs of involvement are fairly distributed between them and the CBFMP; and (b) if they feel capable of sourcing out the financial resources and technical support necessary to establish and sustain the livelihood opportunities they hope to develop. If PO members are not to abandon participation in CBMM altogether in the face of the vastly uncertain economic climate caused by the COVID-19 pandemic, these point to the urgent need to reconceptualize social justice through CBMM as: (a) distributive justice through fair distribution of devolution costs between the CBFMP and its participating POs; and (b) procedural justice through the POs' more active participation in how the problems they face and the proposed solutions are articulated through the CBFMP's support provision mechanism.

ELVIRA, MARLON V.

Assessment of Heavy Metal Contamination in Asiatic Clam (Corbicula fluminea) from Laguna de Bay, Philippines and its Potential Environmental and Human Health Risks -- 2019

Laguna de Bay, the largest and nationally significant freshwater lake ecosystem in the Philippines, has been increasingly subjected to anthropogenic pressures over the years. Domestic, agricultural, and industrial activities in the surrounding areas have contributed directly and indirectly to the deterioration of the lake's overall ecological health and integrity. Previous studies have shown that the lake is heavily contaminated. Pollutants such as heavy metals are persistently discharged into the lake and contaminate the water, sediments, and organisms.

This study assessed the heavy metal contamination in Asiatic clam, Corbicula fluminea, from Laguna de Bay and its potential environmental and human health risks. The concentration of Cr, Ni, Cu, Zn, As, Pb and Cd in water and sediments, and in the flesh and shells of Asiatic clam were determined and analyzed. The clam's biological responses to heavy metal contamination was assessed using geometric morphometric analysis. The knowledge, attitude, and practices of fishing households in relation to the collection, sale, and consumption of Asiatic clam were elicited through a survey. Moreover, the target hazard quotient (THQ) was calculated to determine the potential health risks of consuming heavy metal-enriched clams to fishing households.

Results from the ecological risk assessment showed that sediments collected from Santa Cruz and Victoria were slightly contaminated while those from Pila, Taguig, Muntinlupa, and San Pedro were moderately contaminated. The sediment samples were shown to be moderately enriched with Cu (Santa Cruz, Victoria, Taguig, Muntinlupa, and San Pedro) and As (Santa Cruz, Pila, Victoria, Taguig, Muntinlupa, and San Pedro). The potential ecological risk of heavy metal-enriched sediments to the biological community was found to be very high.

Analysis of biota-sediment accumulation and translocation of heavy metals from sediments to Asiatic clams revealed the high affinity of Cr, Cu, Zn and As with the clams resulting in values exceeding the international standard limits. The geometric morphometric analysis also revealed that shells collected from the West Bay exhibited horizontal elongation while those from the East Bay appear to be vertically elongated. In the evaluation of human health risk exposure, the KAP survey indicated that the majority of the selected fishing households have an acceptable level of knowledge on the hazards posed by the intake of contaminated clams but disapproved the banning of its collection and consumption. Sampled households with high consumption rates in all municipalities except Victoria were also found to be exposed to imminent health risk due to high toxicity level based on their THQ values. Overall, the potential ecological and human health risks validate the worsening condition of Laguna de Bay. An integrative and holistic management of Laguna de Bay through collaborative efforts of various stakeholders and institutions is necessary, to restore the health of the ecosystem and safeguard the health of the public.

ERASGA, DENNIS S.

A Rice-Based Genealogy of Environmental Discourse in Philippine Agriculture,1946-2005 -- 2006

The principal objective of my study was to offer an interpretation of the genealogy of environmental discourse in Philippine agriculture via the biography of rice. The specific objectives were: (i) to identify the different images of rice running through 1946-2005; (ii) to analyze how the confluence of text impacted on the eventual recognition of rice as an environmental crop to the overall environmental discourse in the Philippines. Using genealogical analysis, I generated three discursive episodes, i.e., peasant movement, green revolution and sustainable development and overlaid three dominant images from special documents I called indicator texts with storylines reflecting the shifting object of their intertextuality. My study demonstrated the utility of discourse analysis approach , its analytic tools and concepts, and the power dynamics they engender and the interplay in the construction of environmental issue. Within the framework of environmental science, I amplified the role of culture represented by our unique historical experience, institutions and practices in contextualizing our understanding of environmental issues.

ESCUETA, SILVESTRE

Soil sediments and nutrient losses on kaingin farms at Bazal-Baubo watershed in Aurora, Philippines -- 2006

Three cropping systems (CS) with or without contour strip grass residues were evaluated for three cropping periods for their effects on soil nutrient losses on kaingin farms on sandy soils with slope of 30-50 percent in Aurora State College of Technology (ASCOT) Reservation of Bazal-Baubo watershed. CSI planted to tomato (Lycopersicon esculentum) with 1-meter (m) contour strip of grass residues. CS2 was planted to eggplant (Solanum melongena) with 2 m contour strip of grass residues, and CS3 was planted to squash (Maxima cucurbita) without a strip of grass residues. A randomized complete block design with two replications was used.

Results show that mean soil loss was 250t/ha for CS3 t/ha for CS2, and 181 t/ha for CS1, with losses of 4,064 kg N/ha, 1.97 kg P/ha, and 1,750 kg K/ha, respectively. During the first and third cropping periods there were significant differences in the mean soil loss. No significant difference was observed during the second cropping period. Regardless of width, the contour strip of grass residues effectively trapped the eroded soil. However, the strip was not effective in minimizing soil erosion in the area, especially with the occurrence of high-intensity rain plus high-velocity winds. Pearson correlation was used to determine the relationship between some socioeconomic characteristics and respondents' perception and awareness of kaingin-farming at the Bazal-Baubo watershed.

The respondents have a high level of awareness of kaingin-farming. They perceive the watershed as a source of resources. Correlation analysis showed that age and years of residence have a positively significant relationship with the respondents' awareness that kaingin-farming will lead to landslides. Respondents' annual income have a positively significant relationship with their awareness that kaingin-farming will lead to the disappearance of water in rivers and lakes, and to a change in temperature. However, annual income has a negatively significant relationship with the respondents' perception that the watershed is a source of primary products like timber. This may be the main reason for the rampant gathering of timber in the area.

The socioeconomic characteristics of the respondents' were significantly related with their perceptions and awareness of the existence of kaingin-farming and other illegal activities in the watershed. Selected socioeconomic characteristics were not correlated with awareness that kaingin-farming leads to a decline in soil fertility and soil loss. This implies that the respondents are not aware that kaingin-farming leads to a decline in fertility and soil loss. The lack of awareness leads the respondents to persist in kaingin-farming, with consequent of soil erosion and loss of soil nutrients.

FAJARDO, LORENZ J.
Fluctuating Asymmetry and Acetylcholinesterase Activity in White Goby (*Glossogobius guiris Hamlilton, 1822)* as Potential Biomakers of Environmental Contamination in the East Bay of Laguna De Bay, Philippines. – 2016

Pattern of asymmetry and acelthylcholinesterase (Ache) activity were investigated in white goby *Glossogobius giuris*, a native and commercially important fish of Laguna de Bay. Fluctuating asymmetry (FA), the subtle random deviation in bilateral traits, and inhibition of Ache activity are widely reported as potential early-warning tools in monitoring the health of aquatic ecosystems. Samples obtained from two agricultural sites (Bay and Santa Cruz) in Laguna were compared to a reference group, reared population. Landmark-based geometric morphometrics via Symmetry and Asymmetry in Geometric Data and Procrustes Analysis of Variance revealed significant levels of both directional and fluctuating asymmetries within and among populations. High F values of FA imply that deviations from perfect symmetry may be attributed to environmental stressors. Overall FA variations based from two major principal components were significantly greater in wild populations than in reference group. Conversly, brain and muscle AchE activities were significantly lower in wild populations. Depressed AchE activity in both muscle and bargain tissues of wild samples is indicative of fish exposure to anticholinesterase pesticides in the sites as further supported by pesticide usage revealed through Key Informant Interviews and Focus Group Discussions. Findings may indicate the contributory effects of environmental conditions associated with anthropogenic pressures on the morphology and physiology of gobies.

FARINAS, ANTONIO R.
Spatio-temporal change of nitrate pollution of groundwater in lowland agricultural landscape in Batac, Ilocos Norte, Philippines. -- 2005

The spatio-temporal change of nitrate levels in shallow groundwater wells of lowland rice field planted to rice in the wet season and upland crops such as eggplant, sweet pepper and corn during the dry season was assessed in 2004. The 13 farmer cooperators applied as much as 122 kg N ha4 for rice and as much as 450 kg N ha4 for sweet pepper. Furrow irrigation was done on upland crops. Temporal assessment was done for the monthly variation of nitrate levels in the rainfed lowland rice and upland cropping seasons. The Inverse Distance Weighted (IDW) interpolation method was used to assess the monthly spatial variation of groundwater nitrate levels. It depicted high concentrations of nitrate in areas where spatial data of excessive fertilizer applications were found.

The levels of nitrogen fertilizer application were significantly correlated with mean monthly groundwater nitrate levels in the upland crops specifically for eggplant. The mean monthly groundwater nitrate levels during each cropping were generally low and did not exceed the critical level of 10 ppm except for two wells. Planting of corn as a forage crop after eggplant reduced the level of soil nitrate. Nitrate pollution of groundwater can be minimized by planting corn forage crop after eggplant to utilize residual soil nitrate. Monitoring of the groundwater nitrate must be continued for the sake of public awareness and for the purpose of adopting mitigating measures to reduce environmental impact.

FAVOR, CHERRY CAMBRONERO O.
Socio-Ecological Analysis of Coastal Ecosystem: The Case of Tagkawayan, Quezon, Philippines – 2021.

The destruction of the coastal ecosystem of Tagkawayan was evident in the amount of varied and declining fish catch from excessive extraction of its marine resources and other human activities that cause environmental changes. This alteration in the environment can give irreversible effects if not given appropriate actions. To prevent the worst-case scenario of having biodiversity loss, habitat destruction, and marine wildlife extinctions, exploration of the important domains of sustainable management of coastal and marine resources should be done. The Socio-ecological analysis is an interdisciplinary approach that will show relationship of human and the environment in sustainable management of the coastal ecosystem. Managing the coastal zone involves a balance in the environment, economics, social and cultural, and

governance and policy. Thus, this study aimed to analyze the socio-ecological system of coastal communities in Tagkawayan, that specifically sought to answer the following questions 1. What are the biophysical attributes of the coastal ecosystem in Tagkawayan? 2. How do local communities perceive the biodiversity of marine resources and their relationship to the respondent's livelihood and resources dependency? What are the perceived changes in coastal resources quality? 3. What are the potential futures of the coastal zone of the study area given different environmental drivers of change that affect fishery production? 4. How can the futures of the coastal zone be visualized by the respondents 20 years from now for its sustainable management? 5. What are the possible plan for action on sustainable coastal resource management along the coasts of the study area? And specifically worked on the following objectives, a. Characterize the coastal resources of the study area. b. Analyze local perception on biodiversity of marine resources and its relation to ecology and economy and resource management for sustainable use. c. Examine scenarios of a plausible future for a coastal community based on the perspectives of the respondents. d. Discuss the implications of the study to the fishery production that will promote sustainable coastal resources management in the study area. e. Developed an action plan for sustainable coastal resource management for the Local Government Unit and in an academic perspective. The presentation of this study is divided into (a) Attributes of the Coastal Ecosystem and Fishery Resources of Tagkawayan, (b) Local Perception on Coastal Resource Sustainable Management and Stakeholders' Management and Practices, (c.) Scenario Development for Sustainable Coastal Resource Management. The result reveals, that coral reefs were the most recently assessed among the major coastal ecosystems and it was evaluated to be in fair condition, but not favorable for recruitment of other marine lifeforms because of siltation which is assessed to be associated with the topographic characteristics of the study area. Data on the seagrass beds are found to be limited that only include its location without details on its actual measurement. Some information was gathered from the local knowledge on its local name as *lusay* and the species description was a plat with longer leaves that can have grown to the height of their knee. Data was collected for Mangrove forest specify the forestland area measures that 6,914.49 hectares. It was last assessed in January 2017, to have the potential of developing a site for eco-tourism, where sightings of two endangered migratory birds, five (5) individuals of Grey-tailed tattler (*Tringa brevipes*), and ten (10) individuals of Malaysian Plover (*Charadrius peronii*) are the details information gathered from these coastal ecosystems. A moderate amount of 26.3 MT fishery production for the year 2020 was recorded, which is shown in a moderately positive correlation of the fishing effort and the catch per unit effort, furthermore, it is affected by the restrictions on fishing activities because of the pandemic. Sustainable management of the resources exists with the presence of fish sanctuary and marine protected area and the envisioned future of the fisher folks for the coastal environment was to have a healthy coastal ecosystem with a diversity of species that can be a good source for food and income for the community. As observed the increase in fishery production of the municipality was achieved through the strict implementation of the Philippine Fishery Code. It is an indication that Governance is an important domain and a significant part of the system for successful project implementation, a direct application of the Circle of Coastal Sustainability Framework establishing the link on the fourth significant domain in the assessment of sustainable management coastal resources. This reflects the need for all stakeholders to participate in co-management of the coastal resources to strengthen management, monitoring, and evaluation of the plans and programs for sustainable uses and development. Inadequate baseline data on the major coastal ecosystem strengthen the need to recommend further assessment on biodiversity, species abundance, stock assessment, climate change-related issues along the coastline, Social welfare of the fisherfolks, and environmental issues and concerns. Priorities on marine and coastal projects, plans, and programs for rehabilitation and protection are encouraged. Collaboration and coordination of the LGU to ACADEME and other Government Agencies and Non-Government organizations for funding and technical assistance for project planning and implementation is suggested.

FLORES, JABEZ JOSHUA M.
(no copy)

FLORES, MARY JOYCE L.
Assessment of water quality based on physicochemical parameters and their relationships with the macroinvertebrate communities of Mananga river in Cebu, Philippines. -- 2010

The Mananga River today is a source of potable water to meet the demands of a fast growin Cebu metropolics. This study assessed the temporal and spatial changes in environmental quality of Mananga river based on selected physicochemical parameters in combination with the accompanying structural characteristics of its macroinvetebrate communities. Water and biological samples were collected from February to December 2006. Three sampling stations, each 100 m long, were selected to represent the upstream, midstream and downstream portions of the river. Study protocols were generally adopted from the United States Environmental Protection Agency (USEPA) Volunteer Stream Monitoring Manual (1997).

The water quality of the Mananga river segments significantly varied with location, season, and anthropogenic activities. Flow velocity and discharge, temperature, pH, nitrates, and total phosphates had significantly temporal variations (p0.05). Stream flow velocity was significantly correlated with pH, DO, nitrates, temperature, and TSS (p0.01). Heavy rains were accompanied by increased amounts of nitrate-nitrogen and total phosphate, indicative of run-off from agricultural and domestic sources. Water temperature significantly correlated with DO, pH and TSS (p0.01), and the latter significantly correlated with BOD (p0.05). The BOD in the downstream exceeded the water quality standard (WQS) during low rainfall. Fecal coliform count (280-900,000 MPN/100 mL) in all the sampling stations exceeded from DENR WQS for class C waters, reflecting agricultural and domestic sources.

Thirty-seven macroinvertebrate families representing 15 orders under 7 classes were recorded. The most abundant groups was Class Insecta (25 families), followed by Class Gastropoda (5 families). Family Thiaridae was the most persistent. High persistence was also observed for families Physidae, Caenidae, Elmidae, and Chironomidae. Order Plecoptera of the Ephemeroptera, Plecoptera and Trichoptera (EPT) groups was totally absent. Temperature had a negatively significant correlation with the most number of macroinvetebrate families (8 at p0.05). Family Elmidae was negatively correlated with the most number of parameters (temperature at p0.01; BOD and TSS at p0.05). Family Neritidae positively correlated with BOD and fecal coliform (p0.01 and P0.05 respectively), indicating tolerance to organic pollution.

FLORESCA, JANUEL P.

Assessment and valuation of ecosystem services of lowland rice agroecosystems in Echague, Isabela, Philippines -- 2007

Ecosystem services are the benefits people obtain from ecosystems. In lowland rice agroecosystems, these include grain yield which has an established market price and other non-marketed ecosystem services such as groundwater recharge, nutrient cycling and biological control of insect pests. The economic values of the non-marketed ecosystem services are not considered in making decisions regarding land use conversion of lowland rice farms to non-agricultural uses. These ecosystem services were estimated, analyzed and valued in NIA irrigated and pump irrigated lowland rice farms during wet season 2005 and dry season 2006 in two barangays of Echaque, Isabela.

Groundwater recharge, which was estimated based on saturated hydraulic conductivity and growing period with standing irrigation water in the paddy, was 2,421.7 m3/ha/cropping and valued at P1,307.72/ha/cropping using the price of pumping water from the creek as replacement cost instrument. Soil nutrient cycling, which was estimated using the rice straw yield and its nutrient content, consisted of 16.9 kg N/ha, 12.0 kg P2O5/ha and 55.8 kg K2O/ha per cropping valued at P3,103.74/ha/cropping using the prices of single element inorganic fertilizers as replacement cost instrument. Biological control of insect pests by spiders expressed in terms of predator-prey ratio was 9:61 and 7:24 in the wet and dry seasons, respectively, with a mean value of P376/ha/cropping using price of insecticides as replacement cost instrument. Rice grain yield was 3,530.7 kg/ha/cropping valued at P35,306.86 using the actual market price.

The estimated total ecosystem services value per hectare per cropping was P40,094.32 and P11.5 million/cropping for the whole 286 hectare lowland rice landscape. Meanwhile, most of the value (87.3percent) constituted the grain yield while only 12.7 percent comprised the three non-marketed ecosystem services. However, such percentage would increase if other non-marketed ecosystem services are assessed and value.

These values were derived using transdisciplinary research method. Agronomy, soil hydrology and insect ecology were used to estimate the magnitudes of ecosystem services; environmental psychology was used to explain why farmers used different farm management practices based on their knowledge, attitudes, perceptions and resources constraints; and resource economics was used to value non-marketed and marketed ecosystem services.

Farm management practices affect magnitudes and values of ecosystem services. The economic value of ecosystem services of lowland rice agroecosystems should be shared to farmers and policy makers because these information can serve as basis for policies on lowland rice farm conversion to other land uses.

FUENTES, ERIC E.

Assessment of Heavy Metal Contamination in Lake Water, Sediment, Liver and Gizzard Contents of Philippine Mallard (*Anas platyrhyncos L.*) in the Victoria Area of Laguna Lake, Philippines – 2014.

Assessment of heavy metal contamination was carried out in lake water, sediment, liver and gizzard contents of Philippine Mallard (*Anas platyrhyncos L.*) from free-ranged duck farms at Victoria, Laguna. All duck samples had their gizzards contents and liver removed to verify that the heavy metals reached the digestive system through consumption of plants and animals from Laguna Lake and confirm that these heavy

metals accumulated in the liver. Heavy metal concentration in lake water, sediment, gizzard contents and liver samples from live intoxicated ducks were analyzed using inductively coupled plasma mass spectrometry (ICS-MS). The lake water and sediment samples collected during the wet season were positive for heavy metals. High concentration of the said metals in sediments from this part of the lake may have resulted from deposition of HM pollutants within Victoria. Most of the liver samples examined were swollen and others were characteristically enlarged. Varying degrees of hemorrhages and congestions were the most frequently observed in the samples. All samples contained the four heavy metals in both liver and gizzard contents. For gizzard contents, the HMs rank as follows: Cr>Pb>As>Cd for the dry season and Pb>Cr>As>Cd for the wet season. For liver samples, the heavy metals rank as follows: Cr>Cd>Pb>As during the dry season and Cr>Pb>Cd>As during the wet season with arsenic as the least concentrated. Correlation between seasonal variation in the HM concentration in liver and gizzard contents was not significant. Consumption advisory based on the individual's body weight was constructed to minimize excessive exposure to HM. The findings tend to show that birds exhibiting the following characteristics: stunted growth, sluggishness, poor appetite and lack of vigor tend to have excessive heavy metals in their liver and gizzard contents. Consumption of duck liver should be done with caution if the source has not been ascertained. The observed values for heavy metals and the gross description and the physical characteristics of the liver serve as guide in the diagnosis of HM bioaccumulation. However, more studies should be done to verify the present findings.

GABERTAN, HERMINIGILDA A.

Life cycle assessment of the production of lettuce (Lactuca sativa L.) under greenhouse cultivation in Silang, Cavite, Philippines – 2008

Life cycle assessment of seven varieties of lettuce grown in a commercial greenhouse was conducted to evaluate the environmental burdens associated with production system from culture medium preparation to packaging lettuce for distribution to various market outlets. Coconut coir dust was used as the culture medium. One kilogram of packed lettuce and 1000 m2 of production area were the functional units.

Rate of nitrogen and phosphorus application, cyromazine and deltamethrin use and workers welfare, health and safety, lettuce variety and financial viability were the significant aspects of the management practices in the farm. In the postharvest processing, water use, power consumption and workers welfare, health and safety were the significant aspects. The application of pesticides with low toxicity had no residues in lettuce. Lettuce production significantly differed among varieties. Xanadu variety was the highest yielder.

Technological options and institutional capability building of the workers were recommended to improve the environmental performance of the production system and post harvesting processing of lettuce. The cost of water for lettuce production and processing needs to be reevaluated.

GACELO, ESTER P.

The dynamics of water quality of the San Cristobal river systems, Laguna, Philippines -- 2006

The study sought to assess the spatio-temporal variations in the water quality of San Cristobal River (SCR) and its biological component with an end-in-view of developing a design of rehabilitation measures. The continuing deterioration of the water of this river is evidenced by low DO, high turbidity, high total N and total P in the ecosystem.

Water quality in the SCR varied in relation to land use and the amount of precipitation. Water temperature varied within the allowable limits indicative of this factor's being under the influence mainly of solar radiation. There were no evidences of entry into the study areas of thermal effluents that altered water temperature beyond the normal.

The industrial area was subject to conditions that limited the amount of dissolved oxygen during the warm dry month, at the start of the rainy season, and the cold dry month.

Total P exceeded the standard in the industrial and residential zones during the cool dry and warm dry months. Total N was excessive in the three land uses in the following order of increasing concentration : residential industrial agricultural. In combination with the results indicative of a high P coming from the residential zone, it is implied that in the river, the domestic sector is the primary source of cultural eutrophication followed by industry and lastly, by agriculture practice. The river's pH vacillated within a safe range vis-a-vis the standard implying that the river is well buffered. Salinity levels indicated the river as freshwater. Zinc highly correlated with total N and indirectly varied with pH. A correlation with N could mean that Zn was bound in organic matter or that the conditions leading to an organic increment in the river similarly increased the detectable Zn load.

GACHO, CARMEL C.

Anerobic filter bed baffled reactor for the treatment of food processing wastewater and its application for carbon trading -- 2009

A cost-effective lab-scale Anaerobic Filter Bed Baffled Reactor (AFBBR) was developed to treat food-processing wastewater. The effects of two factors, packing materials (gravel and plastic caps) and organic loading rates (1g/L-d to 8.5 g/L-d) on performance efficiency, gas rate, treatment cost and probable carbon credits were investigated. Better performance efficiency was obtained using the plastic material as compared with that of gravel. The organic loading rates (OLR) when applied singly as a factor was best at 6.4 g/L-d. The combined effects of the two factors were markedly significant when AFBBR was operated at 4.2 g/L-d and 6.4 g/L-d for plastic and gravel, respectively. The lowest treatment cost and the onset of decreasing treatment performance were observed at the highest OLR of 8.5 g/L-d. Calculated carbon credits were maximum at OLR levels of 4.2 g/L-d for plastic and 6.4 g/L-d for gravel packings. A streamlined life cycle analysis revealed low environmental burden brought about by the AFBBR technology which can be attributed mainly to its low energy requirement and high potential for renewable electricity.

GALINDEZ, JONATHAN L.

Vulnerability of organic vegetable farming to drought in Nueva Ecija, Philippines -- 2012

The study was conducted to evaluate the vulnerability of organic vegetables to drought particularly in towns (7) or cities (4) of Nueva Ecija. Only 85 organic vegetable farmers were identified in these places of study and were interviewed from May to July 2011 using an interview schedule. They composed the complete list of organic vegetable farmers in the study areas.

The socio-economic characteristics, support services and technical factors considered in the study were analyzed using descriptive statistics, correlation and regression analysis.

Findings revealed that 73% of the farmer respondents are owner operators while 27% are renters, share tenants or percentage sharers. The adoption rate of the organic farming technology was significantly influenced by the tenurial status of the farmers.

The organic vegetable farmers perceived that climatic conditions such as high temperature, soil condition, and different land use have contributed to the occurrence of drought. Their adoption strategies to counter act the effects of drought are lowering the plots to minimize the amount of water to be used for irrigation, decreasing the area planted with crops, planting of early maturing variety or short duration crops, planting of drought tolerant variety, and mulching to prevent soil moisture evaporation. Also, frequency of irrigation is lessened to minimize unnecessary loss of water.

The organic vegetable farmers perceived that environmental temperature, crop variety and organic farming technology are the factors influencing the occurrence of pests. To suppress this problem, the farmers apply plant extracts reported to have insecticidal properties like kakawate and neem leaves, and hot pepper fruit. In addition, manual removal of infested plant parts was employed by the farmers to eliminate larva or egg deposited inside the infested parts. Other farmers spread ash on plants to reduce foliage damage while some practice bagging of vegetable fruits to prevent insect pest damage. Despite the problems of farmers in organic vegetables farming, they have continued adopting the technology knowing the high economic and environmental benefits obtained.

They also recognize the need to improve the organic farming industry in the country and for government to support it by providing irrigation facilities and machinery to boost organic farming and make it comparable to other countries in Asia.

GARCIA, JOSEPHINE E.

Influence of Land Use and Land Cover Changes in the Estuaries of Quiaoit River Watershed, Batac River Watershed, Ilocos Norte, and Baroro, San Juan, La Union, Philippines – 2017.

Many of the watersheds in the Philippines face water quality issues caused by unregulated land conversion that leads to urbanization and pollution. The primary purpose of the study was to examine the spatial and temporal pattern of land use and land cover changes (LULCC) by using landscape and class metrics in the watersheds of Quiaoit River, Batac, Ilocos Norte and Baroro River, San Juan, La union. The biological conditions and physico-chemical characteristics of the two watershed areas were also assessed to establish such changes. The results of the assessments were then used to determine the effects of varying degrees of land use changes as it relates to land cover changes from the middle stream up to the estuaries of the said watersheds through the examination of the composition of macroinvertebrate communities.

Time of concentration (TC), recession coefficient (RC), baseflow index (BFI) and peak flow (PF) were the hydrologic metrics used to relate the landscape metrics derived through the application of the FRAGSTAT software. The result showed an increasing trend in fractal dimension over time indicative of

more complex shape of patches in both watersheds. BFI and RC varied from low to high and were observed to be decreasing in the later years. This could be indicative of an open space policy, conservation initiatives and reforestation program implemented for the last ten years.

A total of 39 members of the macroinvertebrate communities for both moderately pollutant sensitive and tolerant taxa (Coleoptera, Odonata, Decapoda, Amphipoda, Diptera, and Oligochaeta) were observed at the downstream sampling sites, but this can be attributed to the wide range of tolerances of families found within each of the diagnostic groups. The highest number of pollution tolerant taxa, Chironomidar and Oligochaeta, were observed at the midstream of Baroro River Watershed (B3-in between rice fields and B4-near forested areas) with only one individual of Chironomids downstream but no occurrences of oligochaetes. Based on the list of known species that have high tolerance levels for pollution, the observed macroinvertebrate taxa reflect on the water quality at the lower part of the Baroro River which indicated slight to moderate levels of pollution. Hence, this study recommends for an in-depth and longer time frame of collections and analysis to come up with improved taxonomic descriptions of local taxa that would to provide for more appropriate classification systems that can effectively describe various categories of stream health and the prevailing influences of land-use activities.

GARCIA, JOSE NESTOR M.

Environmental Performance of Livestock Integration in an Upland Farming Community in Batangas -- 2006

Environmental performance of livestock integration in an upland farming community in Dela Paz Pulot Itaas was assessed in terms of its management, operational performance, and environmental condition. Formal and informal interviews of farmer respondents, field measurements, and computer simulation were used and data were analyzed at the household-community-levels. The small-scale crop-livestock systems have poor environmental performance owing to poor management and operational performance, and resulted to poor environmental condition. The poor management performance was attributed to the lack and weak implementation of existing environmental policies and programs, and poor farm management despite of farmers' high environmental awareness.

Operational requirement for feed materials and water was high, which resulted in excessive extraction of fodder from the forests and grasslands, heavy importation of commercial feeds, and utilization of springs for livestock use. Generation livestock manure and wastewater has likewise increased but not recycled in the farm lots. Poor environmental condition was attributed to a) the excessive extraction of fodder, which resulted in forest depletion, b) increase in generation of livestock manure and wastewater, which caused river pollution and health problems, c) increase in asthma cases in the community, which was attributed to malador of livestock wastes, d) utilization of springs for livestock use, which reduced the steam flow, reduction in water level of the river and consequently it's drying up, and e) drying up of the river during the dry season resulted to the disappearance of its aquatic organisms. The extent of the crop-livestock integration, which were more of a mixed but less integrated system, was influenced by households' and farm attributes, as well as institutional and policy factors.

Results of computer simulation indicated that the appropriate livestock mix is a combination of swine and cattle. This gave high income but minimized natural resource depletion and pollution loading. Environmental management strategies identified to improve environmental performance of small-scale crop=livestock integration include use of livestock manures as fertilizer for crops or as input to produce biogas for domestic use, and increase farmers' awareness on the economic implications and agro-ecological interactions between crop-livestock systems and the upland environment.

GARCIA, MHEDA G.

Forty Years of the Philippine Environmental Impact Statement System (PEISS): Measuring its Progress and Performance. -- 2019

This research evaluated the progress and performance of the Philippine Environmental Impact Statement System (PEISS) after 40 years of implementation from quantitative perspective. It focused on the four aspects of the system: EIA law and policy, EIA administration, EIA process, and EIA foundation. These aspects were analyzed using metric scale, statistics and interaction models. The approach was tested on 28 performance indicators rated by a sample of registered EIA practitioners in 2018.

The study also considered the quality of recent environmental impact statements (EISs) to gauge the PEISS performance, particularly the EIA process aspect. Four sets of quality standards: project and environment description; impact identification and evaluation; alternatives and impact mitigation; and communication of results, were applied to 10 EISs of newly approved large-scale mining projects.

More than half of the indicators (54 %) received ‘neutral’ responses, indicating that the respondents were neither satisfied nor dissatisfied with the performance of these items. The rest of the indicators had

'satisfied' responses. Six indicators had high coefficient of variation (≥30 %). These were timeframe for securing environmental compliance certificate, role of local government units in EIA process, role of government agencies in EIA process, level of coordination of the EMB with other agencies, requirement to consider alternatives, and training and capacity building on EIA. This indicates that the respondents had a wide difference of opinion with respect to the performance of these items.

The study also found that interaction is a promising metric in identifying emergent behavior of the PEISS. Results of regression analyses found 5 significant interactions between policy and administration, and 7 interactions between policy and EIA process. Meanwhile, 4 significant interactions were found between EIA process and administration, and 3 interactions between foundation and administration. However, there was no significant interaction found between foundation and EIA process as well as between foundation and policy. This finding was also manifested in the quality of EIA reports reviewed. The EISs of mining projects did not fully meet all the key standards set out for EIS quality. Scientific or core components of the reports, particularly alternatives, and impact identification and evaluation, appeared to be problematic.

The study recommends that the EIA foundation should be strengthened to boost the overall performance of the PEISS. It would entail EIA science improvement, training and capacity building on state-of-the-art approaches on EIA, and contribution of expertise to inspire innovative programs to improve the EIA process. Strategic investment is also necessary to advance science, technology and innovation as the foundation of the PEISS in particular, and sustainable development in general.

The study also recommends that the PEISS performance should be tracked and monitored to identify critical points where performance enhancement resources should be allocated. Metrics and indicators used in this study can be a useful tool for tracking performance and systematic benchmarking of the PEISS over time. The approach should be tested for different PEISS stakeholders with more data to corroborate the findings of this study.

GOMEZ, ROMEO A.

Environmental management of the Ifugao rice terraces in Kiangan and Banaue, Philippines -- 2003

The world famous Ifugao Rice Terraces in the province of Ifugao, Philippines has been declared by UNESCO as a "World Heritage Site" in 1995. However, it has been reported that its physical condition is fast deteriorating. To gain an understanding of this problem, a comparative study was undertaken on how the Rice Terraces is being managed in two sites with different levels of degradations.

The two heritage sites selected were Barangay Bocos in Banaue which is the more degraded area and Barangay Nagacadan in Kiangan, less degraded area. Primary and secondary data on the bio-physical and socio-economic conditions of the Rice Terraces were gathered to shed light on the degradation and determine the factors which may influence this process.

The results of the study established that the Rice Terraces were in fact being degraded. This process was not limited alone to the destruction of terrace dikes, but also extended to changes in the chemical properties of the soil, as well as the social and economic values of the terraces. The destruction of dikes in Bocos were nine times higher than in Nagacadan. Since the catchment or muyung of the terraces in both sites were still in good condition, water and nutrient flow toward the rice terraces remained normal. The primary destructive agent was perceived to be an extraordinary species of earthworm, although insects like crickets and ants may have also contributed to some extent.

The earthworm, which is much longer than the ordinary earthworm species, burrows in dikes and exists in higher population density in Bocos than in Nagacadan. In Bocos, the soil is moderately acidic and contains much higher organic matter -- the two conditions favorable to earthworms. In contrast, the soil in Nagacadan is strongly acidic and the organic matter is lower - conditions which were not favorable to earthworms. These soil conditions may have been brought about by the change in land use. Nagacadan farmers, responding to government policies promoting crop diversification and programs of other agencies like CECAP, introduced high-yielding varieties of rice (HYVs) vegetable crops, and extensively applied fertilizers and pesticides. These patches of HYVs and vegetable crop species on the landscape of the rice terraces may have degraded the aesthetic value of traditional rice in the Rice Terraces. On the other hand, Bocos farming remains traditional. The community has resisted modernizing their agriculture. As a result, the aesthetic value of the landscape is preserved, thus more tourists visit the place every year.

The effect of earthworms on dikes may be further aggravated by water supply, typhoons with strong rains, and the earthquake that occurred ten years ago, which may have destabilized the terrace slopes.

GUILLEN, ANITA S.

Sustainable Livelihoods Approach (SLA) in Assessing Mangrove Reforestation Projects in Padre Burgos, Quezon, Philippines -- 2006

Recognizing the importance of restoring the mangrove ecosystem in the marine environment, the Department of Environment and Natural Resources (DENR) in partnership with the Mirant Foundation and the local government unit of Padre Burgos, Quezon embarked on mangrove reforestation projects (MRPs). The sustainability of these MRPs was assessed using the Sustainable Livelihoods Approach (SLA) framework. Interviews of project beneficiaries and focus group discussions were conducted. Results showed that the sustainability of MRPs is hinged on the sustainability of the livelihood portfolios of the project beneficiaries. Resiliency of the livelihoods to shocks and stresses and the social capital in the community accounted 28 percent variation in the sustainability of MRPs. Further, it was found that the on-going fishery-related livelihood enhancement projects (e.g., mariculture) of the Department of Agriculture- Bureau of Fisheries and Aquatic Resources (DENR-BFAR). The role of LGU in the said link should be strengthened, considering their mandated jurisdiction and governance as provided in the Local Government Code of 1991.

GUILLERGAN, SAMSON NAZARENO J.

Ecological analysis of solid waste management in Boracay island, Philippines -- 2005

The study ecologically analyzed the solid waste management of Boracay island by assessing the stakeholders' knowledge and attitude on some selected parameters such as perception on the provisions of the national Ecological Solid Waste Management Act (ESWMA) and related ordinances of the concerned local government unit.

Stakeholders' knowledge about solid wastes is low and their solid waste management (SWM) practice requires improvement but their attitude on and perceptions toward laws and ordinances are satisfactory. Knowledge of and attitude towards solid waste, perceptions of the provisions of ESWMA and the Municipality of Malay solid waste management ordinances, and SWM practices significantly varied with the stakeholders' demographic, socio-economic, and job-related characteristics. Educational attainment has direct influence on the knowledge of solid wastes but household size has no influence on solid waste management practices.

The existing SWM (Scenario I) in Boracay is executed by collecting unsegregated solid waste and disposing them at the open dumpsite while the remaining uncollected were either self-disposed or illegally dumped anywhere. The unsanitary SWM practice of Scenario I is marked with environmental effects such as air pollution, water pollution, groundwater contamination, odor, unsightly environment, among others. Scenario II on the other hand, shall be executed by an efficient collection of solid wastes and an establishment of a state-of-the-art sanitary landfill (SLF) facility. The Scenario III is the overall ESWM implementation comprising of the facilities in Scenario II plus the Community's Materials Recovery Facility. With Scenario III over Scenario II are resource conservation, increased lifespan of SLF and reduced disposal costs.

The study recommends the enhancement of the level of knowledge of households and business establishments on SWM. Along this line, DENR shall conduct a trainer's training for the selda leaders and eco-officers of business establishments. The IEC campaign shall be coupled with strict implementation of RA 9003 in the area of waste segregation, composting and establishment of material recovery facilities in every barangay. Community participation is needed for the successful implementation of an ecological solid waste management program in Boracay island.

GUILLERMO, MAX P.

Community adaptation to the changing landscapes of Mt. Pinatubo in Central Luzon, Philippines -- 2003

The study sought to assess the temporal and spatial changes that had occurred in the landscape and lifescape of the lahar-covered areas of Central Luzon, Philippines specifically in terms of the vegetation and lahar characteristics, and the adaptive agricultural practices of the community. The study was conducted in three severely affected barangays of Tarlac Province namely : Brgy. Culubasa in Bamban, Brgy. Lilibangan in Concepcion and Brgy. Sta. Juliana in Capas.

Vegetation analysis was done using the Line Intercept Technique. Lahar samples were analyzed at the Bureau of Soil and Water Management. The results of the analyses were compared with the results of the previous studies in the sites. Key informant interview was used to gather socioeconomic variables and descriptive statistics were used to analyze the socioeconomic data. Thirty farmer - key informants were interviewed for the study. The adaptive agricultural strategies were evaluated in terms of productivity/profitability, number of farmers involved, farm size, length of utilization, enhancing

policy/program and stability. The landscape and lifescape dynamics were assessed using time line and trend analyses.

The vegetation changes in the dominance and composition in the study sites except for Brgy. Libibangan where Saccharum spontaneum remained as the dominant species. Imperata cylindrica became the dominant species in Brgy. Culubasa and Lantana camara dominated the sample plots in Brgy. Sta. Juliana in 2002. Both sites were dominated with Saccharum spontaneum in 1993. In terms of plant composition, five species (Phragmaetis vulgaris, Mikania micrantha, Typha latifolia, Euphorbia pilufera, and Solanum ferox) found growing in Brgy. Culubasa in 1993 were already absent in 2002. Another five new species, however (Stylosanthes guyanensis, Imperata cylindrica, Digitaria longiflora, Tridax procumbers and Cynodon dactylon) were observed in 2002. In Brgy. Lilibangan, four new plant species were found and three are no longer there. In Brgy. Sta. Juliana where an advancing succession was observed, there were seven new species found in 2002 and only one of those recorded in 1993 is now absent.

The texture of lahar had not changed, sand to sandy loam with very low water holding capacity. A very slight change in the chemical properties was likewise observed. Organic matter was consistently very low in all sites, although, it is improving in Brgy. Sta. Juliana where an advancing stage of plant succession was observed. Macro and micronutrients were deficient in all sites.

The major agricultural practices in the sites except for Brgy. Sta. Juliana where the farmers resorted to the uplands, were rice farming, sweet potato and sugarcane farming. Rice farming was not yet a stable crop production system in the lahar areas at the time of study. Nevertheless, yield from rice is slightly improving beginning 1996 when groundwater was tapped for irrigation. On the other hand, sweet potato was fond to be a viable farming practice of the farmers in the lahar-covered areas but the highly unstable market price of sweet potato tubers threatens it's stability. At the moment, leasing out the lahar-covered farms to the sugarcane producers is apparently the most economically viable adaptive strategy among farmers in all the study sites.

The study also revealed a different pattern of vegetation change and a similar pattern of change in the agricultural practices in all the study sites except for Brgy. Sta. Juliana where farming was shifted to the uplands. No relationship was noted on the changes in vegetation and agricultural practices. AA The factors that had influenced their adaptive strategies were rice farming experiences, need and food preferences, institutional support and market demand.

GUZMAN, JUNEL B.

A Geographic information systems-based decision support system for municipal solid waste management of Tuguegarao City, Philippines -- 2009

A Decision Support System (DSS) was developed to analyze and simulate the solid waste management system of Tuguegarao City using Geographic Information Systems and Stella modelling software. It was parameterized using data and information on population, per capita waste generation, average annual growth rates of population and solid waste composition in order to predict the volume of waste generated, compostable, recyclable, collected, uncollected waste and compost under five waste management system scenarios.

Tuguegarao City with a population of 67,207 for the urban barangay and 58,326 for the rural barangays generated a total of 1,012 m3 of household solid waste weekly in 2007, equivalent to a rate of 0.5 kg/cap/day and 0.42 kg/cap/day for urban and rural barangays, respectively. The commercial establishments, institutions and market generated at a rate of 384 m3, 209 m3 and 122 m3 of solid waste weekly or an equivalent total waste generation at a rate of 1,745m3/wk.

The weekly solid waste composition was : 279 m3(16%) paper, 105m3 (6%) plastic container, 70 m3 (4%) metal, 70m3 (4%) glass and 279m3 (16%) as recyclable waste, yard waste, 506 m3 (29%) food waste, 122 m3 (7%) other organics as compostable waste, 209 m3 (12%) other plastics, 70 m3 (4%) inert, 17m3 (1%) hazardous waste and 17 m3 (1%) special waste as residual waste.

The DSS was used to search for best waste management options among five scenarios. A decision to continue the existing practice of solid waste management over time (Scenario A) could result to high volume of uncollected waste from 333 m3/wk to 401 m3/wk by 2015 and low recovery of compostable and recyclable waste from 92 m3/wk and 171 m3/wk, respectively. The collection system can be improved through reassigning garbage trucks collection zones (Scenario B) reducing uncollected waste from 333 m3/wk to 82 m3/wk by year 2015. The low recovery can be addressed by composting market waste (Scenario C) resulting to waste conversion from 92m3/wk to 237 m3/wk by year 2015 and by recycling institutional waste (Scenario D0 resulting to waste recovery from 171 m3/wk to 225 m3/wk by year 2015. Processing all generated waste (Scenario E) can recover waste from 92 m3/wk to 1002 m3/wk of compostable and 171 m3/wk to 617 m3?wk of recyclables by year 2015, and zero uncollected waste by year 2011.

To address the environmentally unacceptable burning and disposal of voluminous waste, solid waste management option for the city, Scenario E is recommended, provided that generators in all sectors

will cooperate, there will be re-assignments of garbage truck collection zones, and adequate composting facilities will be made available.

HE, PENGBO

Impact Assessment of Bacillus amyloliquefaciens B9601-Y2 on Soil Properties and Microbial Diversities and Farmer Adoption in Yunnan, China. -- 2019

Phosphogypsum (PG) is a waste by-product derived from the processing of phosphate rock using “wet acid method” of fertilizer production which currently accounts for over 90% of phosphoric acid production. Chemical fertilizers, including phosphate fertilizers, are considered essential components of agricultural activities that increase crop production and improve properties of nutrient-deficient lands. Bacillus sp. as a group offers several advantages over fluorescent pseudomonads and other Gram-negative bacteria as seed inoculants for protection against root pathogens.

B. amyloliquefaciens B9601-Y2 is a plant-associated species of Bacillus having unique gene clusters responsible for the synthesis of antibacterial polyketides, difficidin and macrolactin. It is a typical feature of all representatives of the subspecies “plantarum”. Combined with fertilizers, B9601-Y2 has shown to significantly promote plant growth. It has been reported to have a strong antagonistic activity against many common phytopathogenic fungi and bacteria, and could promote growth of a number of crops, as well as increase their yield. This paper aimed to solve the environmental problem caused by PG pollution, with the additional function of B9601-Y2 to help corn growth. N, P, K of the soil before and after corn cropping were tested; microorganisms diversity changes including bacteria and fungi were discussed by community structural components, PCA, and heatmap. The study results revealed that Y2 can significantly downgrade total soil N, P, K into available N, P, K that can be absorbed by corn. Moreover, micro-organisms community showed no significant changes among Y2 and non-Y2 treatments. This shows that Y2 does not adversely affect the microbial community. Surveys showed that all farmer-respondents accepted and were greatly satisfied with the fertilizer functions with Y2 because it can greatly reduce their annual production expenses and at the same time increase their crop production. All farmer-respondents strongly agreed to adopt fertilizer functions with Y2 for future utilization on their farms.

HILVANO, NOBA F.

The After-Effects of Typhoon Haiyan *a.k.a.* Yolanda: 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.

HTEIN, WIN

Assessment of Adaptive Responses and Adaptive Capacity of Rubber Farming Households to Climate Variability in Mudon Township, Mon State, Myanmar. -- 2017

Climate variability impacts on the livelihood systems of rubber farming households when comprehensive study on the adaptive capacity of rubber farming households is lacking. The study assessed adaptive responses and capacity of rubber farming households to climate variability in Mudon Township, Mon State, Myanmar.

Data were gathered through household interview using structured questionnaire with 228 respondents, complemented by Key Informant Interview (KII), Focus Group Discussion (FGD) and field observation in the selected five villages. The study assessed seven capital resources -human, social, natural, infrastructure, technology, institution and financial to become final Human Adaptive Capacity Index

(HACI). Adaptive capacity indicators were normalized using min-max approach and weighted by factor analysis to accept the indicators which are equal to, and higher than 0.5 factor loading value. Data were analysed statistically using percentage, correlation coefficient of variation, paired sample t-test, and one-way ANOVA.

The study results showed that 75% and 78% of the respondents from selected areas had experiences about rainfall variability and extreme temperature from 20 years ago. There were slight changes in climatic trends from the past and, the projection shows that precipitation pattern is likely to change, with temperature likely to rise in 2020s, and 2050s. This means that the study area will be more vulnerable to climate variability in the future. The study found that the rubber farming households have ways of adaption such as changes of planting time, practice of mulching, changes of tapping time, closing farms during summer, to respond to adverse impacts of climate-related events. However, the study revealed that majority of respondents (84%) has low level of capacity to adapt to climate hazards. The capacities of rubber farming communities are very limited in the case of institution capital (0.086) while the infrastructure capital index (0.513) showed the highest value among the seven capital resources. Households' adaptive capacity indices were validated by using respondents rating approach. Land holding sizes have positive significant effect on household adaptive capacity at 1% level. Selection of rubber market channel and existing rubber production system influences the households' adaptive capacity at 1% level of significance. To enhance the adaptive capacity of rubber farming households, policy implications are recommended in order to reduce the vulnerability to climate hazard effects and achieve sustainable rubber production.

IDAGO, RODELIO G.

Agricultural Tramline Systems in the Farming Uplands of Benguet, Cordillera: Shifting Land Use and Agricultural Sustainability – 2019

The study is an assessment of the impact of agricultural tramline systems in the farming uplands of Benguet, Cordillera. A tramline is a mechanical conveyance system, similar to the principle of a cable car, utilized as a transport facility of agricultural products in the remote farming uplands. Measuring the changes and effects attributable to the establishment of tramline was done by comparing the "with" versus "without" situation. Changes in land use over time were established by assessing the land use change between 2008 and 2018. The study used survey and key informants interview to obtain primary data on socioeconomic, farm characteristics and land use allocations. Data was analysed using combinations of statistical analyses, financial and economic analyses and soil chemical analyses for soil samples obtained from farms with and without tramline. The result revealed that provision of tramline system causes a shift in land use. The system stimulates agricultural land use intensification. These changes have profound influence on the agricultural sustainability of the area. Disaggregated into social, economic and environmental dimensions, each aspect was examined. The facility has a positive impact on the social aspect as it improves the working condition on-farm by eliminating the drudgery from manual hauling, improvement in farmer's productivity and increase in farmer's income. Likewise, it has a positive effect on the economic aspect due to the benefits generated from increase in yield, reduced losses and labor and time savings that outweighs the economic costs of the facility establishment and its operation. The economic soundness is reflected by the result of the cost-benefit analysis that yielded a positive NPV and an ERR higher than hurdle rate. While land use intensification has a neutral effect on soil chemical properties, the latter promotes opening up of adjacent forest land as evidenced by the increase in agricultural land and reduction in forest area. This presents environmental problem in the form of soil erosion and reduction in water yield. On the other hand, mitigation measures were identified. Limitations on the environmental aspect should be addressed as it has a feedback and profound influence on the two aspects of sustainability. Only by striking a balance among the social, economic and environmental aspects would tramline promote agricultural sustainability in the farming uplands of Benguet, Cordillera.

IMRAN, MUHARAM ADE

Evaluating the Management Effectiveness of Marine Protected Areas (MPAs) in Thousand Islands, Indonesia. – 2013.

Evaluating the management effectiveness of Marine Protected Areas (MPAs) has been a continuing challenge in marine conservation in the era. The establishment of MPAs in Thousand Islands has three main objectives that are representatives of the various biophysical, socioeconomic and governance indicators that may directly or indirectly influence the overall management performance of MPAs. The main objective of the study was to evaluate the management effectiveness of MPAs at Thousand Islands, Indonesia. Specifically, the study was conducted to: 1) Evaluate the management level of Thousand Islands MPAs; 2) Evaluate the conservation effect of Thousand Islands MPAs; 3) Evaluate the management level in the achievement of

biophysical, socioeconomic and governance objectives of Thousand Islands MPAs; and 4) Formulate and recommend alternative programs for improving the management effectiveness of Thousand Islands MPAs.

The study used methods from the International Union for Conservation of Nature (IUCN) guidebook as well as procedures developed for the MPAs in Indonesia. In recognition of this need, the study used the scorecard method that contained a set of 70 questions, such are 11 questions for biophysical, 12 questions for socioeconomic indicators, and 47 questions for governance indicators. The evaluation was participatory processes that involved several stakeholders such are the local people that have various activities that include fishing, aquaculture, tourist service and also village officials as part of local governments.

The results of the study showed that the management level of Thousand Islands MPAs as a whole is Level 1 or initiated level, because all scores in each level (1-5) were less than 75%, while the result of conservation effect rating was 72.85% or included in the Rating 3. These results showed that although the management level was initiated, the establishments of Thousand Islands MPAs have been giving the positive impact to the conservation of biodiversity of habitat. In addition, the management level of biophysical indicator was 83.12%, socioeconomic indicator was 56.72% and governance indicator was 58.90%. This result showed that the implementation activities, output and outcome of biophysical indicator were more effective than governance and socioeconomic indicators. In general, the study indicated several factors that may cause low levels as the weakness factors of management in the Thousand Islands MPAs, including: 1) lack of adequate socioeconomic monitoring and evaluation to provide data and analysis of socioeconomic aspect; 2) lack of management plans; 3) lack of zoning plans; 4) inadequate regulations to control violation-related activities in MPAs; and 5) lack of communities involvement. Some activities are already well underway as the strength factors but as indicated by the study, the following needs to be improved: 1) monitoring and evaluation of biophysical aspects, 2) education, training and capacity-building; 3). existence of management body; and 4) increased levels of allocation of funds and resources for MPA management. So, based on the study, the following management interventions to improve MPA management effectiveness in the Thousand Islands are necessary : 1) Improve the regular biophysical monitoring through collaborative survey with stakeholders and local communities; 2) Immediately implement monitoring and evaluation of the socioeconomic aspects of local communities so that the effects of the MPAs establishment to the socioeconomic conditions of the local community would be known; 3) Immediately generate and validate the comprehensive management plan and zoning plan; 4) Immediately produce regulations at the local level of MPAs; and 5) Increase the involvement of stakeholders and local communities in the planning and implementation activities associated with MPAs.

KAGAOAN, CARMENCITA V.

Carrying capacity for ecotourism of wildlife sanctuary Taganak, Turtle islands, Philippines. -- 2004

A modified methodology for determining ecotourism carrying capacity for a wildlife sanctuary was developed and applied to Taganak, Turtle Islands. This modified methodology incorporates the economic, social and physical requirements of both the host community and future visitors, as well as, the Island's existing marine turtle population. Assessment of the island's existing resources and resource users: analysis of the resource allocation, and linkages among resource users; mapping of potential ecotourism zones and calculation of ecotourism zones' carrying capacities were conducted. Finally, determination of the number of visitors that may be supported without affecting the environmental and social integrity of the area was done.

The effective carrying capacity for ecotourism of Taganak Island is approximately 72 visitors per day in its 130 hectares area or about 1 person per 1.8 hectare. The low carrying capacity was due to the limited area for constructing accommodation facilities, freshwater availability and low nesting marine turtle population, a major tourist attraction of the island. As a precautionary measure, detailed assessment of freshwater supply is also recommended. As long as pursued within sustainable limits, ecotourism will benefit the community through additional incomes for the people and increased municipal revenues. Marine turtle conservation is also expected to benefit from ecotourism.

KHAERUDDIN, ISMET

Land use changes and biodiversity conservation in Lore Lindu National Park, Central Sulawesi, Indonesia -- 2005

The study was conducted at Lore Lindu National Park, Central Sulawesi, Indonesia from February 2001 to April 2002 for field survey, and July to August 2003 for GIS analysis. Factors affecting land use changes at the individual family and village factor levels of the 15 buffer zone villages associated with four major vegetation types, namely lowland, monsoon, lower montane, and anthropogenic of Lore Lindu National Park was examined. This study aimed to determine the dominant driving factors for land use change from natural forest to non-forest, and its implications on biodiversity. Village surveys were conducted

to gather individual family data ie. family size, educational attainment, agricultural land possession in the village, agricultural income, ranger activity and agricultural land inside the National Park areas, using semi-structured interview. General village information included population, migration, distance to the city, and ground check for potential agricultural land in the village through key informant interviews and direct field observation. Forest monitoring with a transect of 50 m apart and length up to 1,300 meter was established for each village. The number of trees with 50 cm dbh, trees with 20-50 cm dbh, rattan clumps with stem 8 m, rattan stumps, and vegetation types were used as proxy for biodiversity status.

Stepwise multiple regression analysis was used to determine the dominant factors of land use changes at the individual family and village levels. Individual or a combination of the nine driving variables, namely population, family size, educational attainment, number of migrant families, ranger activity, agricultural land possession, agricultural income, potential agricultural land in the village, and road distance to the city were tested. Pearson correlation analysis was used to determine the relationships between land use change and biodiversity status. Net present value of the natural forest and non-forest land uses were computed in the benefit and cost analysis. The dominant factors for land use change at the village level were migrants and education, and agricultural land possession at the individual family level. Hence, changes in forest structure resulted to a negative effect on biodiversity status. The net present value (NPV) of land use change from natural forest to non-forest was negative. This implies that the area should be better retained as a natural forest. Collaborative management with appropriate zonation implementation is one feasible solution to long-term biodiversity conservation in Lore Lindu National Park.

LACANDULA, LAARNI B.

Effects of Banana Plantations on Streamflow and Farmers' Income in Lantapan, Bukidnon, Philippines. – 2007

The influence of banana plantations in Lantapan, Bukidnon was examined in terms of its effects on: (i) the availability and quantity of water from natural resources through analyzing the stream flow; and (ii) farmers with different landholdings in terms of income, labor shift, expenditures, recreation patterns and women roles. It explored the implications of the results of the study on the regulation and effective management of the development of banana plantation and at the same time, help local quantitative and descriptive research technique was employed. Gathering of secondary data and information; actual stream flow was measured through digital current meter technique; and sets of questions on semi-structured interview schedule were used in KII and FGD. Statistical tool employed were T-tests, Chi-square, and Pearson-Product Moment Correlation Technique.

Results showed that stream flow was significantly affected by the establishment of banana plantation in the study site. Areas without banana had the highest average stream flow of 0.917 cu m/sec and lowest value of 0.144 cu m/sec, with an average 0.377 cu m/sec. With banana plantations, the highest average stream flow was 0.090 and lowest of 0.042 cu m/sec, and average of 0.071 cu m/sec. T-test showed significant difference between the two land uses at 5% probability level with the mean difference of 0.305 compared to t-value of 0.046*.

On the other hand, the income of farmers who leased their lands to the company are significantly increased by the banana plantations in terms of benefits derived by farmers who leased their lands to Banana Corporation compared with those who did not. Farmers' income and related attributes before and during banana plantation were analyzed using STATISTICA software program. T-test showed significant difference at 99% level with the mean income of P124, 039 before the banana plantation and Php 184,619 during the banana plantation. Finally, the banana plantation has significantly influenced the labor profile and women' responsibilities of those who leased their lands. There is gradual shift of livelihood n the locality, from growing crops to becoming laborers and employees in the banana plantation. Women changed from nurturing children, attending to husband's needs and helping in backyard farming, - into fixed earners in the banana company.

The increased water harvesting from the watershed requires a serious look at the capacity of the watershed to generate sufficient supply of water sustainable into the future. The significant effects on income with the advent of banana plantation that changes in livelihood and lifestyle of the community must be further examined. All stakeholders and policy makers must be vigilant and do appropriate actions in terms of economic, social, cultural, political, institutional, and environmental concerns.

LARONA, MARIA VICTORIA L.

Alternative social arrangements and agricultural landscape for large scale mechanization in corn production areas in Isabela, Philippines -- 2006

The study analyzed the alternative social arrangements and physical transformation of the agricultural landscape for implementing land clustering and large-scale mechanization. There were 75

randomly selected respondents, composed of 60 and 15 farmers of clustered and non-clustered farms, respectively from three (3) barangays of Cauayan City, Isabela.

The alternative social arrangements for clustering and large-scale mechanization were the stakeholders' participation; information dissemination for farmers' project awareness and understanding; involvement in cooperative activities; arrangements on boundaries, synchronized farm operations, use of farm inputs; and marketing and inputs arrangements. The physical transformation of the agricultural landscape were the setting size of clusters and the corresponding number of farmers; removal of farm boundaries, and movement of legal property markings for efficient use of farm machines; and widening farm trails for farm roads. The alternative social arrangements and the physical transformation of the agricultural landscape made land clustering and large-scale mechanization economically viable.

The significant variables that influenced farmers' participation in clustering project were age and years in farming: involvement in cooperative initiatives; information/awareness about the project, opportunity provided to understand project, and farm size. Larger farms were more likely to join clustering and custom services.

Significant impacts of land clustering with custom services in comparison with non-cluster farmers were : a) higher corn production per hectare due to better tillage and precise application of inputs, increase in number of corn plant population with the use of planter and the removal of farm boundaries; b) reduction of production cost per hectare due to lower input expenses; and c) increase in income per hectare. At 12 percent interest rate, benefit cost analysis showed that project on clustering and custom services for land preparation and planting was economically viable. The environmental impacts as observed by farmers focused on increase in corn population, increase in area for corn planting, reduction of weeds, and improvement of soil fertility.

Constraints encountered in clustering project were farmers' reluctance to remove boundaries and non-movement of legal property markings due to apprehension on property delineations; limited farmer-clients of planting and harvesting custom services, farmers' different preferences in use of inputs, and labor displacement. Farmers were ambivalent or undecided on the provisions of land consolidation because of the lack of understanding and information on its strategies and benefits.

The project of clustering should implement intensive participatory approaches to increase farmers' awareness of the project benefits and to encourage participation. Labor displacement should be addressed through the establishment of alternative income opportunities for farm laborers.

LIMATES, VILMA G.

Coastal water dynamics in relation to governance of mangrove swamps in Boracay island, Malay, Aklan, Philippines. 2013

A comprehensive assessment of the coastal water quality of Boracay Island was conducted. The assessment linked the social system through investigation of the knowledge, attitude and perception (KAP) of the resource users about the mangrove functions and its governance to the present status of the mangroves' capability to filter and assimilate nutrients loaded to it coming from anthropogenic activities. This capability was manifested on the quality of the coastal waters of the Island. Water quality was evaluated using physical, chemical and biological parameters.

This investigation showed that at present the Long Beach and Puka Beach where most of the tourists visit and enjoy still have good water quality. The indicators are year-round high dissolved oxygen level, low biochemical oxygen demand and phytoplankton community structure dominated by diatoms. The mangrove swamp connected to it has about 50 percent cover and still able to perform its purification function. However, two sites on the Island, Dead Forest and Lugotan Cove, have poor water quality with pathogenic bacteria present. The Dead Forest has only 10 percent mangrove forest cover and is the catch basin of waste waters from most of the restaurants, public market and households in the area. Lugotan Cove receives nutrients from the Dead Forest and the sewage outfall from residences and resorts not connected with the sewerage treatment plant of the Island. This cove has low water movement and therefore the flushing effect of waves has minimal effect. Its sea grass community showed heavy siltation and low net primary productivity. The sites in between the two mangrove swamps investigated have fair water quality.

Overall status of coastal water of the Island is still good as shown by the phytoplankton community structure. The autotroph components of the ecosystem are still capable of assimilating the high nutrient inputs to the coastal water. However, there are signs that the system is at its ecological threshold and already at its carrying capacity. The present status of these different sites is related to the knowledge, attitudes and perception of the resource users and the system of governance of the local government unit and DENR. The resource users in the sites with good water quality have higher and better attitude and appreciation of the ecological services of the mangrove subsystem. The users from sites where the water quality is poor perceived only the material benefits they can get from mangroves rather than the ecological services that it can provide.

There is a need to address the problems cited through improvement of governance and enhancement of resource users' KAP towards mangroves. This is very imperative for Boracay Island to maintain its top beach status as the tourist destination of the world.

LINAN, EFREN L.

Tourism Development Impacts on Groundwater Quality through GIS-Based Vulnerability Analysis in Boracay Island, Malay, Aklan, Philippines. – 2020

Boracay Island in Malay, Aklan, Philippines is famous for its powdery white sand beaches and crystalline waters, hence there is swelling of population and tourist's influx into the island every year. However, the environmental and health consequences of coastal tourism are often unexpected and will become severe when taken for granted. Hence, this study was done to assess the status of the groundwater resource of Boracay island. Groundwater quality analysis and Vulnerability Assessment of contamination were performed to: 1) provide a background information on the status and quality of groundwater resource; 2) present a concrete and scientific explanation on the possible areas which need rehabilitation and protection; and 3) develop a vulnerability index of groundwater resources. Several components of assessment were undertaken such as groundwater quality analysis, vulnerability assessment and analysis of the multistakeholder's perception on the value groundwater resource in relation to coastal tourism industry. Results of the water quality analysis showed that the groundwater resource in Boracay Island is unsafe since it is contaminated with coliform, nitrate and phosphate. Therefore, the impacts on the shallow groundwater will have corresponding downstream impact on the coastal resources which are very important in maintaining the Coastal Tourism in the island. Degradation of groundwater with bacteriological contamination, nutrient loading and other pollutants will result to the degradation of the water quality of the coastal waters of Boracay which is the most important tourism asset of the Philippines. A total of 562.37 (56%) hectares in all three barangays of Boracay Island are highly vulnerable and 410.28 (41%) hectares were moderately vulnerable to contamination. About 30.95 (3%) hectares were considered very highly vulnerable areas. Results of the overlay showed that most of the existing wells used by the local people either for drinking, washing and other domestic chores were in highly vulnerable areas. Survey results statistically analyzed revealed that bio-chemical condition of groundwater in places with younger residents were found to have higher levels of chloride and phosphate, higher total coliform (MPN/100 ml) and fecal coliform (MPN/100 ml), Knowledge on 1) the nature of groundwater quality problems in the locality; 2) the person who monitors the standards; 3) the groundwater resource in their locality which suffer from groundwater quality or salinization problem were significantly associated with the biochemical condition of the groundwater

LLEVA, EMMANUEL M.

Environmental impacts of mossy forest conversion into vegetable farms in Tinoc, Ifugao, Philippines -- 2003

This study was conducted to determine the environmental impact of mossy forest conversion into vegetable farms with the specific objective of looking at the costs associated with the activity in terms of its benefits to the farmers and the indirect effects on the environment. Watershed assessment, forest inventory, soil analysis, soil loss modelling, economic valuation for nutrients lost, financial analysis of vegetable farms and fuel consumption requirements were measured and quantified.

Vegetable farming provides high financial returns from the sale of cabbages, carrots and sweet peas at PhP 11,650; 22,200 and 90,190 per hectare per cropping season respectively. The utilization benefits of the community from the mossy forest include medicines, bio-pesticides, household use, water supply and many others. The costs of bulldozing the mossy forests from topsoil loss through nutrient replacement using inorganic fertilizers is PhP 406,410.19 based on 2003 prices. The predicted total soil erosion due to steep slopes and decreasing forest cover is estimated at 37,230 tons per hectare per year for all the slope classes in the municipality. The quantified watershed function of the mossy forest in the irrigation of the vegetable farms using diesel pumps is estimated at PhP 4,086.74 of fuel necessary to irrigate one hectare.

The study recommends that the remaining mossy forests of Tinoc should be preserved. Bulldozing should be banned and only the open and stable grasslands should be used for vegetable farming.

LOMBOY, JOBERT G.

Assessing the Role of Social Capital in Reducing Vulnerability to Climate-Related Hazards in Alabat, Quezon, Philippines. -- 2016

Threats from changing climate increases the vulnerability of society and environment. Social capital is a critical factor in disaster resilience because the communities have to adapt, learn, and reorganize after a disaster. Understanding social capital and investing on it can strengthen the society's resiliency to any perturbations. Thus, this study was conducted to assess the social capital and its role in reducing the vulnerability to climate hazard of the island municipality of Alabat, Quezon, Philippines. Social capital was assessed using seven indicators, namely, Group and Network (GN), Trust and Solidarity (TS), Collective Action and Cooperation (CAC), Information and Communication (IC), Social Cohesion and Inclusion (SCIn), Peace and Order (PO), and Empowerment and Political Action (EPA) with a total of 37 variables using index approach to assess quantitatively and qualitatively the social capital. Vulnerability from climate- related hazard follows the IPCC framework with its Sensitivity (health, water, and housing), Exposure (typhoon, rainfall, temperature, sea level rise, and elevation) and Adaptive Capacity (social capital) with a total of 37 variables. Principal Component Analysis was ran to determine weight loading for each of the variable. The adaptive capacity (social capital) was statistically assessed suing correlation to determine association with vulnerability.

LOVINA, DARLENE P.

Assessment of Resilience in Tropical Ecosystems Using a Socio-ecological Approach: A Case Focusing on Avifauna in Mount Makiling Forest Reserve, Laguna, Philippines.—2022.

Mount Makiling Forest Reserve is a socio-ecological system (SES) that has the capacity to resist, recover and adjust to changes driven by natural and anthropogenic perturbations. This study aimed to assess the resilience of the protected area and is divided into five parts (a) bird assemblages in habitat types along the elevation gradient, (b) ectoparasites of canopy birds, (c) climate change vulnerability of birds, (d) environmental knowledge, attitude, and perception and (e) socio-ecological resilience. A combination of ecological survey, secondary data analysis, and social surveys was employed for data collection. Eighty-seven bird species were accounted from transect and mist-net methods on forest and agroforest with a varying pattern of diversity influenced by environmental factors. Feeding guilds indicating functional diversity were observed in all habitat types along the elevational gradient. The stable ecosystem enables host-parasite interaction. Lice, mites, and fly were collected from captured canopy birds that were dust ruffled with insecticide. A trait-based approach using climatic projections up to 2050 revealed bird's
moderate to high vulnerability to climate change is primarily due to differences in sensitivity, adaptive capacity, and other stressors. On the other hand, the online and faceto- face survey results using Likert-scaled statements showed that stakeholders of MMFR have high knowledge of basic ecological concepts, a positive attitude on conservation actions, and a high perception of environmental concerns and ecosystem services. The survey of key informants from Barangay Bagong Silang generated a high overall resilience score using ecological, agricultural, and social indicators. Diversity, connectivity, and adaptive capacity of SES, under the leadership of UPLB with the proper use and management of natural resources by stakeholders increase the resiliency and the availability of ecosystem services towards sustainability of MMFR.

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 analysed. 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.

MADRIGAL, ALEXANDER R.

Evaluation of material recovery facilities for solid waste management programs of selected local government units in Batangas and Cavite Provinces, Philippines -- 2006

After the enactment of RA 9003 in January 2001, also known as the Ecological Solid Waste Management (ESWM) Act, Local Government Units (LGUs) Abruptly established 672 MRFs (Material Recovery Facilities) without adequate knowledge and guidelines on sustainability of its operation. With the lack of a comprehensive understanding of the essential strategies and elements of a sustainable (MRF) operation, LGUs are confronted with a challenge on how to optimize its resources and to utilize MRFs in enhancing ESWM programs.

Material balance of waste generation, key informants and focus group interviews, structured survey and financial analysis of each MRF were done. Analysis of the operational performance of 36 MRFs in the provinces of Batangas and Cavite in terms of strategies for enforcement, equity education, environmental organization, and engineering was undertaken to identify essential elements and develop evaluation criteria to guide the establishment and operation of MRFs.

Most of the LGU-managed MRFs were not sustained after a year of operation. MRFs managed by association, women and church groups had committed ecological organization adequate resources, and effective ecological governance to sustain their operation.

All operational MRFs decreased in collection and sale of recyclable waste on the second year due to competition with curbside/push cart waste buyer. Only St. Joseph Parish MRF obtained positive financial return. Collection of user fee significantly improved the MRFs financial capability. This study noted the basic features of a sustainable MRF.

MAKMUR, ABDUL

Environmental performance of selected oil palm agroindustrial estates in West Sumatera and Banten Provinces, Indonesia -- 2002

The environmental performance indicators for resource use, environmental emissions, and environmental interactions with the ecosystem were used to evaluate the environmental performance of the processing center and plantations of Nucleus Estate and Smallholders (NES) Ophir and South Banten oil palm agroindustrial estates in the Republic of Indonesia. The crude palm oil (CPO) and palm kernel (PK) content of the fresh fruit bunches (FFBs) and free fatty acid (FFA) content of CPO are material use environmental performance indicators which reflected the quality of the produced nuts from the plantations and processing efficiency of the processing center. The processing center of the NES-Ophir oil palm agroindustrial estate had higher environmental performance than that of the NES-South Banten agroindustrial estate. In 1985-2000, the former had a mean annual production of 19.4 tons FFBs/ha/yr with 22.4 percent CPO, 4.04 percent PK and CPO had 3.44 percent FFA. However, NES-South Banten produced 5.6 tons FFBs/ha/yr with 14.64 percent CPO, and 2.50 percent PK and CPO had 4.92 percent FFA.In 1996-2000, NES-Ophir had higher water (1.06 cu.m./ton FFBs), fuel (1.18 li diesel fuel/ton FFBs) and lubricant (0.02 li/ton FFBs) use efficiency than NES-South Banten's (1.16 cu.m. of water/ton FFBs, 3.49 li diesel fuel/ton FFBs, and 0.07 li lubricant/ton FFBs). However, NES-Ophir had lower energy use efficiency (14.7 kW/ton FFBs) than NES-South Banten's (12.6 kW/ton FFBs).

They generated almost the same amount of solid waste per ton FFBs but their treated wastewater did not meet the BOD and COD regulatory standards of the Republic of Indonesia in 2000. Empty fruit bunches (EFBs) were incinerated in NES-Ophir but were used as mulch in NES-South Banten since 1997 and this reduced air pollution. Both used the fiber and the nutshell as boiler fuel. The ash from the boiler fuel and incinerator was partly used as fertilizer material in the plantations of NES-Ophir. There were no complaints from the nearby community on the impacts of processing center on air quality and water quality of the river, which serves as sink of treated wastewater. The former generated more jobs and small enterprises related to NES development than the latter. Improvement of the environmental health and safety program is needed in the NES-Ophir processing center. The processing center of NES-Ophir had higher

environmental performance than NES-South Banten's.NES-Ophir plantation had higher farm resource use efficiency and product value than NES-South Banten's with balance fertilization, integrated pest management, soil conservation, use of dried leafstems as mulch and favorable rainfall distribution and land qualities. The smallholders of the former had 100 percent loan repayment while those of the latter only had 42.7%.

The operational management performance of the nucleus estate and smallholder's plantations of NES-Ophir is higher than NES-South Banten's. The mean production of the sample farms in NES-South Banten was 7.9 tons FFBs/ha which was about one-half of NEs-Ophir's.The use of by-products from the processing center in the plantations needs to be improved. The use of empty bunches as mulch instead of being incinerated should be promoted both in the plantations of the nuceleus estate and smallholders. Other potential uses of by-products of the processing plant in the plantations should be studies to improve nut production and quality. The overall rating of the environmental performance of NES-Ophir was higher than that of NES-South Banten. The environmental performance indicators used in this study can be used in the environmental audit of oil palm agroindustrial estates.

MALAKI, ARCHIEBALD B.

Landscape pattern impacts on the population density and distribution of Cebu Black Shama Copsychus cebuensis Steere in Argao Watershed Reserve (AWR) in Argao, Cebu, Philippines. 2013

This study determined the impacts of landscape pattern on population density and distribution of *Copsychus cebuensis* within Argao Watershed Reserve (AWR), a high conservation priority area located in Cebu, Philippines. Specifically, this study sought to identify the area distribution of different landscape elements constituting AWR; analyze the landscape pattern in AWR at landscape and class levels; and determine the relationship between landscape variables and population density and distribution of *C. cebuensis.*

Three land use/land cover classes were identified within the AWR area, namely: a) cultivated areas (45 percent); b) forest lands (40 percent); and c) build-up areas (15 percent).The estimated population density of *C. cebuensis* in mixed strata was 52 individuals per hectare; while it was 53 individuals per hectare in natural strata. There were four forest habitat patches of varying conditions remain in the watershed area. Results showed that patches at class and landscape level had increasing patch shape complexity and irregularity, as well as were highly fragmented with increasing degree of landscape heterogeneity.

In regression analysis with 25 and 10 explanatory variables used to predict the behavior of the population density of *C. cebuensis* (response variables) both at the landscape and sampling site level. There are only three out of 25 and four out of 11 have able to predict or explain the behavior of the population density of *C. cebuensis* at the landscape and sampling site level. The predictors which are highly significant at the landscape level include the following, a) relatively humidity (RH), b) tree basal area (TBA), and c) canopy cover (TCPY). Whereas, four predictors are found to be significant at the sampling site namely, a) elevation, b) slope, c) canopy cover, and d) shrub cover. However, at landscape level regression analysis shows that the final model (adjusted $R2=0.345, F22,107=4.093$, $p<0.000$) accounts for about 34.5 percent but only (adjusted $R2=.212$; $F10,119=4.474$, $p<0.000$), 21.2 percent for sampling site, hence, regression analysis done on the former is better than the later.

MALANON, HERNAIZ G.

The potential of rice postproduction mechanization in addressing climate-related risks, isabela, Philippines -- 2019

This study demonstrated the potential of mechanization technologies in addressing climate-related risks brought about by tropical cyclones and prolonged rainy/cloudy days. These climate hazards constrain rice farmers during harvest and drying operations. The number of tropical cyclones that affected the province of Isabela has been declining but the frequency of stronger/more destructive typhoons is increasing. Annually, rice farmers in Isabela incurred an average of Php 158.71 million amount of crop damages, qualitative losses and additional costs due to tropical cyclones during harvest. In addition, rice farmers suffer an average of Php 105.86 million value of grain qualitative losses per year due to continuous rainy days that hamper drying activity. The use of RCH potentially reduces exposure of rice farmers to tropical cyclones by 36 percent while mechanical dryer (RFBD) eliminates the risks associated with prolonged rainfall. The reduced exposure of rice farmers to climate hazards during harvest generate savings amounting to Php 73.95 million per year through reduced crop damages, averted grain qualitative losses and avoided additional cost of harvesting lodged crop.

MALENAB, MA. CHARISMA T.

Analysis of Socio-ecological Systems within Mount Pinatubo Lahar Landscape, Philippines: The Case of Burgos-Baquilan Resettlement Community, Botolan, Zambales -- 2024

This study demonstrates the application of socio-ecological systems (SES) analysis as a framework for disaster studies specifically on disaster recovery and resettlement planning within disaster-altered landscapes formed after the 1991 Mount Pinatubo eruptions. Using the multi-method approach, this study analyzed the extent of land cover change in the Bucao Watershed within Mount Pinatubo landscape over a 31-year period.

Results show that Bucao Watershed as an ecosystem exhibited ecological succession after the 1991 explosive disturbance of Mount Pinatubo, as evident in the presence of the four land cover classes shown in the series of NDVI-based land cover maps (1990-2021). It is surmised that the following environmental factors and processes have contributed to the ecological succession in the watershed: depth of tephra deposits, erosion, climate, and formation of secondary lahar. These led to suitable modifications in the physical environment of Bucao Watershed which contributed to its ecosystem recovery. Within this watershed, the farmers of Burgos-Baquilan, Botolan, Zambales implemented multiple
multi-level adaptation responses amidst the presence of volcanic hazards and related risks. Hence, the presence of agroecosystem recovery. There are also indications of improved community well-being in the Burgos-Baquilan resettlement from the viewpoint of the relocatees. Thus, over the past 28 years, the Burgos-Baquilan resettlement community has gradually established order in their environment and in their way of living. Analyses show that the farming community's commitment to till their land and their commitment to stay as a community progressively facilitated their re-establishment of order despite a more
challenging landscape brought about by the 1991 Mount Pinatubo eruptions

MALICSI, LORNA C.

Decision-making dynamics on by-product exchange in the Philippines -- 2001

As a newly introduced concept in the Philippine Business Sector, Industrial Ecology (IE) offers a wealth of information for clienteles wanting to discover on how to sustain flow of earth resources. While so many IE-related studies have dealt with the technical dimension, this study looks at the social dimension and examines the fabric of how IE becomes woven into the production process of a typical business organization. In particular, this study examines the decision-making dynamics with regard to By-Product Exchange Practice of industrial estate business locators in the Philippines. Specifically, this work probed on the following aspects : 1) Policies, 2) Decision-Making Factors, 3) Stakeholders' benefits from BPX, 4) Relationship/Roles of Stakeholders and 5) Communication Factors. Results of this study showed that for policies and practices related to By-Product Exchange, certain laws favored the adoption of this concept. In particular, these were the Solid Waste Management and the Clean Air Act. However, IE and BPX practices are not explicitly mentioned under these laws: thus a need for these concepts to be integrated.

In looking at the decision-making dynamics, I found two major factors that facilitated or paved the way to the industry adopting By-Product Exchange. These include : 1) the presence of the PRIME project and 2) the presence of an organizational structure that encourages BPX practice among the primary stakeholders. The organizational structure processed three features, namely : 1) built-in decision to practice BPX even before company started to operate, 2) local companies connected to partner companies which have high environmental consciousness and because of this involvement, they came to appreciate the merits of BPX as an approach, 3) the presence of PCOA, a substructure in the organizational structure of industrial estate. This substructure favors a quicker decision-making dynamics. Because Industrial Ecology and By-Product Exchange concepts are newly evolving in the Philippine setting, government needs to come up with policies that would encourage the institution of these concepts until they become practices and part of the daily routine of the industries' production processes. One policy would be on giving incentives to those who make this part of their company life cycle.

In addition, either the government or the private sector can build a bridge or a connecting link by providing a group similar to PRIME which can function as a clearinghouse, a database, a networker of companies that are engaged or interested in IE and BPX. Finally, IE and BPX can also be useful to the local government units, particularly in relation to the Ecological Solid Waste Management Act of 2000. Empowering them and their constituents about these concepts would better their chances of successfully implementing this Act.

MANILAY, ALESSANDRO A.

Effect of Land Use Change on the Use Value of Selected Ecosystem Services of the Uplands of Nagcarlan within the Sta. Cruz Watershed, Laguna, Philippines, 2017

The uplands in Nagcarlan, Laguna is a natural resource that benefits the town as a watershed, a land for producing food crops, and as a carbon sink. The combined effects of economic development, population growth, and mismanagement of the uplands can put this resource at risk. Determining the value of the ecosystem services that are provided by the Nagcarlan uplands can be a useful information in designing a sustainable framework to effectively manage this natural resource. This study was conducted to estimate the economic value of selected ecosystem services provided by the Nagcarlan uplands and to determine how land use changes can affect these values. The study focused on use values of ecosystem services, namely, food provisioning, water supply, and CO_2 regulation. The land use changes that were analyzed were: 1) expansion of the area planted to vegetables, and 2) conversion of the agroforest in the protected area into a dipterocarp forest. Converting the agroforest into a dipterocarp forest was found to be a more ecologically sustainable option. The carbon market through the Clean Development Mechanism can be used to provide farmers an incentive to assist the government in natural resource management.

MANZANILLA, DIGNA O.

A model of sustainable water management for the Laguna Water District, Philippines -- 2000

The study generally aimed to develop a model that integrates the social, economic, ecological and institutional factors underlying sustainable water management under a local water utility set-up. This is to ensure that water use does not impair the natural resources, capacity to provide life support system on a sustainable basis. Specifically, the study aimed to : 1) conduct a rapid water resource balance analysis for the Laguna Water District, 2) assess the issues involved in the evaluation of water supply and demand in the study area, 3) examine the decision-making patterns that influence water production, treatment and distribution tasks of the Water Utility, 4) assess how population needs and ecological concerns are incorporated into the decisions on water production, treatment and distribution, 5) analyze aspects of the water management system in terms of production capacity, water quality and distribution that influence efficiency in water services, and 6) recommend measures and strategies to attain sustainable water management and services.

The study used a combination of qualitative and quantitative methods in addressing specific research questions. A Water Resource Balance Analysis was conducted to ascertain the water requirements and supply based on varying assumptions. Rough-and-ready indicators were used to analyze the efficiency of water management. Qualitative methods included key informant interviews, case study, cross-check and group interviews and use of documents. The concept of sustainability of water management requires a clear understanding of the level of uncertainty in dealing with water availability and assessing supply and demand situations. Available data showed that potential scarcity could be brought about by ecological limits as well as the organizational and institutional arrangements in place.

The results of the study included a framework that incorporates not only the social and economic concerns but also the protection of the ecosystem that provides water services. This study showcases, in local context the interlocking forces that should be considered when addressing sustainability of water. The complexity of water management underscores the existence of institutional links of a water utility influencing its decision-making process. The viability factors determine to a large extent that capacity of the water utility to explore, abstract and distribute water to target users. Internal operating policies influence efficiency through decision-making patterns that are also dependent on national policies and organizational requirements to sustain the operations. To address the concept of sustainability, the operationalization of the efficiency criterion allows for proper appraisal of the outcomes of interaction in a given resource management system.

MARTIN, SAMUEL P.

Religion-environment relationships in the teachings, beliefs and practices of Hindus and Christians in Los Banos, Laguna, Philippines -- 2005

The general objective of the study was to examine religion and environment relationships in the teachings, beliefs, and practices of Hindus and Christians in Los Banos, Laguna, Philippines. Specifically, it aimed to : 1) analyze the Hindu and Christian religious teachings that bear on human-nature/environment relationships; 2) analyze how belief in Hindu and Christian religious teachings is correlated with the respondents' values, commitment, and environmental practices; and 3) analyze the implications of religious-based environmental practices to overall conservation and protection of the environment. Informed by the phenomenological approach, the study used the theory of planned behavior. A combination of textual

analysis, Focus Group Discussions, and survey of Hindu and Christian respondents were employed as research methods.

In the Christian tradition, the bible is the word applied to sacred scriptures, while the source of the Hindu teachings is the Vedic Hymns, both of which reflect creation and human's responsibility over it. The texts provide strong grounds for respect for nature and its creatures and for living in ways that preserve and protect them. Aware of the present state of the environment and the role and contribution of religion, both the Hindu and Christian survey respondents' values, commitment, and practices with regards to nurturing the environment were said to be guided by their strong beliefs in their religious traditions. People's actions are grounded on their belief system and religion. In general, the respondents believe that religion indeed can contribute to reversing the end of the present ecological problem. The study affirmed both the utility of phenomenology and the theory of planned action and the merits of using multiple research methods.

MEDIATRICE, NTABUGI MARIE K.
(no copy)

MERANA, LAMBERTA G.
Methodology and format for monitoring biological impacts of quarrying in Teresa, Rizal -- 2003

The main objective of the study was to develop methodology and format for monitoring biological impacts of quarry projects. A methodology for monitoring biological impacts of quarrying specifically in Teresa, Rizal, Philippines, derived from the study, involved triangulation approach : flora and fauna from existing literature, verification of the baseline floral and faunal studies and validation through the ethnobiological surveys. The approach was used in monitoring the changes in biodiversity indices before and after three years of limestone quarrying and in disturbed and undisturbed quarry areas.

There was a marked increase in floral species richness after 3 years of quarry expansion activities brought about by the increase in the number of invasive, mostly introduced shrubs, weeds and grasses. Destruction of habitat for forest tree species adapted to limestone areas could also mean habitat improvement for other lesser desirable species than forest tree species.

The floral species density was significantly reduced after 3 years of continuous limestone quarrying, indicating the devastating effect of quarrying on the number of individuals belonging to a species.

The floral and faunal species evenness and species diversity index before and after quarrying and in the disturbed and undisturbed quarry areas did not differ significantly. Both plant communities assessed at different time frames and environmental conditions showed the pattern of few abundant species associated with many rare ones. No specific avifaunal species provided extremely high number of individuals.

The format to facilitate monitoring biological impacts of quarrying included a checklist reflecting the species under investigations, its presence or absence in the existing literature, baseline data, verified data and the ethno biological surveys. Information on the species' conservation status was also considered.

Using the format, the biological impacts of quarrying were also determined as manifested in the extirpation of an indigenous forest tree species, himamao (Dysoxyllum mollissimum: Meliaceae), a resident bat species, common bent-winged bat (Miniopterus schreibersit : Vespertilionidae) and a migrant bird, Asiatic migratory quail (Coturnix japonica : Phasianidae).

MOLINA, VICTORIO B.
Health risk assessment of selected heavy metals bioaccumulation in Laguna de Bay fish products. -- 2011

This study provides an assessment of the risks to human health associated with the exposure to heavy metals bioaccumulation in fish products from Laguna de Bay. Samples of five edible fish species, namely : Bangus, Bighead carp, Dalag, Kanduli and Tilapia were collected in eight sampling stations in three major areas of the lake during the dry and wet seasons. Dry season samples were collected from May to June 2010 and wet season samples from September to November 2010. Coordinates of sampling site locations were recorded using Global Positioning System (GPS) and plotted in Geographic Information System (GIS) digital maps. Heavy metal analyses for Cadmium (Cd), Lead (Pb), Mercury (Hg), Arsenic (As), and Chromium (Cr) were conducted using Atomic Absorption Specrophotometer (AAS) and Mercury Analyzer (Mercur-Duo).

Estimates of health risks associated with fish consumption were summarized according to non-carcinogenic and carcinogenic health effects. Non-carcinogenic Health Quotient (NHQ) values of five heavy metals showed that lead is the most urgent pollutant of concern in terms of adverse health effects from risks associated with fish consumption from all sampling locations in the lake. Elevated health risk for Mercury

exposure was also evident in the west bay and central bay particularly for dalag and kanduli species. Among the five heavy metals only Arsenic is a confirmed human carcinogen (Class A) through the oral route of exposure. The highest life time cancer risk for arsenic was computed for tilapia from sampling station 2B (west bay) during the dry season with risk value of 8.5x10 or an excess of 85 cancer cases per 100,000 populations. The lowest life time cancer risk for arsenic is computed for dalag, tilapia and kanduli from all sampling stations except 1B and 4 (northern west bay and south bay) during the wet season with risk value of 9.7 x 10 or 1 cancer case per 10,000,000 populations. From the point of view of human health protection and disease prevention, fish products from the lake particularly bangus, bighead carp, dalag, kanduli and tilapia are not fit for human consumption primary due to lead contamination.

MORALES, LUNINGNING R.
Effects of Swine Waste Pollution on Water Quality and Fish Productivity of the Calumpang River Watershed, Batangas, Philippines – 2013.

The intensive swine industry in Calumpang River watershed has altered the ecosystem services of Calumpang River. Spatial assessment of swine waste loading into this river system and its influence on water quality, Cu and Zn content of sediments and fish and fish assemblage was conducted in December 2010 to May 2011. Four sampling stations were established along the main stream. Local policies related to swine waste management were analyzed.

Animal unit density, estimated manure production and potential eutrophication in each barangay identified the environmental hotspots on animal waste pollution. Total P, BOD and fecal coliform counts exceeded DENR (1990) water quality standard for class C of fresh water. Total N most often did not exceed Class C standard inspite of high animal units. The overall mean of BOD and total P and N at different sections of the main stream were significantly correlated with estimated cumulative manure production from upstream to downstream. The Zn and Cu contents of the fishes exceeded the WHO (2003) standard for fish. Fish diversity increased from upstream to downstream. Market based instrument could improve value adding to swine waste to enhance compliance local and environmental policies on swine waste management.

MOTALIB, MOHAMMAD ABDUL
Analysis of Factors Causing Air Pollution from Brick Kilns in Dhaka City, Bangladesh. – 2014.

The main source of air pollution in Dhaka City is emissions from brick kilns. This study assessed the main factors that affect the city's air pollution levels, as well as the contribution of the different types of brick kilns in the different zones in Dhaka. The significance of air polluted variable, health impact, and policy analysis on the types of kilns was also examined. Among the variables analyzed, specifically PM_{10}, $PM_{2.5}$, SOx, NOx, NO_2, CO and O_3, only PM_{10} and $PM_{2.5}$ exceeded the Bangladesh air quality standards and World Health Organization air quality guidelines. The study found that existing Fixed Chimney kilns (FCK) emission of PM_{10} concentration in Dhaka City is 32.2 μ/m^3, and if all FCK converts to Zigzag, Vertical Shift Kiln (VSVK) or Hybrid Hoffman Kilns (HHK) kilns, the PM_{10} emissions would be 10.9 μ/m^3, 4.6 μ/m^3 and HHK 11.9 μ/m^3, respectively. On the other hand, the FCK emissions of $PM_{2.5}$ concentration in Dhaka City 11.5 μ/m^3 and other kilns (Zigzag, VSVK or HHK) would be 6.6 μ/m^3, 2.5 μ/m^3 and 7.1 μ/m^3, respectively. Among the different types of kilns VSBK had the lowest PM_{10} and $PM_{2.5}$ emissions, while Zigzag was the second lowest emitter. But SOx and CO emission levels, which are considered Zigzag, had the lowest emission. For CO2, HHK had the lowest emission. Based on the air pollution parameter of Dhaka City, PM_{10} and $PM_{2.5}$ emission levels were the only significant ones among all the parameters. PM_{10} and $PM_{2.5}$ emissions from brick kilns used in the health effect model shows that Zigzag kilns can be reduced by 60%, VSBK by 83% and HHK by 57%, which can be used to avoid health effects and the Disability-Adjusted Life Year, as well as save cost on health care. Analysis on the existing brick kilns policy proved that there are deficiencies on the policies such as insufficiency of, and having unskilled, employees, gaps in the monitoring and implementation of policy implementation, the government's inability, and having contradicting policies in running brick kilns. In areas surrounding Dhaka, the maximum brick kilns that are most polluted with FCK is situated in the lowlands. To minimize air pollution and its health effects in the City, the study showed that the clusters of Asulia, Gazipur and Naryanganj which are using FCK kilns can be replaced by Zigzag kilns, and the clusters of Dhamrai and Keraniganj which are using FCK kilns can be replaced by VSBK kilns.

MONTAÑO, TERESITA G.

Analysis of the effects of leachates from a controlled dumpsite on surface and groundwater quality and implication to its management in Zamboanga City, Philippines -- 2008

The study assessed the quality of the surface and groundwater used by the residents living near the dumpsite area in Zamboanga City during the early part of 2008. It has also assessed the social impacts particularly on livelihood, health and sanitation and the environment. The findings were used as basis for the development of a mitigation/rehabilitation and monitoring plan. A framework plan was developed to serve as basis whether to continue with its operation or plan for eventual closure.

The results of the water quality revealed that most of the parameters for the physico-chemical analysis in both the surface and groundwater were within the normal Philippine water quality standards except for the observed low levels However, the fecal coliform was within standard acceptable value for both the river and deep wells except for site RS1. Pseudomonas Aeruginosa was found to be exceedingly numerous in all of the sampling sites of the river and numerous in DW1 and DW2. The data on the social impacts show that some of the livelihood activities of the people are affected as well as the health especially those that deal with respiratory, digestive, and skin diseases which were confirmed from the health center's annual report. The most prevalent effect on the environment is the proliferation of foul odor. Continuous water quality and social impact monitoring is encouraged to effectively analyze the impacts of the dumpsite on the environment and human health.

The results obtained from the assessment of the quality of the river and groundwater and the social impacts related to livelihood, health and sanitation and the environment were tabulated and served as guide for the development of the Environmental Management Plan. The data on the effects of the dumpsite on the quality of the water, the environment and the community, were the basis for the preparation of the evaluation framework for decision making, whether to continue with the dumpsite operation or plan for closure. DO in all of the three deep wells which were sampled and high levels of BOD in site 2 of the River and deep wells DW1 and DW2. The phosphate and sulphate levels were also noted to be more than the prescribed standard. The microbiological analysis reveals that the Total Coliform was way beyond the acceptable value in all sites of the River as well as in deep well 1.

MUTIA, MA. THERESA M.

Environmental Influences on the Reproductive Biology and Population Dynamics of *Sardinella tawilis* in Lake Taal, Philippines. -- 2015

Environmental factors influencing the reproductive biology and population dynamics of *Sardinella tawilis* in Taal Lake were studied to address the problem on declining catch and population. Length weight relationship analysis showed negative allometry with an equation of $W= 0.0151\ TL^{2.8}$. The females are more than males with a ratio of 1:06 (F:M) with size at first maturity at total length 11.5cm in both sexes. Two peak spawning seasons were observed from February to April and July to September with an estimated average fecundity of 8,895 ova. The estimated L_{max} L_{∞} and K vakue were 15.39cm, 15.5cm and 0.98cm, respectively. Meanwhile, fishing mortality, natural mortality and exploitation values were noted at 4.77, 2.15 and 0.62, respectively. The main diet comprised of 52% calanoid copepods. *Tawilis* larvae were identified morphologically with a total of 337 ind/100m^3 collected in 9 out of 15 stations in the southeastern and western part of the lake and were carcoded through DNA analysis. Majority of the fisherfolk (95%) are highly dependent on fishing using two types of gear, namely gill net and beach seine. The average catch per unit effort of gill net and beach seine were 5 kg/day and 29 kg/day, respectively. Multivariate analysis showed that among the environmental variables, salinity and temperature were found to be the predominant factors that influence the biological parameters of *tawilis*. Temperature and salanity facilitate gonadal development and spawning during the months of February to April and July to September. The high values of fish catch and catch per unit effort in March and September indicate fishing pressure which also coincided with the spawning season of *tawilis.*

NAZARENO, PATRICIA ANNE G.

Response of vegetation to heavy metals and the perception of the community mitigation in Cebu City landfill, Philippines -- 2010

This study focused on the screening of the plants in the Cebu City Landfill, Philippines for their resistance to the presence of metals; whether they acted as excluders or tolerant towards cadmium, chromium, lead and mercury. A vegetation survey was conducted prior to the collection of samples. A total of 30 plant species were recorded, with the most represented families being Poaceae, Convolvulaceae, Asteraceae, Euphorbiaceae and Fabaceae. The most dominant species was Cynodon dactylon.

Of the 32 plant species analyzed (including those collected outside the quadrats) for the metal level, using atomic absorption spectrophotometry. Cyperus odoratus, Cynodon dactylon and Muntingia calabura proved to be candidates for metal translocation. To verify the behavior of the plants in the Cebu city landfill towards the four heavy metals controlled experiments are recommended.

The wide range of metal concentrations in the soil would imply that there was no proper segregation of the waste both at source and in the landfill.

Although the respondents agreed that the plants growing inside the facility helped in absorbing the pollutants and should be planted in the facility, they gave more importance on the medicinal value of the plants.

NGUYEN THI HUYEN.

Assessing landscape change and effectiveness of mangrove conservation in Ca Mau Cape National Park, Ca Mau province, Vietnam -- 2019

The study was conducted in Ca Mau Cape National Park (CMCNP), Ca Mau province where the largest areas of mangroves in the country can be found. The study aims to examine landscape changes, the factors affecting landscape change and the effectiveness of the mangrove conservation based on monitoring data of CMCNP from 1973 to 2018. To evaluate landscape change and the effectiveness of mangrove conservation, both quantitative from remote sensing, landscape metrics and qualitative from key informant interviews were conducted. At the first period from 1973 to 1979, the natural regeneration of mangrove forests was the main factor, which enabled an increase of forestland and a decrease of bare land and water surface. Although mangroves were destroyed during the war, the landscape is still homogeneous and simple structure but low value in connectedness. During the second period (1979 to 2003), sparse mangrove increased by 144% and dense mangrove increased by 85%. The landscape became more fragmented due to the expansion of shrimp farming as well as the reduction of mangrove forests. Weak and conflicting policies in mangrove conservation, overexploitation, and conversion of mangrove areas to shrimp ponds were the main factors affecting landscape change. The last period from 2003 to 2018, dense mangrove increased by 45% while sparse mangrove decreased by 30%. The landscape became more aggregated or clumped due to the reduction of shrimp farm and expansion of mangrove forest. These pieces of evidence prove the good management of CMCNP. Although mangrove conservation in CMCNP is effective, this area still faces many problems such as climate change, sea level rise, and the impacts of tourism development. Therefore, the local government should be aware of changing policies and management framework that is more suitable in mangrove conservation in the future.

OBLIGADO, ANTHONY B.

Reducing the GHG Emissions of Commercial Swine Production in the Philippines through the use of Life Cycle Assessment. – 2021

The study analyzed the the reduction of greenhouse gas emissions in the commercial farms in the country by the use of life cycle assessment. It focused on the operations of selected farrowto-finish commercial farms located among the top swine producing regions of the country. Swine production is a major source of carbon emission among the livestock and poultry industry, the sector being second only to rice production as the highest emitter of GHG among the agriculture sector. Five module or major processes in the production cycle are considered for evaluation – the transportation of raw materials from farm to feedmill, the feed production, the transportation of compounded feeds from feedmill to farm, the animal production and the manure management system. The status of emission of the current swine production in the country was established along with the conventional production systems being employed in the industry. In the process, the hotspots in the industry was determined along with the low carbon system utilized by the local swine industry. The potentials of appropriate low carbon technology are also included in the determination of the ideal low carbon technology for commercial farms in the Philippines. The emission from commercial swine production in the Philippines ranges from 1648.04 to 2253.56 g CO2 per kilogram liveweight produced at farm gate. The emission from feed production produces the greatest value form all emission sources at 1409.72 g CO2 e/kg liveweight or about 72.86 percent of the total. Animal production accounted to 284.35 g CO2 e/kg liveweight on the average or about 14.70 percent while emission from manure management system from all the farms accounted for 182.40 percent or about 9.43 percent of the total. The least source of emission came from transportation of raw materials to feedmill at 54.79 g CO2 e/kg liveweight or 2.83 percent and from the transportation of compounded feeds to farm at 6.33 g CO2 e/kg liveweight or about 0.33 percent of the total emission. The study recommends low carbon technologies to achieve further reduction in GHG emissions. For feed production module, the use of low protein, high amino diet at 30 percent Protein Enriched Copra Meal (PECM) replacement of soybean be adopted along with the control of feed wastage at 5 percent and sourcing of feed in close proximity to the farm. In addition, for animal

production module, open-sided housing is also suggested together with the Don Severino Agricultural College (DSAC) model of biogas digester for the manure management system module. The use of Life Cycle Assessment was proven to be an instrumental in determining the reduction potential of GHG in commercial swine production system as such it is also recommended to be utilized for the study of other commodities in the livestock industry.

OLATUNJI, EMMANUEL T.

Impacts of Urbanization on Mangrove Ecosystems in the Coastal Communities of Tayabas Bay, Quezon Province.

There have been numerous efforts towards the sustainability of the mangrove ecosystem in the country, but mangrove decline is still occurring. This study aims to evaluate the changes in the socio-political, economic and ecological systems in the context of urbanization and the impact on the mangrove forest cover, to identify interventions for sustainable management of the mangrove forest development and incentives for the community dependent on it. Twelve municipalities were along the Tayabas bay of Quezon province were analyzed, covering three time periods, 1993, 2008 and 2016. The Maximum Likelihood Classification and Spatial autocorrelation was employed to determine change detection in the LULC and how urban development impacted the mangrove forest. The institution analysis and development framework was used to evaluate the incentives for community participation in the management and development of the mangrove forest.

The population density of all 12 municipalities is steadily increasing as well as the increase in the transitioning of the land use. Built-up areas expanded continuously in all of the municipalities, fishponds development declined in eight of the municipalities while rice fields and coconut expanded on the overall in all of the municipalities. The mangrove forest cover indicated an overall decline in all of the municipalities, including 28.59 ha in Agdangan, 57.19 ha in Catanauan, 79.24 ha in General Luna, 120.60 ha in Lucena, 72.65 ha in Macalelon, 45.71 ha in Mulanay, 221.52 ha in Padre Burgos, 380.93 ha in Pagbilao, 54.43 ha in Pitogo, 98.49 ha in San Francisco, 56.82 ha in Sariaya and 158.81 ha in Unisan. These mangrove loss as due to the encroachment of built-up areas, coconut and rice plantation and fishpond development. Other causes are illegal harvesting and extreme weather condition, including typhoon. A holistic bottom top approach should be introduced to insure the sustainability of the incentives for the community participation.

ONG, SUSAN A.

Heritage trees in the Philippine urban landscapes : an assessment of their selected socio-cultural,ecological and conservation values. -- 2012

Selected ecological, socio-cultural and conservation value of Heritage Trees (HTs) in urban landscapes located in the cities of Quezon, Legaspi, Cebu and Davao in four climatic types in the Philippines were assessed. Ecological values measured were temperature and humidity differences under and outside canopies of HTs was also estimated. Socio-cultural and conservation values were assessed involving a survey of 200 respondents using Likert scale and the modified Linear Arousal-Stress Scale (LASS). Twelve interdisciplinary experts used the Analytic Hierarchy Process (AHP) to rank criteria for valuing HTs. Data were triangulated by interviews, remote sensing and review of secondary documents. T-test, Analysis of Variance and the Statistical Package for Social Research were used in data analyses.

Results indicated that 99 percent of the respondents prefer to retain urban HTs and were aware of their healthy existence. Albizia saman ((Jacquin) Merrill) or akasya was the most known HT in urban areas due to its domain canopy and prevalence in public spaces, followed by Balete (Ficus sp.) and Narra (Pterocarpus indicus). Between 8am to 4pm, the mean ambient temperatures under the canopy of HTs were cooler by 3.94 C (range = 3.85 – 4.05 C) while mean humidity was higher by 8.92 percent (range = 6.04-10.69%). Betweeen 12 pm to 3pm, the mean temperature and mean humidity difference under and outside canopies were - 4.09C and +8.5 percent, respectively. These values were the presumed maximum benefits that shades of HTs provide on the hottest time of the day. During the same period, the 10-point LASS scale showed what respondents felt when under a canopy and had a weighted mean of 9.41 level of comfort compared to only 1.30 when under sunlit-exposed areas. These results provide the physical basis, of respondents' perception of what maginhawa and maalingsangan are, implying that 81.10 percent is contributed as the perceived level of comfort when respondents stay under the shade and canopy of HTs. Using the Likert scale, respondents perceived ecological values as the most important values of HTs (mean = 4.24) whereas experts ranked socio-cultural values as highest when using the AHP method. The normalized values from Likert Scale was computed and compared with AHP values. Results indicate that the public gave equal weights to the three values whereas experts highly preferred the socio-cultural values. A major contribution of this research is that HTs can be assessed objectively and that decision-and policy-

makers in various institutions can use the combined methods to resolve conflicts about the fate of HTs in urban landscapes. A modified set of assessment criteria for identifying and selecting HTs for conservation is also proposed.

ONGLEO, CAROLINE P.

Social sustainability of livelihoods in Mount Kitanglad range natural park, Bukidnon, Philippines -- 2003

The study identified and assessed indicators of social sustainability of livelihoods in Mount Kitanglad Range Natural Park (MKRNP), Bukidnon, Philippines. Social sustainability is the ability of the community to maintain and promote livelihood activities. It is a function of the level of participation and other social capitals.

In analyzing the social sustainability of livelihoods, the synergy of the Systems Theory, Contingency Theory, and Political Ecology Theory, coined here as the SCOPE Theory was used as the conceptual framework. The Systems Theory emphasized that social sustainability of livelihoods is a function of the systems of inputs, structures (institutions) and processes (policies). The Contingency Theory demonstrated that social sustainability of livelihoods is an adaptive management through the practice of rituals and other customary traditions to adjust to its environment, while the Political Ecology Theory established that relationships of institutions and stakeholders determine the access to and flow of livelihood resources.

The study employed the Livelihood Monitoring and Evaluation approach using survey as the primary method of data gathering. Through the Stratified Simple Random Sampling using proportional allocation, the study sampled 124 members of the peoples organizations (POs) in the 7 municipalities MKRNP. These respondents identified the livelihood capitals during the prelivelihood phase (1995-97) and during the livelihood phase (1998-2001). Secondary data on transforming structures and processes were assessed in relation to the sustainability of these livelihood capitals.

The McNemar Test determined changes in the livelihood capitals during the prelivelihood phase and the livelihood phase. Results showed that natural, physical and financial capitals are generally insignificant to contribute to sustainability of livelihoods. However, human and social capitals, particularly the type and degree of participation enhanced the potential for sustainability of the livelihoods.

The probability or sustainability of participation as a social capital to occur over time in relation to selected livelihood variables was determined through the Odds-Radio Test. Result showed that the high probability of participation in meetings, trainings, community activities (pahina) and farm technologies to occur are related to the characteristics of source of information and perception on livelihood, training, role and sources of stress such as natural calamity. A high probability of occurrence of participation will transpire only if the livelihood capitals strongly related to it are likewise fairly distributed and sustained. Further, participation in livelihoods is expected to be active, integrated, functional and even leading to self-mobilization.

However, participation was lacking in the project planning stage. It is inferred therefore that for participation not to become transitory, participation in all aspects of the project cycle should be evoked. In general, participation facilitated cooperation because it enhanced the sense of identity, sense of belongingness, honor, social status, prestige and spiritual well-being, but the strong sense of belongingness also lead to social exclusion.

Transforming structures (institutions) and processes (policies) on livelihood systems development in MKRNP also influenced the degree of participation or practice of social justice and norms. These institutions are highly formal, centralized, involves many units, many tasks, and interdependent units that contribute to the high internal complexity of the livelihoods. However, the complex institutions are complemented by an adaptive local policy environment through a supportive Protected Area Management Board management policies and PO operational rules on livelihood systems development. Hence, the local institutions and local policy environment facilitated participation of the community in livelihood activities in the livelihood phase as compared to the prelivelihood phase, and are the enabling factors to social sustainability of livelihoods.

OROZCO-GLORINA D.

Biophysico-chemical and socioeconomic study of two major Manila esteros -- 2008

Two major Manila esteros namely Estero de San Miguel and Estero de Quiapo, were studied to determine their ecological status. Physicochemical parameters of the esteros investigated were: turbidity, temperature, salinity, EC, pH, DO, BOD, COD,TKN,TP, chl-a and oil grease.

The results of analyses indicated that the recommended safe limits for the Class D water resources were all met. The TKN and TP values indicated hypertrophic conditions in all stations. Low chl-a values were indicative of stressful conditions to the primary producers. Pearson Correlation analysis showed highly significant positive correlation between the following pairs of parameters, namely: salinity, conductivity, COD;

depth, TP,TN; velocity, clarity; and BOD,TP,TN, chl-a. Highly significant negative correlation were observed between: salinity, velocity,,chl-a; chl-a,TP, TKN, BOD; and DO,turbity, oilgrease. Statistical analyses showed significant mean differences of most of the parameters per station and sampling season.

Four species of fishes were found in the esteros, namely, Rasbora maculata (Kataba), Gambusia affinis (Mosquito Fish), Anabas testudineus (Climbing perch or Gurami) and Hypostomus plecostomus (Janitor fish), with Rasbora and Gambusia which exhibits resiliency and dominance in the two esteros. . On the other hand, a total of 19 phytoplankton genera belonging to three algal groups were found thriving in the esteros, namely: Cyanophyta (3 spp), Chlorophyta (9 spp) and Bacillariophyta (7 spp) Community indices of fishes and plankton showed high dominance in the plankton communities but low in evenness. Fish communities exhibited high evenness but low in dominance and diversity.

Socioeconomic study revealed that attitude and actions of stakeholders to their esteros were influenced primarily by their economic status, educational and cultural background. Survey also showed the awareness of the communities on the problems of esteros and their willingness to cooperate in the rehabilitation of their polluted canals. Institutional initiatives such as environmental education and community-based programs were looked into as possible key for the effective rehabilitation and attainment of sustainability of Manila esteros.

PALER, MARIA KRISTINA O.
(no copy)

PANAHON, MARIUS L.
Assessment of the Siganid Fishery of the Caluangan Lake and Baruyan River in Calapan City, Oriental Mindoro, Philippines. – 2015

An ecological assessment of the siganid fishery in the Caluangan Lake and Baruyan River in the City of Calapan, Oriental Mindoro, Philippines was conducted from June 2013 to May 2014. The mottled spinefoot, *Siganus fuscescens (*Houttuyn, 1782) and the orange spotted spinefoot, *Siganus guttatus* (Bloch, 1787) were identified in this young lake. The dissolved oxygen pH, temperature, and electrical conductivity during the dry and wet seasons at the different sections of the lake and the Baruyan River, which drains the lake into the sea, were Class SC of DENR (1990) water quality standard. However, sodium, chlorine, sulphate as well as the total dissolved solid (TDS) exceeded Class SC standard.

These species are good sources of livelihood for fisherfolk. However, the availability of other sources of livelihood prevents the exploitation of siganid and other fishery resources in the study area. The site can be developed for lake based ecotourism with siganid as identity of the lake. Adoption of the ecosystem-based Fisheries Management should be considered by the policy makers and implementers on siganid fishery to attain the sustainable management of this natural resources.

PANGAN, RONEL S.
Environmental analysis of a village-level pressing machine for the densification of cans -- 2006

The study focused on the environmental analysis of the developed pressing machine to determine the potential impacts of the introduced technology. An assessment of the need for a machine in the densification of cans was first conducted by gathering both primary and secondary data. As a result from these activities, the need for a pressing machine was established.

Based from the gathered data an appropriate machine was designed and fabricated which was very simple, affordable, made from locally available materials and can be easily fabricated by local artisans. Performance tests of the machine showed that the machine can press an average of 17.55 kilos of aluminum cans per hour and 27.37 kilos per hour of steel cans.

Evaluating the machine in terms of its economic viability resulted to a positive incremental net benefit because of the considerable saving both in fuel and labor costs due to the reduced number of trips per month but having a much heavier load of materials. Using a 12 percent discount factor, the project's profitability was further substantiated because the benefit cost ratio (BCR) is 1.45 which is more than one, a positive net present value (NPV) of P22,846.20 and an internal rate of return (IRR) of 19.34 percent. The introduction of the developed machine resulted to a positive response by the majority of the surveyed junkshop owners towards the adoption of the machine. However, the machine should be modified to increase its capacity since they are paying their hired hands on a daily basis.

PARAGAMAC, JASON BEN R.,

Environmental Annoyance and Urban Green Space: Influence on Sustainable Development Values Among Residents of Davao City, Philippines. – 2023

Urbanization is a global phenomenon that has been occurring for centuries but has accelerated in recent decades. It is driven by various factors including industrialization, economic opportunities, better access to healthcare and improvements in transportation and communication networks. As urban areas attract more people it dramatically influences the overall structure and dynamics of urban ecosystems as a form of built-up expansion and loss of urban green space, resulting in the fragmentation of urban landscapes and increasing stress levels among households. The prevalence of unsustainable consumption patterns, waste accumulation, dwindling green spaces, and urban sprawl is hypothesized to influence the sustainable behavioral intentions and actions among people in urban centers across the three (3) selected barangays of Davao City.

An adopted survey instrument that includes several indicators was used. Four hundred (400) heads of households were randomly selected and proportionally distributed across three (3) barangays to participate in the survey. Focus Group Discussions (FGD) were conducted to determine the variable ranks and their corresponding weights and degree of importance to residential sustainable development values through Analytical Hierarchy Process (AHP). The generated data were analyzed using Pearson's Correlation, Ordinary Least Squares (OLS) and Partial Least Squares- Structural Equation Modeling (PLS-SEM) at a .05 level of significance.

Demographic profile data shows barangay Tibungco has the highest dependency ratio of 56. However, barangay Buhangin has the highest workforce participation with 69.48%. The highest age group classes are at 15-19, and an aging population group classes of 80 and above.

Data reveals that majority households have feelings of annoyance and feels disturbed in relation to feelings of insecurity with 42%, incivilities related to using public transport with 49%, annoyance and global environmental concern with 38%, lack of control over time in relation to car use with 39%, incivilities related to different users sharing public spaces with 43%, lack of efficiency due to population density with 47%, and an insecure and run-down living environment with 53% respectively.

Results revealed that the perceived level of environmental annoyance, pro-environmental behavior, and sustainable development values are high, with a variable mean value of 2.90, 3.01, and 3.06, respectively. On the other hand, the attitude towards urban green space is very high, with a variable mean value of 3.28.

Similarly, correlation analysis showed that perceived environmental annoyance has a weak positive directly proportional relationship with r-value of .256, pro-environmental behavior revealed a moderate positive directly proportional relationship with r-value of .434 and strong positive directly proportional relationship for attitude towards urban green Spatio-temporal mapping of UGSA trends showed a cumulative increase of 7.69%, equivalent to 784,820.90 sq. kms. from 2010-2015 and decline by 33.57% equivalent to 4,762,824.17 sq. kms over BUA from 2015-2020.

Analytical Hierarchy Process (AHP) ranks environmental annoyance as the most important variable with 51.19%, followed by pro-environmental behavior with 36.02% and the least is urban green space with 12.79%. The index score to measure sustainable development values ranges from .00-1.00. Cities with SDVI closer to 1 are better than those with SDV close to zero. The level of SDVI is described from very high to very low.

For model scenario simulations, Model 1 scenario simulation revealed an SDV of 1.000 described as very high, Model 2 scenario with .774 described as high, Model 3 scenario with .556 described as low and Model 4 scenario with .221 described as very low. The level of SDV across urban households is described from a very strong to very weak commitment to sustainable development practices and behaviors promoting environmental stewardship, social equity, and economic prosperity.

Urban areas are on the verge of becoming unsustainable and unlivable in the coming years. To address these challenges, possible sustainable urban development solutions were identified.

PARASO, MICHELLE GRACE V.

Estrogenic disruption in male common carp (Cyprinus carpio Linnaeus) introduced to the East and the West sites of Laguna de Bay. -- 2011

Experiments were conducted to determine contamination of Laguna de Bay with estrogen disruptors and to examine their impact on introduced fish. Results revealed 17B-estradiok (E2) levels in waste samples ranging from 0.29 +0.07 ugL to 0.40 +0.16ugl. Caging experiments in the east and west bay of the lake induced vitellogenesis in adult male common carp (Cyprinus carpio Linnaeus) and mild to moderate cases of testicular lesions that are consistent with estrogenic effect.

A significantly reduced hepatosomatic index (HSI) was noted in the east bay fish. The lake environment also stimulated the formation of melanomacrophage centers (MMCs) of bigger size and

number. The preponderance of melanin and hemosiderin pigments within MMCs was found to be greater in west bay fish compared to the reference group. In general, the results support and validate estrogenic pollution of the lake. Whether or not the reported E2 levels could elicit biologic effects that can compromise reproduction and population dynamics in fish and in higher vertebrates should be a subject of future research endeavors. Given the current weight of evidence on the adverse effects of estrogenic disruption, the implementation of measures that could prevent the discharge of these compounds in the lake watershed is recommended.

PARILLA, RICHARD B.

Effects of Habitat Fragmentation on Population Distribution and genetic Diversity of Cebu Black Shama (*Copsychus cebuensis* Steere) Based on Two mtDNA Genes in Cebu Island, Philippines – 2015.

Four (4) Cebu black shama (*Copsychus cebuensis* Steere) habitats in the island of Cebu, Philippines were surveyed from July 2013- February 2014. One hundred ninet-three (193) households were interviewed regarding their knowledge, attitude and perception (KAP) in relation to the black shama conservation. Vegetation composition and community similarity of 45 black shama territories were analyzed. Population size and distribution of black shama were estimated. Feather samples of 23 black shama individuals were analyzed for mtDNA gene diversity and phylogeny using 619 bp cytB and 580 bp COI genes.

Based on the interviews, the respondent's KAP were exceptionally high indicating their high level of awareness on black shama conservation issues. With regards to vegetation composition, it varies between habitats, however all habitats showed high species diversity, i.e. H'>3.0. Similarly, a total of 59 individuals across a 45,000 m^2 sampled habitat were recorded with an estimate of 13 individuals per hectare of habitat. Haplotype diversity (Hd) and nucleotide diversity π_n of both cytB and COI genes were high, i.e. HD>0.50 and π_n >0.005, typical of large stable population with a long evolutionary history that undergone recent demographic transition as supported by non-significant values of Tajima's D test, Fu and Li's D^* and Fu's *Fs* statistics. Furthermore, phylogenetic analyses of *C. cebuensis* revealed that it is monophyletic and distinct from other species of the same genus.

The study recommends immediate interventions to protect black shama habitats from further destruction and to conserve the remaining black shama population in the island of Cebu.

PASICOLAN, SIMPLICIA A.

Interhabitat connectivity of feeding and roosting patches of egretta species at Palaui island marine reserve, Sta. Ana, Cagayan, Philippines -- 2003

This study sought to examine the connectivity of two types of Egrets' habitat as a basis in assessing the appropriateness of the zoning plan of Palaui Island Marine Reserve. Habitats were characterized through vegetation analyses, benthic faunal assessment and waterfowl count. Social survey were carried out to assess the demographic pressures and the politico-institutional factors that affect the ecological integrity of the Egret's habitats.

The eastern part of the Palaui Island Marine Reserve is a suitable overwintering site for waterfowls, because of the presence of good feeding grounds and roosting sites that are closely linked to one another. The Egrets roost of the mangroves. They also use the trees at the edge of second growth dipterocarp forest which is part of the Multiple-Use Zone as their roosting site. The vast intertidal flat are the feeding habitats of egrets. Their habitats are vulnerable to human disturbance as these zone are also used for livelihood activities of the locals.

Social survey revealed that the current socioeconomic, cultural and politico-institutional conditions of the island have less bearing on the ecological integrity of the egrets' habitats. However, if the present trend of demographic pressure persists, the coastal marine resources could be degraded and eventually people would shift to farming and other land-base resource livelihood patterns, thus affecting the Egrets' habitats.

The Zonation Plan of the Palaui Island Marine Reserve was based primarily on spatial consideration with bent on man's resource access and current economic activities in the area. Apparently, the protection of egrets and other avifauna species were not integrated into the total design of the management zones.

The study advocates that in coming up with zoning plan, the PAMB should not only consider the spatial dimension as basis of defining the strictly protected and multiple use zones. More importantly, the functional, structural and temporal interactions between or among interconnected habitats supporting certain fauna population should be given equal importance.

PASTOR, FLORAMANTE C.

Biocapacity and ecological footprint for rice and wood in the Philippines -- 2007

A National assessment on the availability and use of resources for rice from 2003 to 2005, and wood from 2003 to 2004 was conducted using biocapacity and ecofootprint analyses. The assessment was accomplished by determining the demand and supply for rice and expressed the demand into ecofootprint while supply into biocapacity. Ecological surpluses and deficits were determined through biocapacity and ecofootprint comparisons. Ecofootprint for rice and wood were also interfaced to reflect the environmental conditions of rice land and forest ecosystems, reinforced by forest cover area, flood occurrences, and extent of irrigated rice areas.

If rice is considered for food alone, the Philippines could have a minimal ecological surplus. If seeds, feeds and wastes are included, the country had an ecological deficit of about 0.50 million nationwide hectares (M nwha) or an average per capita of 0.005 nwha from 2003 to 2005. For wood, the Philippines had an estimated biocapacity of 7.168 M nwha in 2003 and 2004, while the estimated ecofootprints were 18.19 and 13.78 M, respectively. This means a national ecological deficit of 11.02 and 6.62 M nwha or a per capita of 0.135 and 0.078 nwha for 2003 and 2004, respectively. Importations supplemented the deficits for both rice and wood.

Consumption reduction, population control and increase productivity could reduce ecological deficits. Avoidance of loss and reduce seed use could also reduce deficits for rice, while improved harvesting and wood processing could reduce wood deficits. Interface of ecofootprint for rice and wood identified 14 provinces that are vulnerable to flooding hazards and should be given consideration for any future action.

PATI, ROMEO C.

Flood Vulnerability Analysis for the Towns of Mabitac and Santa Maria, 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 dn Mabitac, Laguna.

The social vulnerability analysis indicated that Barangays Jose Rizal, Masinao, Adia and Corolan in Santa Maria and San Antonio, Naguma. Lambac and Pag asa in 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, TEOFANES A.

Comparative analysis of environmental management of selected protected areas in the Visayas, Philippines -- 2003

The study was conducted to make a comparative analysis of environmental management of three protected areas, namely : Rajah Sicatuna Protected Landscape (RSPL), Lake Danao Natural Park (LDNP) and PNOC Reservation. Specifically, the study aimed to : 1) characterize the biodiversity resource use patterns and environmental management in three protected area; 2) determine the status and distribution of the preferred species by the local inhabitants; 3) examine the association of socio-economic and cultural variables, biophysical characteristics and management interventions with resource use patterns; 4) assess qualitatively the impact of resource use of the local community on biodiversity resources; and 5) formulate some policy implications of the study.

Primary data were obtained through respondent interviews with protected areas users. Key informant interviews were also conducted to elicit information not discernible through respondent interviews. Selected biodiversity variables were obtained through field measurements. Secondary data from office records and files were used to reinforce and substantiate the primary data. Descriptive statistics and correlation analysis were used.

Farming, the most dominant economic activity undertaken inside protected areas, shifted from subsistence to cash economy in the three sites. There was a significant increase of inputs and use of improved varieties instead of traditional ones. Integration of few exotic tree species in the farm became

evident. Farm species diversity was positively associated to the respondent' age, number of years in farming, household size, farm size, off-farm income, total income and number of years with livelihood projects.

A difference in the cropping systems, based on the crop arrangement and amount of production systems were practiced in RSPL. Low-input mosaic, low-input abaca-based, and high-input vegetable production systems were associated with LDNP and PNOC. Although legally prohibited, timber cutting was virtually taking place for subsistence use in the three sites. The most preferred timber species for construction by the respondents were premium hardwoods belonging to the family Dipterocarpaceae, which could be found only in less accessible primary and secondary forests. Preference to timber species, which was influenced by the availability of species in the locality, differed among the respondents in the three protected areas.

Hunting, an important part of the underground economy among the inhabitants inside and around protected areas, increasing shifted from subsistence to commercial. Because of the attractive financial incentive attached to wild pig, the primary target game species, hunting intensity was increasing along with the improvement of hunting techniques. Farm size, total income and livelihood projects showed significant negative relationship with hunting effort.

Hunting was more evident in LDNP and PNOC than in RSPL owing to the high stock of game. Stock of the preferred game may be comparatively high in LDNP and PNOC because of the availability of less disturbed breeding grounds. In RSPL, wildlife habitat was more disturbed because of the favorable access and proximity to human population centers.

The environmental management program of PNOC managed protected areas focused on providing sustainable livelihood package to its recognized beneficiaries, aside from the very rigorous protection work. The program of DENR-managed protected areas put more emphasis on ecotourism. PNOC's environmental management program significantly reduced the dependence of the local inhabitants on protected areas resources.

Considering the financial resources, institutional arrangement and management strategies, PNOC-managed protected areas would be more sustainable than DENR- managed protected areas.

The difference in biodiversity among the three sites is due to the inherent site variability and land use history. The diversity of commercially important flora and fauna was declining significantly. Considering the low economic status of the inhabitants and the lack of other livelihood opportunities in protected areas, there is a strong financial incentive to overexploit cropped areas, wildlife and commercial timber species. Unless the trend is reversed, the future of our biodiversity is highly uncertain even in protected areas, which are considered the last refuge of this precious national treasure.

PATRICIO, JOSE HERMIS P.

An analysis of the environmental impacts of the proposed oil palm (Elaeis guineensis Jacq.) plantation and mill project in Bukidnon, Philippines -- 2006

The study was undertaken to analyze the environmental impacts of the proposed 4,000-ha oil palm plantation and 10-t fresh fruit bunches hr processing mill project in Impasugong, Bukidnon, Philippines. Field surveys, sampling, GIS mapping, interview schedules, key informant interview, focus group discussion and secondary data gathering were conducted from April to November 2004.

The proposed plantation sites are situated in idle grasslands mostly with slopes of 18-30 percent and elevation of 600-800 masl. However, there are dipterocarp forests in the far north and northeast of the plantation sites. These forests are habitats of one endangered and two threatened faunal species. Moreover, most of the plantation and mill sites are located close to Tagoloan River and some of its tributaries. Biophysical characteristics of the project area are generally favorable for oil palm production except for slope of some plantation sites.##The insufficiency of basic social services, relatively low income of project and non-project participant-respondents, and their support for the project in spite of the inadequacy of consultations indicate that the project is essential for the socioeconomic development of the project area. However, the relatively high project development cost, competition from other vegetable oils, and possible occurrence of palm disease and fire in the project area may hinder the realization of potential project economic benefits. If not properly managed, the project may adversely affect forests, wildlife, soils, hydrology, water and air quality, water and energy supply, health of plantation and mill workers, and existence of indigenous peoples in the vicinity of the project area.

The project can be managed sustainably through zoning of plantation and mill sites, phasing of plantation, development, practice of zero burning, adoption of soil conservation practices, optimum and timely application of safe agrochemicals, recycling of water and energy, implementation of appropriate hiring policy, consultation with various stakeholders, active involvement of cooperating agencies, and adoption of appropriate occupational health and safety measures.

PAZ, SHERRYL L.

Drivers and Patterns of Wildlife Hunting and Trade in Two Selected Protected Areas in Caraga Region, Mindanao Island. – 2019

Wildlife hunting and trading are still rampant in Agusan Marsh Wildlife Sanctuary (AMWS) and Siargao Islands Protected Landscape and Seascape (SIPLAS) despite of Wildlife Act (RA 9147). In this study, demographic, socio-economic, and cultural profile of the hunters and traders through snowballing and semi-structured interviews showed that most of the respondents were farmers with low educational attainment, low income and lack awareness on Wildlife Act and on threatened species in two PAs. Most of the hunters in both PAs resorted to subsistence hunting using traditional and modern but harmful hunting techniques. Local trading of threatened wildlife was also rampant for quick cash. Structural Equation Modeling results showed that hunter's knowledge and awareness on Wildlife Act and on conservation-related activities positively influenced hunting regulation attitude which in turn reduced hunting footprint in AMWS. Surprisingly, awareness on threatened species and on conservation-related activities negatively influenced hunting regulation attitude of hunters in SIPLAS. However, awareness on Wildlife Act positively influenced hunting regulation attitude and monitoring frequency reduced hunting footprint. Hence, poverty, low awareness on Wildlife Act and poor enforcement influenced hunting and trade in two PAs. This suggests that to reduce hunting footprint, raising conservation awareness, improving monitoring and enforcement, community engagement, sustainable livelihood and more hunting sustainability research must be done.

PEÑARANDA, EMELYN SANA.

Determinants of Payment for Environmental Services (PES) in Maasin Watershed Forest Reserve, Iloilo, Philippines. -- 2014

Watersheds play vital environmental, economic and social roles in the lives and prosperity of communities dependent on them. Presently, many Philippine watersheds are critical condition, experiencing loss of forests and biodiversity, severe soil erosion, erratic streamflow, diminishing groundwater resource, and declining land productivity. Hence, innovative and alternative strategies like Payment for Environmental Services (PES) are considered to protect sustainability manage the watersheds. PES is a market-based approach to conservation financing that links efforts of both environmental service providers and beneficiaries. This study assessed the critical preconditions of PES in Maasin Watershed Forest Reserve (MWFR). The biophysical determinants were analyzed using BROOK90 Hydrologic Model and remote sensing. The economics and institutional preconditions were determined through survey, key informant interviews and focus group discussions.

Findings showed that at present, MWFR's water yield, given its land cover, precipitation, and other geomorphologic characteristics, could still sustain its water provisioning ecosystems function. Upland farmers have willingness to participate in PES based on their opportunity cost to forego current farming practices. The positive dynamic interplay of the factors identified together with good environmental governance could make PES workable in MWFR.

PEREZ, FEDERICO O.

Soil pollutant susceptibility rating for rice agroecosystems -- 2002

This study developed a rating system to assess pollution susceptibility of various soil groups in rice agroecosystem using Soil Taxonomy system. Specifically, it established the inherent and potential soil pollution susceptibility rating (ISPSR and PSPSR) of soil orders based from computed coefficients of formative elements at the various categories of the system. A simple regression model was used to establish the behavior of pollutants vis-a-vis selected soil properties. Profile descriptions were made to the soils in the validation site to establish their soil names using the Keys to Soil Taxonomy. Laboratory analysis for nitrate-nitrogen was performed on the profile samples collected to establish a benchmark data on pollutants as well as indicator used in the validation of the rating system developed. Results of the study revealed that the clay content and mineralogy, soil pH. organic matter content, cation exchange capacity, and soil calcium content significantly affected the absorption of NO3 and the selected heavy metals namely, Cu, Cd, Pb and Zn. A positive linear relationships were observed between the soil properties and the pollutants studied. The trend established was an increased adsorption of NO3 and heavy metals occurred with increasing amount of the aforementioned soil properties.

Prediction of NO3-N content of soils was possible using the equations established by the simple regression model. Four out of five pedons can be predicted to have similar values with the actual values analyzed using soil organic matter as the predictor while three out of five (60 percent) pedons can be predicted to have similar values with the actual value using soil pH. Pollution assessments through susceptibility rating in rice agroecosystems can be done with the use of the system developed. It can be

assessed by determining the Inherent Soil Pollution Susceptibility Rating (ISPSR) of the soil class based on the coefficients of formative elements evaluated either as a pollutant deterrent factor or as an inducer of availability. The soil classified as fine, mixed, isohyperthermic, Entic Chromusterts obtained the highest ISPSR of 0.80 while the lowest rating was registered by the soil named as fine, mixed, isohyperthermic, Typic Haplustalfs with 0.70. Soil groups under the order Inceptisols had 0.78 (ISPSR), rating which is slightly higher than those obtained from soils belonging to the order Vertisols with 0.73.Increasing soil organic matter as well as pH and Ca through liming are promising best management practices to adsorp pollutants in soils as shown by the high predicted values obtained using NO3, Cu, Cd, Pb and Zn.

PIADOZO, RADEN G.
Environmental program awareness and participation' of business establishments in Laguna de Bay region. – 2011.

The study was done to help contribute to the development of measures that will protect and sustain the use of water from Laguna de Bay. The general objective of the study was to assess the awareness and participation of the establishments in the environmental programs introduced and implemented by LLDA and their willingness to pay the environmental user fee.

The study was conducted in the region of Laguna de Bay covering the areas under LLDA jurisdictions. A total of 485 business establishments were interviewed during the survey covering the provinces of Cavite (24), Laguna (231), Batangas (10), Rizal (90) and Metro Manila (130) made possible through the LISCOP project component 2. The business establishments were categorized into agriculture-related manufacturing/processing, chemical industries, plastics, informal business, housing institution energy/construction and others.

Results revealed that around 25 percent of all the respondents comprised the informal business group. The big establishments requiring more than half-million a monthly operating expenses were predominantly found in Laguna, Rizal and Metro Manila. The informal business group (46%) required only 10,000 pesos or less for their operations.

In terms of projects to the lake, only 62 out of 485 establishments implemented such projects monthly such projects by institutions (44%) and the housing sector (40%). On the other hand, 15 Laguna, 6 Rizal and 5 Metro Manila establishments planned to create projects that will affect the lake. Nineteen establishments jointly implemented activities with other organizations except the housing sector.

Fifty five establishments, either had transactions, interactions or relationships with LLDA, Batangas and Metro Manila establishments had very weak relationships with the agency in terms of mutual understanding, flow of information, personal relations with LLDA representatives, participation in decision-making and actual participation in the agency's programs and projects. More than 43 percent of Metro Manila establishment were aware and willing to participate in the efficient trading program, and learning resource center. Batangas (40%) and Rizal (49%) establishments were also willing to participate in the latter program. Only 15 percent of all establishments were registered with LLDA except in Batangas with no one was registered. Thirteen percent only of the total establishments had the perception that the collected fees were used to improve the lake's environment. More than 50 percent of them were not aware of the environmental user fee while only 18 percent were willing to pay for using the lake water. Majority of them stated their willingness to pay the amount of 6 to 10 pesos per cubic meter per month.

The relationship with LLDA was found to be the most significant variable in terms of awareness, participation and willingness to pay the environmental user fee. To improve the level of awareness and participation of the business establishments in the implementation of the agency's programs, the regular fora/dialogue, use of print media for information dissemination, continuous monitoring of programs, periodic checking of registration, maintain good report between the agency and stakeholders and formation of stakeholders organizations.

POQUITA, ALLAN L.
Environmental performance of brackishwater fishponds in Bohol, Philippines. -- 2004

Environmental performance of the brackishwater fishponds production systems for milkfish and shrimps in Bohol, Philippines was assessed based on set criteria. This includes 55 extensive fish farms, 28 semi-intensive and 8 intensive production systems. Soil fertility and water quality status of the fishponds were determined. A structured questionnaire was developed to determine the levels of inputs used, resource use patterns, productivity, cultural and environmental management practices, adoption of wastewater treatment facilities, knowledge and skills on fishpond production of the operator of each fish farm. The knowledge, perception and attitude towards fishpond production of municipal fishers and fishpond farmers were compared. Decision-theoretic evaluation was used to analyze the existing policies affecting the fishpond production. The soils of the fishponds are slightly acidic to neutral, low in organic matter, deficient

in phosphorus and adequate in potassium. The salinities of water in the fishponds are suitable for milkfish and shrimp production. The dissolved oxygen was below the desired levels for milkfish and shrimps. Majority of the fishponds produced 1.0 ton of milkfish or shrimp per cropping.

The semi-intensive fishpond production systems had higher environmental performance that the extensive fish production system. There was no proper fishpond development plan and poor site selection. However, there was continuous use of traditional cultural practices contributed to low ecological and technological viabilities of extensive fishpond production system. The semi-intensive and intensive fishpond production systems had established environmental management for soil quality, by-products and wastewater, and trained fishpond managers. The municipal fishers had negative perception and attitude towards brackishwater fishpond development due to indiscriminate conversion of mangroves forest into fishpond, use of persistence pesticides in the fishponds and disposal into the coastal areas of polluted wastewater during harvest and pond clearing. Environmental policies on environmental impact statement had higher policy outcomes to influence operators of fishpond than policy on toxic and hazardous waste as per revised Philippine Forestry Code and Local Government Code.

RACHMAN, AGUS HASANUDDIN

Sustainability of smallholder cashew production in West Nusa Tenggara Indonesia -- 2001

The main objective of the study was to assess the sustainability of smallholder cashew production, focusing on selected ecological, economic, social and cultural indicators involving the Eastern Island Smallholder Cashew Development Project (EISCDP) and its participants in West Lombok - West Nusa Tenggara, Indonesia. The respondents consisted of 100 from the population of EISCDP beneficiaries; the list was drawn from three (3) villages, with 36 from Loloan, 25 from Bayan, and 39 from Anyar. The few informal leaders for each group who were knowledgeable about EISCDP were selected at the district, sub-district and village levels. Samples of non-EISCDP farmer-participants were drawn from three (3) villages outside of the EISCDP, a total of 50. The villages were chosen according to their distance from Bayan village which was central to the study area. T-test on the household characteristics of the respondents in the study area showed that there were significant relationships between the characteristics of EISCDP beneficiaries and non-beneficiaries. This means that participation in the project is a major reason for the household income of the participants, Rp 1,771,610 (US$196.85) for the non-participants, and Rp 1,179,800 (US$131.08).

Tests of relationships were done among the five economic variables : production, infrastructure, market infrastructure, credit accessibility, labor use allocation, and input utilization. The probability values in all instances were the same, indicating that the four factors have positive interrelationship. For the three variables of ecological soundness : soil erosion, soil fertility, and soil moisture, all the relationships were found positive. All values are shown to be highly significant at 0.025 level.

The project respondents shared more in the decision making process of their cashew production than did the non-project respondents. The project respondents adopted more of the technologies prescribed by the EISCDP than technologies adopted by the non-project respondents prescribed by government or other agencies. The project respondents were more cohesive in their organization. The income levels of the project respondents were much higher, and the income distribution was more equitable than those of the non-participants. The EISCDP is financially viable as a measured by three computational tools, as follows : a) The benefit-cost ratio (B/C) is 3.259. b) The net present value (NPV) of the project is Rp 10,058,081 (US$ 1,117.564); this is high c) The internal value of return (IRR) is 26 percent, which is higher than the interest rate, which is only 12 percent.

REGONIEL, PATRICK A.

Fisherfolk's participation in the formulation of and compliance with fishery policies in Puerto Princesa and Ulugan Bays, Palawan, Philippines. -- 2004

This study analyzed the perceived condition of and actual changes in the coastal and marine resources in the bays of Puerto Princesa and Ulugan from time of fisher settlement in a rural and an urban barangay. In relation to these changes, the development of coastal and marine resource-related ordinances in Puerto Princesa City since devolution of national government authority to local governments in 1992 was discussed.

Fisherfolk's participation in the formulation of and compliance with these ordinances were evaluated and its implication to the condition of coastal and marine states were examined. The study utilized findings of recent studies and in-situ coral reef and fish visual assessment to analyze the actual resource states. Analysis of policy development focused on policy context, process, and implementation. Fisherfolk's perception and the dynamics of participation and compliance were determined by interviewing 156 fisherfolk and 20 key informants. The health of coastal and marine resources in the two bays started to decline

significantly, more so in Puerto Princesa Bay, during the last ten years. This decline was apparently held in check by coastal and marine-related ordinances formulated by the city government despite of scarce resources, weak enforcement capabilities, and clamor from affected parties. The fisherfolk's participation in policy development was mainly information-giving and consultation because of the local government's interpretation of participation favor these modes.

General fisherfolk compliance was high in both study areas, but was more variable in the urban barangay. There is a significantly positive relationship between participation in terms of information-giving and compliance and significant negative relationship between participation in terms of consultation and compliance. The fisherfolk's educational attainment, income, length of residence, year of arrival, perceived mode of enforcement, tolerance in enforcement, attitude towards fishing and resource dependence relate significantly to perceived changes in the coastal and marine resources in the bays of Puerto Princesa and Ulugan.

The study concluded that there is a significant negative relationship between income and compliance and significant positive relationship between year of arrival, mode of enforcement and tolerance in enforcement and compliance. There are significant negative relationships between educational attainment and length of residence and compliance and significant positive relationships between year of arrival, attitude towards fishing and resource dependence and compliance. There is a significant positive relationship between compliance with fishing permit and status of fish and significant negative correlations between compliance and status of corals.

RELOX, RICHEL E.

Ecological response of Fruit Bats (Family Pteropodidae) to Anthropogenic Threats of Selected Forest Habitats in the Mt. Kitanglad Range, Bukidnon, Philippines. – 2014

Reduction of habitat quantity and quality drives away the endemic megachiropterans which affects the services of the forest ecosystem. This study determined the fruit bat's composition, richness, abundance, diversity, endemism, diet and roosts as influenced by the geo-climatic, vegetation, socio-demographic, agricultural and institutional factors through primary and secondary information in the selected forest habitats in Mt. Kitanglad Range. The mist-netting method was employed in the selected forest fragments from October 2012-September 2013 during the dryad n wet seasons. Results showed a total of nine (9) species of fruit bats (Family Pteropodidae), *Cynopterus brachyotis, Haplonycteris fischeri, Ptencochirus minor, Macroglossus minimus, Ptenochirus jagori, Alionycteris paucidentata, Rousettus amplexicaudatus and harpyionycters whiteheadi.* Fruit bats were not significantly affected by seasonal variation due to the presence of foraging and roosting sites throughout the year. Fruit bats were positively correlated to the habitat quality and temperature but negatively correlated to rainfall, relative humidity and elevation of the forest fragments. The growing population of indigenous people and migrants perceive the fruit bats and forest as a primary source of basic ecosystem services but residual forests have been threatened by agricultural and other economic activities. Habitat fragmentation changed the species composition and community structure into highly tolerant species to disturbances from endemic species destabilizing ecological integrity thus reduces the quality of life of the local people. This study would like to recommend the following: the preservation of endemic and threatened species, the protection and rehabilitation of forest fragments, the improvement of ecotourism and sustainable agricultural practices in the uplands and the increase of local participation and awareness-raising activities.

REPLAN, ENRICO L.

Willingness for Biodiversity Conservation and Valuation of Ecosystem Services in Lagonoy Natural Biotic Area At Camarines Sur, Philippines. – 2022.

Protected areas provide ample benefits to people all over the world, and these benefits have been identified as "ecosystem services". Upland communities depend on these environmental services for their survival, well-being, and welfare. The study aims to analyze the determinants of people's willingness to conserve these services and provide strategies to enhance the conservation of Lagonoy Natural Biotic Area (LNBA).

A survey was conducted to 294 household respondents in LNBA to analyze their socioeconomic and demographic characteristics. Factors that determine people's conservation attitude, as well as economic valuation of LNBA and its ecosystem services were subjected to binary logistics regression model to obtain a diverse representation of the different points of view as to the determinants of local people's conservation attitude.

Residents' willingness to protect and conserve LNBA is significantly associated to their socioeconomic characteristics. The model is significantly different to the null (X^2 64.823, p. 0.01) and shows good fit to the data (HL test: p. 0.05). The results shows that the people's willingness to conserve

the ecosystem services of LNBA are driven by their socioeconomic conditions and interest of benefiting from it.

People's socioeconomic characteristics determine their willingness and conservation attitude. The study concludes that although households' were heavily reliant in LNBA ecosystem services, current use levels are not sustainable, endangering the local population's capacity to support themselves in the future. The study recommends promoting sustainable management strategies in LNBA while helping local stakeholders develop alternative sources of income.

RODRIGUEZ, MARY GRACE DP.
Integrated Vulnerability Assessment of Water-Energy-Food Security Nexus in Waras-Lalo Watershed, Bicol River Basin, Philippines. -- 2018

The usual vulnerability assessment is often sectoral and hazard-specific. With the nexus approach on water, energy and food (WEF), it is recognized that these three sectors have interactions and synergies and tradeoffs in their activities. Security has five dimensions, namely: availability, accessibility, affordability, accessibility, quality and sustainability. This study involved developing and implementing an integrated vulnerability assessment (IVA) methodology and framework of WEF security nexus applied to a watershed. The framework considered the watershed with three sub-systems of ecological, energy and food interacting with water as the common element. The same concept of vulnerability assessment was used for IVA as a function of exposure, sensitivity and adaptive capacity. IVA was operationalized by identifying variables or parameters pertaining to relationships among WEF and inclusion of sectoral variables related to the various dimensions of security. Based on the study, IVA of WEF nexus is a more holistic approach in assessing vulnerability. IVA account for the relationships among the sectors, in contrast to the sectoral approach. Using the combined climate risks due to different hazards (intense typhoons, erratic rainfall, severe drought, and temperature rise) gives a broader coverage unlike the hazard-specific approach. Parameters used were applicable for IVA of the watershed area. Additional relevant variables can be included if data are available.

RUBIO, JONATHAN S.
Ecological risk and management of ballast water from the International ships in Bauan Batangas, Philippines -- 2011

Ballast water collected from international ships in Bauan Batangas, Philippines was used to determine its risk in the coastal water ecosystem. The identification of the risk incurred by the ballast water composed of non-native zooplankton and the biocidal is the main objective of the study.
Ballast water samples were collected from nine international ships as they released ballast water to the coastal port water. The non-native zooplanktons from the ballast water were classified and compared to the indigenous species of zooplankton in the coastal port water. The physico-chemical characteristics of the ballast water were measured and compared to the coastal port water and category class SC water quality of the DENR marine water standards. The toxicity of the ballast water was determined using the Artemia bioassay. The ecological risk of the ballast water is identified using the retrospective and prospective risk analysis.

The most abundant zooplankton found in the ballast water is the Gymnosome and followed by Globigerina which are tolerant zooplankton. Some of the ballast water zooplankton species when compared to the indigenous zooplankton were present also in the coastal port water. The relative densities, frequencies and abundance were determined. The zooplankton species were ranked based on their importance values. There are three ships that the number of zooplankton exceeded the standard value of less than 10 organisms per ml of the ballast water.

The retrospective risk analysis shows that the ballast water has possibly affected the indigenous zooplankton, corals, fisheries and indigenous species. Though, there is no direct observation of the decline of the recipient ecosystem components it can be one of the debilitating factors that change the ecosystem and affect the livelihood and indigenous species.

The risk quotient is used to determine the prospective risk of the ballast water. It shows that there is low risk of some of the physico-chemical factors of the ballast water. The pH, salinity, phosphate, hardness and temperature have posed a low risk as shown in their risk quotient that exceeded to 1.

SABINO, LORENA LOMA.

Vulnerability to Climate Variability and Change and Household Livelihood Security of Farming Communities in Roxas Mountain Range, City of Koronadal, South Cotabato, Philippines. -- 2016

Generally, this study assessed how vulnerability to climate variability and change is linked with household livelihood security of the concerned communities in Roxas mountain range, City of Koronadal, South Cotabato. The International Panel on Climate Change (IPCC) theoretical framework of vulnerability in terms of exposure, sensitivity and adaptive capacity was used to measure overall vulnerability, while livelihood security was measured based on two aspects of United Nations Development Program (UNDP) human security concepts, namely, freedom from fear and freedom from want. Freedom from fear indicators were based on support received from LGUs and predictable weather. Meanwhile, freedom from want was based on household income.

Data were gathered using household survey with 265 respondents complemented by key informant interview (KII), focus group discussions (FGD) and field observations. The level of vulnerability was assessed based on recent literature. Moreover, the analytical hierarchal process (AHP) was used to produce overall vulnerability and Quantum GIS was also employed. Data were analyzed statistically using correlation, regression, Mann-Kendall test, Bartlett's test and coefficient of variation.

The results showed that for three decades there were significant changes in climatic patterns suggesting that climate change had occurred and was experienced by the farming communities in the study area which increases their vulnerability and significantly affect their livelihood security. The study revealed that majority of the farming households in the study area was moderately vulnerable to climate variability and change. This means that majority of farming households are in vulnerable condition. Although they have ways of coping with the adverse impacts of climate-related events, the farmers still need appropriate adaptation strategies to increase their adaptive capacity. On the other hand, the results revealed that 67.9% of households' livelihoods most of which came from Barangay Paraiso were non-secured. Many of the households are still struggling to cope from their insecurities and need urgent collective actions in securing their livelihood sources. Moreover, the study revealed that vulnerability to climate variability and change is a determinant factor of the household livelihood security, implying that reducing the vulnerability through effective adaptation measures increases the chances of securing the household livelihood

SABULARSE, JULIUS ALFONSO C.

Harmonization of Attributional Life Cycle Assessment and Good Agricultural Practices Certification for Commercial Bell Pepper [*Capsicum Annuum* L.] Production in Bukidnon, Philippines – 2015.

Harmonization of attributional life cycle assessment (aLCA) and good agricultural practices certification (GAP) for commercial bell pepper (*Capsicum Annuum* L.) production was conducted in Bukidnon, Philippines. The Department of Agriculture – GAP certification standard was used to assess and upgrade the facilities, production and postharvest processes including real time monitoring of farm activities. From gate to gate was the life cycle boundary. Greenhouse experiment was conducted to compare the yield and environmental hotspots of three bell pepper varieties (Compass, Bachata and Tricolore) inoculated with patented bio-inoculant fertilizer.

The use of the bio-inoculant significantly increased the yield of the bell pepper varieties than those without bio-inoculant. The yield did not differ significantly among varieties. Bell peppers with bio-inoculant had lower carbon, water, atmospheric acidification, human toxicity and terrestrial ecotoxicity footprints.

The use of Aerial Drone UAV system and 3D Modeling facilitated the relocation and design of the farm facilities required for GAP and communication with the top level management. The life cycle inventory of aLCA improved the Internal Control System of GAP. The upgraded farm facilities and Internal Control system complied with GAP standard. Harmonized GAP with aLCA has provided quantitative environmental burdens of bell

SALAS, GERALD M.

Assessing resilience using socio-ecological production landscapes and seascapes (SEPLS) model : the case of Candaba wetlands, Philippines.—2019

Candaba wetlands is a key biodiversity area in the Philippines and a globally important ecosystem for waterfowls in the East Asian -Australian Flyway (EAAF). The wetland serves as a production landscape providing livelihood to the communities. This study aimed to assess the resilience of Candaba Wetlands' to different key drivers of change using the Socio-Ecological Production Landscape and Seascape (SEPLS) model. The study is composed of four parts (a) ecosystem profile, (b) land use/land cover change analysis, (c) resilience assessment and (d) scenario development. Based on the in-situ water quality analysis using a multiparameter probe and soil tests, the wetland water was found hypoxic and the soil had high

concentration of phosphorus and potassium. In terms of biodiversity, various species of birds, amphibians, fish and macrophytes were found in the area. The distribution of species was mainly due to feeding and foraging behaviors and habitat heterogeneity. The land use/land cover change analysis revealed a shift in land use and land cover from 1997 to 2016. It is characterized by a reduction in water body and an increase in built-up areas and bare soil. Through surveys and workshops with community members and local government officials, respectively, the Candaba Wetlands scored moderate to high socio-ecological resilience with agricultural biodiversity, knowledge, learning and innovation, and social equity and infrastructure contributing significantly. In the scenario development, the farmers envisioned better agricultural production, provision of support from the government, enhanced biodiversity and tourism in Candaba Wetlands. Through community-based management was preferred by farmers, the conservation and management of Candaba Wetlands would require a broader base of stakeholders including private landowners, government agencies, academic institutions, and civil society organizations. The SEPLS model can be useful tool in the management and development of other important socio-ecological landscapes as it highlights the value of local knowledge, techniques, rules ad norms.

SALVACION, ARNOLD R.
Modeling banana suitability and fusarium wilt distribution in the Philippines under changing climate -- 2019

SALVADOR, AMELITA R.
Assessment of the Potential Reduction of Greenhouse Gas Emission through Increased Use of Rice Hulls for Mechanical Dryers in Nueva Ecija, Philippines. – 2015.

This study was conducted to assess the environmental and economic gains associated with the use of rice hull as heat source for grain drying in Nueva Ecija. It also evaluated the greenhouse gas emission from the different uses of rice hulls in the province.

More than half (52%) of RH produced in Nueva Ecija are sold to cement to manufacturers, 35% to paper mills, 4% to poultry raisers and 2% to feed mills. Almost 7% of the RH produced is used as heat source for mechanical dryers (MD). Emission from indirect-fired rice hull fed furnace (RHF) developed by PhilMech for MDs amounted to 0.01563 kg CO_2e per ton of RH. Results of the study showed that cost emission for RHF is negligible while the cost of emission from other RH uses ranged from Php 580 to Php 849 per ton of RH. The current utilization of RHF for MDs can reduce the emission by 951 to 1,107 kg CO2e per ton RH. This has a corresponding value of Php 502.22 to Php 584.60 per ton of RH when transported and utilized in cement manufacturing firms and paper mills.

Increasing the utilization of RH as heat source for MDs in Nueva Ecija will reduce carbon emissions associated to RH transport and other RH activities. The use of MDs with RHF among farmers' and irrigators' associations must be encouraged to increase the utilization of RH for grain drying. Other policy options are identified to increase the RH use to mitigate GHG emissions.

SAMANIEGO, BADI R.
Changes in the Fish and Benthic Communities Within Marine Protected Areas of Different Ages in Batangas, Verde Island Passage, and the Perceived Benefits of Reef Fishers – 2015.

Studies of the marine protected areas (MPAs) have centered on its enhancement of fish and benthic communities, fisheries benefits, and potential improvements of stakeholders' well-being. However, these aspects of reef management are often treated separately. The study aimed to gain insights on the relationships of biological change in MPAs of different ages and the perceptions and attitudes of stakeholder towards these MPAs. Fish and benthic community data, and fishers' perceptions of MPAs were collected at twenty sites in Batangas representing "young", "moderate", and "old" MPAs. The results showed that MPAs enhanced the condition of benthic and fish communities through time. However, fishermen's perceptions indicated negative changes in the volume and quality of fish caught especially immediately after MPA establishment. While stakeholders perceived negative changes in their catch, the attitude of fishers towards MPAs remained positive, especially in locations with moderate-aged and old MPAs, where tourism and alternative livelihoods were developed. Together with biological and ecological bases of MPAs, the success of MPAs in enhancing the well-being of stakeholders that result in positive attitudes and support for the project lies heavily on socioeconomic factors such as the development and availability of alternative sources of income, continual education and capacity building of stakeholders.

SAMIR, TOPNO E.

Environmental Performance and Energy Recoverable from Stored Rice Straw Bales in Humid Climate. – 2015.

The environmental performance and recoverable energy from stored rice straw bales with different storage methods and time for energy production were determined. Rice plants were harvested, baled, transported and stored with different methods. The effects of different storage methods and time on physical and chemical properties and energy were also determined.

The high heating values of dry rice straw bale did not fifer significantly whether they were stored under the roof and outside with and without tarpaulin cover. For wet rice straw bales these did not also differ significantly among storage methods in the wet season. In the dry season, the high heating values of wet rice straw bale was higher with storage outside than under the roof.

After four months of storage those that were stored under roof and outside with HPDE tarpaulin covers had comparable reduction in high heating values (5-7%). Those stored outside without tarpaulin cover had higher reduction in high heating values (15-17%) and higher solid waste generation.

The cost of rice straw bales stored outside (USD 22-26 t^{-1})was comparable to those stored outside covered with HDPE tarpaulin (USD 25 $^{t-1}$); however the former had the lowest net income (USD 559-580 t^{-1}) than with tarpaulin cover (USD 733-767 t^{-1}). Indoor storage had comparable net income USD 733-767 t^{-1} with outdoor storage with tarpaulin cover.

From harvesting of rice to storage of rice straw bales had very high net energy (98.2%) with climate change potential of 706 kg CO_2 emission t^{-1} rice straw bale. N, P and C content significantly changed during storage. The stored rice straw bales four months under the roof and outside with tarpaulin cover had comparable in high heating values (3-6%) irrespective of seasons and initial moisture content. Outside storage of rice straw bales without cover had higher loss of energy of about 15-17%.

SAMSON, MARICAR S.

Environmental management of mangroves and brackish-water ponds in the Philippines. -- 2011

The inverse link between the remaining mangrove cover and extent of brackish-water ponds has been well established. Although efforts toward reverting idle ponds into mangrove forests had been numerous, such seemingly straightforward approach towards mangrove rehabilitation appeared to be much more complex. This study presents a roadmap towards harmonizing mangrove rehabilitation efforts and brackish-water pond utilization in the Philippines. To achieve this goal, the following were conducted: mapping and review of the extent of remaining mangroves and status of brackish-water ponds; review of management approaches implemented; financial and economic valuation of management options identified; and development and application of a vulnerability assessment tool to demonstrate the importance of idle pond revegetation in mitigating impacts of climate change.

The proposed road map aims to assess the status and protect the estimated 280,350 hectares of remaining mangrove areas and assess the status of around 230,000 hectares of brackish-water ponds towards the revegetation of 69 percent and production optimization of 31 percent of these existing brackish-water ponds. The revegetation of these idle ponds was demonstrated to be necessary in increasing the resilience and adaptation of mangroves and coastal communities to climate change.

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 feathers 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 burdens 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 the MWS and White collared kingfisher, Pied fantail, White browed crake, 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.

SANDOVAL, ROBERTO PEDRO ISABELO C.
Rapid vulnerability assessment of small island ecosystems to temperature and rainfall variability in Alibijaban island, San Andress, Quezon, Philippines. – 2011.

A rapid bottom-up resource-based vulnerability assessment was conducted in Alibijaban Island, San Andress, Quezon to analyse current biophysical and socio-economic vulnerabilities to temperature and rainfall variability, typhoon occurrence, and other community-observed manifestations of climate variability.

The vulnerabilities of Alibijaban Island include : observed climate variability that increase the exposure of Alibijaban Island to the impacts of climate change and triggers complex interactions between biophysical and socio-economic subsystem components; disturbed biophysical subsystems that are sensitive to climate and anthropogenic stress; Socio-economic conditions that increase sensitivity and reduce adaptive capacity and lead to antropogenic activities that put pressure on the biophysical subsystem; and dominance of and dependence on climate-sensitive livelihoods.

Climate change adaptation options/strategies identified include rehabilitation of the mangrove forest, seagrass meadows, and coral reefs; establishment of fish sanctuary; trainings and other activities that will facilitate access to non climate-sensitive livelihoods; establishment or revival of a Peoples Organization to facilitate access to capital; and increasing access to important development institutions.

The study recommends the adoption of a rapid bottom-up resource-based vulnerability assessment methodology that will include participatory assessment tools in both biophysical and socio-economic components to equip island residents with knowledge and skills that can be used in monitoring the health of ecosystems and adjusting adaptation strategies depending on ecosystem responses and dynamics and climate variability.

SANTOS, LARRY A.
Life Cycle Assessment of Sweet Sorghum Co-products of Community-based Small Scale Production Systems in Batac City, Ilocos Norte, Philippines. -- 2016

Environmental and social life cycle assessment of community-based small scale production systems of sweet sorghum co-products (flour, grain for feeds, powdered sweetener, syrup, vinegar and hand sanitizer) was conducted to determine their significant impacts during production and processing stages. From gate to packaging was the life cycle boundary following the methodological framework for LCA consisting of four phases; goal and scope definition, inventory analysis, impact assessment and interpretation. Seed crop of SPV 422 variety was grown on rainfed lowland rice farms after rice. Low moisture availability resulted to low grain and striped stalk yields compared to study with the same variety in the trials of Mariano Marcos State University, Batac City, Ilocos Norte. This affected the values of the functional units. Market prices of the products were used to allocate the inputs and environmental impacts for co-products. Nitrate pollution potential was used as one of the environmental impact categories.

Fertilizer application, use of fossil-based fuel for mechanized cultivation and pumping groundwater irrigation were hotspots in co-production of sweet sorghum grain and juice. Use of electricity for milling, a processing hotspot for flour production, resulted to its higher environmental burdens than the grain for animal feed.

Fuelwood-used for pasteurization was the common processing hotspot for four products and for distillation of alcohol. Use of electricity was the additional processing hotspot for powdered sweetener. For juice products, vinegar had the least environmental burdens while hand sanitizer, the highest. Mitigating measures were recommended to reduce environmental burdens of each product. Community-based production systems of sweet sorghum co-products by the cooperative had complied with Philippines labor laws for the farm workers.

SARINAS, MARIPRES U.
Analysis of Tourism Development in Tayak Adventure, Nature, and Wildlife (TANAW) de Rizal in Rizal, Laguna, Philippines -- 2019.

This study assessed the tourism development in TANAW de Rizal in the municipality of Rizal, Laguna, Philippines by examining the area's existing resources, attractions, amenities, and land uses, including its environmental issues and other concerns. The current tourism conditions along with the LGUs' various plans and future projects were analyzed to determine the potential direction of tourism development in the park based on the characteristics of the different tourism subsectors that are relevant

to the study area namely, the ecotourism, adventure, nature, wildlife, health and wellness, and religious subsectors. The perceptions and attitudes of the host community and the visitors towards the existing tourism as well as their suggestions for future development were incorporated in the analysis of the potential direction for TANAW de Rizal's tourism development. The findings revealed that the park is more viable for ecotourism and that all the tourism subsectors studied can complement each other and may form the ecotourism make up of TANAW de Rizal.

SAZON, ROWENA R.
Environmental Impacts of Mining Operations on the Riverine Ecosystem of Sta. Cruz, Zambales, Philippines – 2016.

The impact of nickel ore mining operations on the riverine ecosystem of Sta. Cruz, Zambales was investigated. Water and sediment quality of Alinsaog River across four stations and sampling periods was assessed using physio-chemical parameters. The river exceeded the limit for Class C water (DAO 34, s. 1990) in terms of dissolved oxygen, total dissolved solids and chemical oxygen demand. The mean concentration of Ni, Mn, Cr, Sr, and Ba in the sediments exceeded the threshold effect level, low effect level and probable effect level prescribed in NOOA guidelines for inorganics while Fe exceeded the probable effect concentration suggesting their possible adverse effects to aquatic biota and ecosystem. The number of taxa, density and abundance of plankton and benthic macroinvertebrates were relatively low and the identified species could indicate oligotrophic status of the river and metal pollution. The mean thickness of laterite deposit on the rice fields and ponds were 13.9 cm and 62.5 cm, respectively. Ni, Co, Cr and V exceeded the Canadian CCME limits while Fe and Mn did not meet the Eco-screening level for plants and microbes indicating the unsuitability of the soil for agricultural purposes. Metals in mangrove sediments were in the order of Fe>Ca>Cr>Ni>Mn. The metal accumulative capacity of the five mangroves and associated species was also evaluated. Generally, accumulation of metals in all species was in the order of root>stem>leaf. All of the tested species have the capacity to accumulate metals based on bioconcentration factor (BCF). *Sonneratia alba* tend to immobilize Cr and Ni on its pneumatophores while *Rhizophora apiculata* and *Avicennia* sp. also did not translocate Cr to upper plant tissues indicating their potential for remediation of Ni-Cr polluted riverine ecosystem. The magnitude of impact to the environment and on the livelihood of the subsistence farmers and fishermen necessitates that the Mine and Geoscience Bureau (MGB) and other agencies should reconsider valuating the social cost and benefits of mineral resource exploitation in Zambales.

SIA SU, GLENN L.
Health impacts in Payatas dumpsite in Quezon City, Philippines -- 2004

No significant differences in the health-related parameters (NO3-N, total cadmium, total lead, total chromium and total coliform) of the groundwater sources of communities 'with' (Barangay Payatas) and 'without dumpsite' (Barangay Holy Spirit) areas were observed. However, aesthetic-related parameters : TDS, conductivity, salinity and SO4 were significantly higher in the 'with dumpsite' area. DENR and DOH water quality standards were not exceeded for most parameters, except for TDS, TSS, pH and total coliform. The dose-response function confirmed the absence of significant impact on diarrhea incidence by the health-related parameters, with significant but negligible effect obtained from the parameters SO4 and total cadmium.

The economic dependency of the people on the Payatas dumpsite is high with about 44% dependent on the site working either as scavengers, vendors and junkshop operators. Estimation of income revealed that on daily basis, a scavenger earns a net income of PhP 131.00, a vendor ears PhP 114.25 and a junkshop operator earns PhP 323.00. The earnings sufficiently cover their daily household's expenditures.

In light of this economic dependency and lack of established health impact, it is not surprising that people continue to engage and live close to dumpsites. This study recommends more in-depth analyses on other illnesses linked to exposure to dumpsites.

SILVESTRE, PRIMA R.
Drought Risk Management through Rainfall-Based Insurance for Rainfed Rice Production in Pangasinan, Philippines – 2014.

Climate risk management, which includes risk transfer through crop insurance, is an important and reasonable step toward reducing the agricultural losses due to typhoons, floods and droughts. Weather index-based insurance is an innovation in crop insurance which uses indices based on weather parameters to characterize crop loss or failure. It uses historical weather data from reliable weather gauging stations and

its main issue is the determination of weather index that is closely correlated to crop yield loss. In this study, the rainfall-based crop insurance model for drought risk is based on the amount of the cumulative daily rice crop water requirement for vegetative stage, reproductive stage and maturity stage which are 270 mm, 210 mm, and 180 mm, respectively. Cumulative rainfall deficit from these threshold values indicate yield loss that serve as basis in the computation of payout. The amount of premium rates calculated based on the values of the probability of drought varies with planting period. For Pangasinan, the planting periods with minimum drought risk and consequently with low insurance premiums are from the fourth week of May to third week of June.

The study also pointed out the challenges and constraints in the implementation of rainfall-based insurance that need to be addressed through institutional and policy recommendations, namely: (a) availability of weather gauging station; (b) affordability of insurance premium; and (c) policy support and regulatory framework for implementation of weather index-based insurance.

SOMPHONG, CHANTHAVONG

Human-Plant Diversity Interaction in Dong Na Tard Provincial Protected Area, Lao PDR and Implication for Priority Conservation Planning. – 2016.

The study on human-plant diversity interaction and implication for priority conservation planning was conducted in Dong Na Tard Provincial Protected Area, Lao PDR where the ecosystem services were affected by human activities. This study aimed to assess the plant diversity in the area and come up with a conservation planning for both plants and local people. System approach based on system analysis was used for understanding and the solving environmental complexity.

A total of 675 individuals, 70 species, and 33 families of plant diversity were documented in the park and were grouped into six forest zones: Zone 1: *Dipterocarpus* spp–*Afzelia xylocarpa–Diospyros malabarica*, Zone II: *Artocarpus* spp- *Ziziphus cambidiana- Dipterocarpus* spp., Zone III: *Dipterocarpus* spp.-*Irvingia harmandiana-Dialium indum*, Zone IV: *Dipterocarpus* spp–*Anisoptera costata–Solanum torvum*, Zone V: *Dipterocarpus* spp.-*Dipteroarpus macrocarpus-Syzygium tinctorium*, and Zone VI: *Eucalyptus* spp.-*Tectona grandis* plantation. For effective conservation of such species, 4 Critically Endangered (CR), 23 Endangered (EN), 31 Vulnerable (VU), 11 Near Threatened (NT) and 1 Least Concern (LC) were categorized by this study. The first and second priority areas which totaled 3,303 ha and 1,664 ha, respectively were presented as core areas. The remaining 1,303 ha were identified as the transition areas or areas of cooperation. These were separated by buffer zones widths of 155 m in section I, 160 m in section II, 174 m in section III, and 189 m in section IV, respectively.

The environmental variables, human disturbance, and socio-economic characteristics of local people were the driving forces of plant diversity threats. The study on the issues is vital as a scientific approach for solving the environmental complexity. The results of the study can be used to develop conservation plan, policies, and strategies for sustainable utilization of plant diversity and for improving the well-being of local people. A strong support for a conservation program and strict enactment of laws are imperative to address the threats to plant diversity loss.

SOPSOP, GLENN O.

Litter and soil anthropod assemblages in environmentally critical areas network in Palawan Island, Philippines – 2015.

Environmentally Critical Areas Network (ECAN), a graded system of protection and development control, is the strategy adopted through Republic Act 7611 for the Strategic Environmental Plan (SEP) for Palawan and divided the province into Core Zone (CZ), Buffer Zone (subdivided into Restricted Use Area (RUA), Controlled Use Area (CUA), Traditional Use Area (TUA), and Multiple Use Zone (MUZ). The assemblage patterns of litter and soil anthropods were investigated to determine their conformity with ECAN zoning and the driving factors (vegetation, litter attributes and soil properties).

The vegetation variables were significantly different among the sites with CZ, RUA and TUA having more complex vegetation structure than other sites. Litter quantity in CZ and RUA was higher than other sites but the quality did not show a distinct pattern. Only soil temperature and moisture content conform with the ECAN zoning and the low soil nutrients among the sites had no discernable pattern.

The overall abundance and species richness assemblage of litter and soil arthropods significantly differed among the sites. However, they did not conform with the ECAN zoning but appeared to be affected by human disturbance, which occurs even if prohibited. The ECAN sites maintain distinct species composition and structure of litter and soil anthropods and conformed with the zoning. Influence of vegetation, litter quantity and quality, and soil properties on the abundance and diversity of litter and soil arthropods appeared to be taxon-specific and driven by vegetation, which, in turn was affected by human disturbance.

Human disturbance appeared to be the main driver of litter and soil assemblage pattern in ECAN zones. Strict implementation of the law through close monitoring of human activities in each ECAN zone is recommended to avoid faunal collapse.

SOPSOP, LITA B.

Human-forest interaction in Aborlan Guba System, Palawan island, Philippines and Implications for conservation and management. -- 2010

The dynamics of human-forest interaction in Aborlan Guba System, Aborlan , Palawan was determined by doing floral and social surveys and by using the STELLA program for model development. #Of the 324 vascular plant species in 192 genera and 8 families recorded, 59.9 percent were rare, 401.1 percent were abundant; 20 percent were endemic, 9 of which can only be found in Palawan; 6 were suspected as new to science and 14.5 percent were threatened in some Red List.

The mean number of trees (GBH .10 cm) was 2,470 per ha (c.l. +396, P0.05) of which 49.6 percent were small (3-40 cm GBH) while 18.3 percent were big (100 cm GBH). #Cluster and principal component analyses revealed four forest associations with environmental variables significantly influencing the spatial distribution of tree species. Human impact was inversely proportional with species richness (r2=0.968).

The direct users of the forest were poor Indigenous Peoples and migrants. Income, family size, education and size of cultivated farm significantly influenced the harvest frequency of forest products.

The model projected that with the present economic condition, population and reforestation program, forest cover declines at 3 ha per year and by 2031, 33 percent of the species will be lost resulting to PhP 789,91 annual loss.

The best way to sustainably management the Aborlan Guba System is by increasing people's income, reducing population growth and increasing reforestation efforts. For immediate protection, the area must be upgraded from a Controlled Use Zone to Core Zone but declaring it into a Protected Area under NIPAS law ensures its long term sustainability.

SUBADE, RODELIO F.

Economic valuation for biodiversity conservation of Tubbataha reefs national marine park and world heritage suite, Sulu Sea, Philippines -- 2004

The economic valuation of biodiversity conservation in Tubbataha Reefs National Marine Park (TRNMP), a UNESCO world heritage site located in Sulu Sea, Philippines was determined using contingent valuation method (CVM). This site is highly rich in marine biodiversity, has been a popular scuba diving destination around the globe, and has supported the neighboring fishing grounds with its teeming fisheries, but has been greatly threatened by society's wasteful and destructive use. the willingness-to-pay (WTP) of Filipinos, particularly non-users, to contribute to biodiversity conservation of TRNMP was assessed in tree cities : Quezon City, Cebu City and Puerto Princesa City. Two variants of data collection, personal interview (PI) and self-administered survey (SA) were employed in a dichotomus choice -- referendum contingent valuation method (CVM) with 3200 respondents.

Across sites and CVM modes, 41% of 2591 valid observations (47 percent for PI and 31 percent for SA) were willing to pay to a trust for biodiversity conservation of TRNMP. The main motives for positive WTP were bequest value/motive (concern for future generations), existence value/motive, altruistic value/motive and good cause. The main reasons for non-willingness to pay were : limited income, the thought that conservation would take place without the respondent's contribution, and mistrust on the institutions who would handle the conservation funds.

Bid price significantly and negatively affected willingness to pay, while annual income, education, familiarity with marine biodiversity, and education level positively contributed to WTP.

The average WTP values using SA (PhP 233 for Quezon City, PhP 135 for Cebu city, and PhP 278 for Puerto Princesa City) was lower than the values obtained using PI (PhP 437 for Quezon City, PhP 285 for Cebu City, and PhP 496 for Puerto Princesa City). For the household population of the three cities the aggregate WTP ranged from PhP 141 million using SA to PhP 269 million using PI. This amount represents a potential source of financing for the protection of TRNMP. A conservative estimate of the latter was placed at PhP 10 million. This points to huge potential of tapping non-users' contribution to financing conservation of TRNMP. Efforts on developing mechanisms to do so are called for.

SUPERALES, JERRY B.

Organic matters turn-over of Rhizophora species litterfall and its socio-economic implications on the local coastal dwellers at Moro gulf, Western Mindanao, Philippines -- 2007

Mangroves produce large amounts of organic matter through litterfall, which is exported as an influential carbon source to adjacent coastal ecosystems in the tropics. Overexploitation and land use conversion of mangroves for different human economic activities greatly contribute to the declining area covered by mangrove forests in the Philippines. This corresponds to losses of organic matter and nutrients coming from mangrove leaf litterfall to the mangrove ecosystem.

The leaf litterfall and its potential nutrient content (OM, N,P and K) were quantified and compared between sites. In order to determine the socio-economic implications of mangrove with the Rhizophora spp., it has to be assessed against without mangrove scenarion.

Rhizophora mucronata was the highest producer of leaf litter (323.2 g tree -1 mo-1), while R. stylosa the lowest (78.2 tree-1 mo-1). The leaf litter DM ranges from 760 to 831 kg dw ha-1 yr-1/ The yearly leaf litter yield of Rhizophora species is about 2,140 g tree-1 and potentially contributes about 6 kg OM month-1, 3 kg C mo-1, 0.3 kg N mo-1, 0.006 kg P month-1, and 0.33 kg K mo-1. These are the relative contribution of Rhizophora species to the mangrove nutrient pool. The decomposition rate (k) of these species ranged from 0.010 - 0.038 g day -1. There were about 46 fish species and 39 species of benthic macroinvertebrates found foraging along the more or less 20 km2 mangrove-shoreline in the study sites, Mangrove support the costal fisheries bearing on livelihood opportunity and quality of life particularly in the local coastal community of Moro Gulf, Western Mindanao.

TANQUILUT, NEIL C.

Biosecurity Assessment of Poultry Farms in Central Luzon, Philippines. – 2020.

The biosecurity status of broiler (n=397) and layer farms (n=124) in Central Luzon, Philippines were assessed quantitatively using Biocheck.UgentR . Biosecurity measures in the survey tool were classified into subcategories (external and internal biosecurity) and subcategories. The overall biosecurity scores of broiler and layer farms were 71.2% and 65.9%, respectively. Subcategory scores per farm were also generated to specifically determine which biosecurity area needs to be prioritized for improvement. Basic biosecurity compliance of duck farms (n=171) in Candaba, Pampanga, Philippines and backyard poultry farms (n=604) in four barangay (villages) in Magalang, Pampanga, Philippines was also assessed descriptively. Duck and backyard poultry farms had poor compliance rating of 69% and 45%, respectively. The trading network analysis of duck products revealed very extensive geographic distribution. Distances between backyard poultry farms was also analyzed to determine its possible role in disease transmission. The potential of commercial poultry farms to transmit Highly Pathogenic Avian Influenza virus in Central Luzon was also evaluated by calculating reproductive ratios. This has demonstrated the utility of mapping farm-level reproductive ratio estimates to facilitate prompt management to control and prevent infectious diseases. To date, this is the first quantitative assessment of biosecurity in broiler and layer farms in the Philippines. The findings will serve as basis to improve the status of poultry biosecurity and craft the local and national biosecurity program of the country.

TAN, ANDREW EUSEBIO S.

Collective action, adaptive and transformative capacity of communities affected by oil spill in Guimaras, Philippines -- 2009

Collective action, adaptive capacity and transformative capacity of three selected communities affected by the oil spill in Guimaras in August 2006 were investigated using both the qualitative and quantitative approaches in research. Questionnaire elicits data on their level of adaptive and transformative capacity. Focus group discussion, in-depth interviews, observations and narrative analysis were employed for qualitative data.

Results showed that forms of collective action can be categorized based on actions through formal organization, informal organizations and spontaneous actions. Most actions' realization were attributed to outsiders other than the affected residents. Their motives in engaging collective actions were predominantly self-serving. Their adaptive capacity is fairly adaptable (55.35) as revealed by the household adaptive capacity index. Communities' collective action strengthens adaptive capacity when the objectives and manner of carrying it out is sustained. It is contrasting when inappropriate understanding and knowledge of such actions were apparent. The desired trajectories as transformative capacity were not evident as there are decisions and actions needing redirection. The spill was not seen as an opportunity by the residents in further improving the existing social institutions. Instead, the decisions made were all based on their intuition and expediency without consideration for future and long term consequence.

The study concluded that there should be an institutionalization of process and systemic change. Prescriptive approach by outsiders should be discouraged. Spontaneous actions and those attributed to informal organizations must be hastened with the understanding that these are for long term benefits and sustainability. Its realization will further strengthen the community's adaptive capacity in addressing future hazards.

WELLA TIU TATIL
Ecological-Economic Approach in Developing Sustainable Management Options for Beach Forests in Iligan Bay, Mindanao, Philippines. -- 2023

This study used ecological and economic attributes of three beach forests in Iligan Bay to estimate the benefits of its ecosystem services (provisioning and regulating) and, in turn, provide options for coastal stakeholders to sustain their beach forests. The beach forests studied, composed of moderately diverse plant communities, were important to coastal settlements. As estimated, the beach forests provided products to the community valued at ~Php2,652,136 (Bacolod), ~Php1,477,732 (Naawan), and Php548,832 (Iligan City) for year 2023. The regulating service benefits (total C sequestered and stored) had economic values estimated at ~Php570,489 (Bacolod), Php229,025 (Iligan), and Php140,308 (Naawan). The subsequent trade-off analysis of three management options – _development, conservation, and business-as-usual options, at a discount rate of 10% for a 15-year period, revealed that the option to conserve beach forests could return higher net present value (NPV) estimates of Php19.46 M (Naawan) and 35.17 M (Bacolod). The Iligan site was excluded from this analysis since it was already declared as park and recreation zone. Therefore, based on NPV alone, this study proposes the conservation option over the development and business-as-usual, as this management alternative assures the sustainable delivery of the beach forests' provisioning and regulating services.

THEINT THEINT AUNG
Sustainable Solid Waste Management System for Pyin Oo Lwin Township, Myanmar – 2020

Pyin Oo Lwin is one of the scenic hilly towns in Myanmar. Throughout the years, there are many tourists visiting the place but unattractive garbage litters and open dumping of unsegregated garbage of households and commercial establishments are found in the area. Hence this study on solid waste management was conducted to: (1) assess the current solid waste management program and practices in different institutions; (2) assess the awareness on the threats of unsegregated waste and opportunities on segregation of waste; and (3) determine and assess the level of knowledge, attitude, perception, and practices of the households.

Per capita solid waste generation from the households is 0.397 kg/day where (a) 63%, biodegradable; (b) 12.57 %, recyclable; (c) 0.41%, hazardous; (d) 9.36% , residual; (e) 7.45%, single-use plastic bags; and (f) 5.42%, other plastic wastes.

About 68% of the respondents are aware of the threats of unsegregated waste. Education of the respondents has significant positive relationship with solid waste management. Occupation of the respondents has significant positive relationship with awareness on segregation of solid waste. Only 75% of the respondents are aware of the opportunities from solid waste segregation.

About 35.9 % of the respondents could properly identify the types of solid waste. Knowledge on and best practices of solid waste management did not differ among gender. However, attitude towards best solid waste management practices significantly differs among genders and occupation of respondents. They perceive that local government and the constituents are responsible for effective municipal solid waste management program.

Information education campaigns for all sectors of the community, collaborative transdisciplinary planning and management on solid waste management, incentive and disincentive local policies, support of the local government on infrastructure, enhancement of solid waste management governance and full commitment of the local with support from the village leader are the key steps to sustainable solid waste management.

TOPNO, SANIR E.
Environmental Performance and Energy Recoverable from Stored Rice Straw Bales in Humid Climate – 2015.

The environmental performance and recoverable energy from stored rice straw bales with different storage methods and time for energy production were determined. Rice plants were harvested, baled,

transported and stored with different methods. The effects of different storage methods and time on physical and chemical properties and energy were also determined.

The high heating values of dry rice straw bale dis not differ significantly whether they were stored under the roof and outside with and without tarpaulin cover. For wet rice straw bales these did not also differ significantly among storage methods in the wet season. In the dry season, the high heating values of wet rice straw bale was higher with storage outside than under the roof.

After four months of storage those that were stored under roof and outside with HDPE tarpaulin covers had comparable reduction in high heating values (5-7%). Those stored outside without cover had higher reduction in high heating values (15-17%) and higher solid waste generation.

The cost of rice straw bales stored outside (USD 25-26 t^{-1}) was comparable to those stored outside covered with HDPE tarpaulin (USD 25 t^{-1}); however the former had the lowest net income (USD 559-580t^{-1}) than with tarpaulin cover (USD 733-767t^{-1}). Indoor storage had comparable net income USD733-756 t^{-1} with outdoor storage with tarpaulin cover.

From harvesting of rice to storage of rice straw bales had very high net energy (98.2^%) with climate change potential of 706 kg CO_2 emission t^{-1} rice straw bale. N, P and C content significantly changed during storage. The stored rice straw bales four months under the roof and outside with tarpaulin cover had comparable loss in high heating values (3-6%) irrespective of seasons and initial moisture content. Outside storage of rice straw bales without cover had higher loss of energy of about 15-17%.

TORIBIO, MARIA ZITA B.
Analysis of factors and impacts of good environmental governance in coastal areas -- 2011

Step-wise and multiple regression analyses were conducted to explore the relationships between selected institutional, socio-economic and biophysical attributes of 31 study LGUs in Central Visayas, Philippines and their environmental governance performance. The latter was measured using the Guided Self Assessment on the State of Local Environmental Governance method. It was only the institutional factors, specifically the ability to leverage external assistance, political will and leadership, and LGU internal management capability that were found to be statistically significant influence on environmental governance performance. All socioeconomic factors tested- Internal Revenue Allotment, income class, population density, and degree of urbanization were found to have no statistically significant influence. Among the biophysical variables considered, only the size of forestland and the total land area of the LGU were found to have significant contribution to environmental governance performance. The regression analyses indicate mostly insignificant relationships between biophysical improvements and environmental governance performance. Nonetheless, qualitative data analysis, perception survey, and field observations suggest that good environmental governance can lead to environmental improvement. Improving local environmental governance offers a potent approach to environmental sustainability but the process takes time and needs outside assistance and higher level policy support.

TORRES, ARMI G.
Assessment of Fish Diversity and Environmental Conditions Towards Integrated Conservation of Endemic Fishes (Cyprinidae) of Lake Lanao, Philippines. -- 2018

Historical records show that Lake Lanao has 24 native fishes including 18 endemic cyprinids. Recent fish landing surveys reveal that Lake Lanao is dominated by introduced fishes, mostly by *Giuris margaritacea* (Eleotridae). Ten fishes are found, comprising one endemic and nine introduced species. *Barbodes tumba* is the only endemic fish recorded and is thriving mainly in river tributaries of Lake Lanao.
Using IUCN Red List of Threatened Species categories and criteria, three endemic cyprinids, *Barbodes sirang*, *B. lindog*, and *B. tumba*, are uplisted from Vulnerable to Critically Endangered. The remaining 15 endemic cyprinids have disappeared for over 30 years and are considered Critically Endangered “Possibly Extinct”. The endemic cyprinids are mainly threatened by invasive alien species. Fish introductions resulted in catastrophic disappearance of endemic and other native species affecting almost 20,000 fisherfolk.

A combination of *ex-situ* (offsite) and *in-situ* (onsite) conservation approaches under community-based resource management may yield high species recovery and success. Habitats of *Barbodes tumba* should be protected and rehabilitated. Breeding and stock enhancement programs must be implemented. Equally important is to locate surviving individuals of *B. lindog* and *B. sirang*. Governance of Lake Lanao is weak. Institutionalizing its management with active participation of all LGUs and communities surrounding the lakeshore is paramount.

TRUC, NGO THI THANH

Comparative assessment of using rice straw for rapid composting and straw mushroom production in mitigating greenhouse gas emissions in Mekong Delta, Vietnam and Central Luzon, Philippines. – 2011.

The study aimed to assess two alternative uses of rice straw (rapid composting and straw mushroom production) in mitigating greenhouse gas emissions in Mekong Delta, Vietnam and in Central Luzon, Philippines.

The study was surveyed 417 farmer-respondents in addition to focus group discussion in Mekong Delta (O Mon and Cai Lay) and Central Luzon (Munoz and Santo Domingo). Interviews with current adopters and key informants of rapid composting and straw mushroom production were also done in the sites in order to assess the current rice straw practices, described farmers' awareness and perception and determine the factors affecting farmers' acceptance of the two alternative uses of rice straw. The greenhouse mitigation potential was estimated through the reduction of methane emissions when shifting from the current rice straw practices to the alternative uses and then monetized through the carbon dioxide equivalent (CO2 eq). Economic feasibility was assessed by determining the net present values (NPV) of the incremental net benefit of the alternative uses.

The survey shows that majority of the rice straw in Mekong Delta and Central Luzon was burned. In Mekong Delta, a small percentage of rice straw was used to grow mushroom, left in the field and used to feed cattle while rice straw in the Central Luzon was left in the field, used as feed for cattle and mulching.

The study also found that farmers have low awareness on the use of Trichoderma for rapid composting. The factors affecting the acceptability of the Trichoderma using the logit model show that household income and perceptions are significant factors of Mekong Delta and Central Luzon. Farm size is another significant factor in Central Luzon. For straw mushroom production farmers have good awareness, however the level of engagement was low. For factors affecting farmers' acceptance to grow straw mushroom, household income and household size are significant in Mekong Delta while household income, farm size and willingness to learn more about straw mushroom are significant in Central Luzon.

Among the rice straw uses, rapid composting and straw mushroom production emit less methane than other current uses (leaving or incorporating in the field, feeding cattle and burning. Growing mushroom gave the highest net benefit while leaving straw in the field give negative net benefit in both countries.

The highest NPV and CO2 eq reduction were from shifting from dump burning to straw mushroom production (Mekong Delta) and shifting from leaving rice straw in the field to straw mushroom production (Central Luzon). Both yield higher NPV and CO2 eq reduction that shifting to rapid composting.

To enhance adoption of rapid composting and straw mushroom production, the policy options that can be applied are : 1) upgrade farmers' knowledge about rapid composting and straw mushroom production, 2) set up supply system of activators and mushroom spore, 3) conduct more research producing and applying rapid compost to paddy and other crops, especially non-flooded crops and improving straw mushroom techniques and spore quality, and 4) set up marketing activities for straw mushrooms.

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.

VERGARA, SHEILA G.

Comparative models of establishing operational and knowledge networks for coastal management training in the Southeast Asian Region. -- 2005

Vietnam and Indonesia were case study sites selected to test the feasibility of transferring knowledge in the form of an Integrated Coastal Management training and networking package developed in the Philippines. This study sought to identify factors that may have facilitated or constrained the knowledge transfer to these two countries, recommended a framework for ICM training implementation for Southeast Asia and contribute to the evolution of theories related to the mechanics of knowledge transfer for ICM training development.

The study was conducted from January 2001 until December of 2003. Actual ICM training development and networking of partners was conducted and data were collected through process documentation, analysis of cases and impact evaluation surveys.

Results of the study demonstrated that the transfer of knowledge on ICM training development and networking was feasible with some modifications compared to the Philippine situation. In the case of Vietnam, the decision making patterns providing feedback and modes of motivating module developers were modified to suit the local situation. In Indonesia, where training facilitators were observed to be more advanced than the Philippines, more effort was invested on improving inter-institutional dynamics. Some factors identified to contribute to ICM training development were the change agents' familiarity and understanding of governance mechanisms, institutional dynamics, respect for culture and the availability of much needed expertise on the training development process, in an environment of trust and teamwork that sustained the collaborators' interest. These factors should be incorporated into a framework that supports improved ICM services through enhanced capacities of stakeholders. It established the necessity of building the necessary social capital that supports the effective pursuit of capacity building for ICM in Southeast Asia. Without investments in networking among stakeholders and expert groups, capacity building for ICM will remain one shot training events, deprived of the human drive that will steer ICM as a real means for conservation and sustainable coastal management in the region.

VILLANUEVA, LEAJIM A.

Management Framework Development for Small Island Ecosystems, Case of Polillo Islands Seascape. -- 2023

The Philippines, as an archipelago, boost an extensive seascape environment. With more than 7,100 islands, the coastal communities that inhabits these important socio-ecological systems benefit from the strings of ecological services that supports human well-being and are important for community survival. However, seascapes are in danger from unsustainable resource utilization patterns which influences its capacity to provide services and benefits. The changing seascape influences the change in suits of ES that is available. Understanding the role of population dynamics, as well as the institutions that govern management is important to develop a management framework which would guide intervention directions. This study made use of the case of Polillo Municipality, an important conservation area part of the Polillo Islands Key Biodiversity Area. There are four study objectives which include: 1.) Evaluate the influences of population dynamics on the seascape condition of Polillo Islands; 2.) Describe the change in ecosystem services from the seascape environment; 3) Describe the influences of institutional setup and political structures and dynamics on the management of seascape of Polillo Islands; and 4.) Propose a management framework for island ecosystems using the case of Polillo Islands. To achieve these objectives, there are various methods employed from remote sensing and spatial analysis and combining geographic information system with data on population dynamics. Focus Group Discussion, Key Informant Interviews were also done. ES maps were also developed based on available data using satellite imageries acquired for the study

site. Scenarios which are done to define the Business as Usual (BAU) direction and Desire Future (DF) are developed through community consultations coupled with the used of Artificial Neural Network (ANN) through QGIS plugin MOLUSCE. Key findings shows that seascape change for the study site is dominated by the change to man-made environment, one which is agricultural in nature. The population increase overtime creates greater demand for livelihood and settlement areas. The decrease in natural seascape is perceived to have resulted to change in the services that are available for local communities. There is a general perceived decline in ES including characteristics of living systems that enable aesthetic experiences, elements of living systems used for entertainment or representation, hydrological cycle, and water flow regulation (including flood control, and coastal protection), and wild animals (terrestrial and aquatic) used for nutritional purposes. The changing management framework from one that is highly centralized to that which involves more of the local government resulted to differences in programs implemented across the seascape elements. Given the current trend of decline, a Business-as-Usual Scenario versus a Desired Future scenario was made as basis to develop strategic responses as part of the management framework for small island ecosystem using the case of the study site, Polillo Island seascape.

VILLANUEVA, SALVACION P.
Effectiveness of the multipartite environmental monitoring team of the Pagbilao coal-fired thermal power plant in Quezon Province, Philippines.

Using focus group discussion (FGD) and key informants interviews (KII), some 63 stratified and randomly selected respondents were interviewed on their perception of the effectiveness of Pagbilao Multi-partite Monitoring Team (PMMT) in monitoring the Mirant Pagbilao Coal-Fired Thermal Power Plant (MPCFTPP) in Quezon Province. The performance of PMMT in monitoring the environmental compliance of MPagC power plant was found efficient. Ninety percent of those interviewed rated PMMT's performance as highly effective.

The five factors perceived to have wielded impact on the level of performance were all found to be highly influential : ie. Availability of financial resources was rated the highest at score of 4.5. This was followed by the social environment at 4.35 then by the knowledge of DENR environmental policies at 4.04 and MpagC commitments and third party audit with a rating of 4.0. PMMT's internal was given the least rating at 3.75 but this was still considered acceptable.

The rating jibed well with the results of various compliance reports on the quality of environment in Pagbilao. MPagC had complied satisfactorily with all the eight (8) major conditions set forth in the ECC. The results of PMMT's monitoring activities showed that the quality of air and water at the sampling stations were generally compliant with the standards set by the DENR and all the relevant environmental guidelines, particularly in the operations of its Power Station were adhered to. The company's environmental and social development activities were likewise satisfactorily complied with.

Although PMMT was already found to be an effective mechanism in environmental monitoring of MPCFTPP's operations, areas recommended to improve this are : (a) PMMT organization should be revised, together with the criteria used in the selection of PMMT members, (b) functions of PMMT regular and sectoral members should be redefined, (c) current PMMT fund management needs to be improved, and (d) incentive system must be provided to project proponents to improve their environmental performance. Research thrusts were also recommended for future scientific investigations.

WANGDALE, REBECCA G.
(no copy)

YAMUTA, DENNIS T.
Environmental Implications of Antimicrobial Resistance by a Novel Biosensor Developed for Klebsiella pneumoniae (Schroeter) Trevisan in a Dairy Cattle Farm in Misamis Oriental, Philippines. -- 2023

A colorimetric DNA-based biosensor was developed to detect genomic DNA (gDNA) of antibiotic-resistant Klebsiella pneumoniae, for use as a more convenient and reliable method for detecting antimicrobial resistance (AMR) in environmental samples.

The biosensor was field-tested on local cattle farm-wastewater. Together with the results of farmer-interviews on their antimicrobial-use handling, and disposal practices, possible factors leading to the detection or non-detection of AMR were analyzed. Environmental issues (and solutions) on AMR in Philippine cattle dairy farms were also discussed. The biosensor utilizes gold nanoparticles (GNP) as signal reporter, with direct assay of the K. pneumoniae-resistant gDNA. The color images from the assay were processed by an image-processing algorithm. Results showed that color intensity was directly proportional to the concentration of target gDNA, with the lowest sensitivity level at 0.01ng/µL. The biosensor was also

highly specific to target gDNA when tested with other interfering gDNA. Biosensor field-test and interview results identified possible risk factors that could lead to AMR detection in the test site. These include unmanaged antibiotic prophylactic use, prolonged antibiotic treatment beyond recommended protocol, and disposal of drug bottles, expired drugs, etc. in a pit without proper containment. Hence, a holistic approach to the management of antimicrobial-use must be implemented, engaging stakeholders in massive information dissemination and education campaigns and formulating appropriate strategies to control the spread of AMR.