

Build an Artificial Coral Reef Community Extension Project: An Impact Study

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Originality: 100% • Grammar Check: 95% • Plagiarism: 0%



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ABSTRACT

Coral reefs are ecologically important as they provide shelter and life support to the marine resources, sustain ecological balance, and human existence. Coral reef degradation is an ecological problem that needs human intervention and is considered a school's social responsibility. The USANT College of Maritime Education and College of Engineering and Architecture rationalized social responsibility in partnership with the Bureau of Fisheries and Aquatic Resources (BFAR) and the Philippine Coast Guard Auxiliary (PCGA) and the barangay Pararao, Balatan, Camarines Sur, Region V, Philippines. The researcher used the Impact Evaluation and Study Design substantiated by an FGD and Underwater Diving of BFAR marine specialists to ascertain the impacts of the artificial coral reef project in drawing environmental awareness and determine the actual effect of the artificial coral reefs as shelters and spawning sites of fishes. Findings reveal that communal participation in safeguarding the vicinity of the reefs emanating at the barangay level is evident; the community folks had gained an understanding of the role of coral reefs in the ecosystem and school of fishes shoaled in the vicinity. Thus, this coral reef project drew positive attention, reduced minimalistic attitudes, and increased environmental awareness. The artificial reefs now serve as

natural habitat. Active partnership and participation of the stakeholders and the provision of budget are imperative to sustainable project implementation.

Keywords — Ecology, Social Science, Artificial Coral Reefs, Impact Evaluation, Impact Evaluation, and Study Design, Philippines

INTRODUCTION

Coral reefs are some of the most productive ecosystems on earth that support the marine living organisms at sea that reverberates to the survival and growth of other living organisms on earth. Also known as the rainforests of the sea (Shannon, 2018; Swart, 2013), fishes, corals, lobsters, seahorses, sponges, and sea turtles are only a few of the thousand creatures that rely on reefs for their survival, according to the National Oceanic and Atmospheric Administration, (NOAA, 2017).

“Reefs at Risk Revisited” (2011) reported that 75% of the coral reefs are at risk from local and global stresses. Ninety (90%) of the coral reefs will be in danger by 2030 and nearly all of them by 2020. The drastic increase in temperature (Jokiel, 2016; Banaguas, 2014) siltation, (Banaguas, 2014; White, Vogt, & Arin, 2000) and the impacts of long terms biophysical conditions (Banaguas, 2014), the accumulated human impacts and the combined with current fishing pressures and devastating coral mortality in 2015, have resulted in a degraded coral reef ecosystem state at Puakō in West Hawai i. Changes to resource management are needed to facilitate the recovery of ecosystem functions and services (Weijerman et al. 2018).

In the Philippines, overfishing, destructive fishing methods, and sedimentation have damaged and destroyed many reef areas, White, Vogt, & Arin, 2000). A study revealed that the manifestations of organic nutrients discharged from streams adjacent to the populated areas in Palau may cause a shift in the balance of corals and algae found in shallow barrier reefs, which can be aggravated by intense agriculture, land degradation, and overfishing, (Colin, 2009).

On this note, the responsibility of rehabilitating and mitigating the impacts of coral reef degradation and how each individual from all walks of life will be a potent factor should be the concern of the government, non-government organizations, schools, and families, and community. Schools can share the greatest responsibility as it caters to educating the minds, teaching the hearts, and making a difference (Soriano, 1995).

Schools contribute in two ways; rehabilitative and educative. The former deals with the artificial reef building activity while the latter pertains to the continuous environmental teaching of the community folks who are direct beneficiaries of the project.

The University of Saint Anthony (USANT) is not only concerned with providing quality education to the students but also in reaching out to help the marginalized sectors of the community through its corporate social responsibility initiatives and community extension projects. USANT's community services are not only limited to its adopted barangay but to other barangays, municipality, or towns within the Province of Camarines Sur it serves. It is in this context that the College of Maritime Education and the College of Engineering and Architecture decided to rationalize their goals through the Build an Artificial Reef Project in Pararao, Balatan, Camarines Sur. The project idea emanated from the people of BFAR; Region V coral reefs are diminishing. The College of Maritime Education and the College of Engineering and Architecture, in coordination with the Community Extension Service (CES) Office, decided to conduct an ocular inspection in the vicinity to be able to gain an idea on how and what project will be implemented.

The group then found out that the coral reefs in the said place started to vanish. It is in this perspective that the group decided to help the community by building an artificial coral reef to help the small fisherfolks to earn a living. The College of Engineering and Architecture also envisioned to provide livelihood programs for the people in the place while waiting for the reefs to grow to temporarily address the needs of the people in the place. The said project was realized with the help of the Bureau of Fisheries and Aquatic Resources (BFAR) and the Philippine Coast Guard Auxillary (PCGA).

FRAMEWORK

The framework displays the elements that contribute to the preservation, rehabilitation, and survival of coral reefs towards sustainable development. The political, legal, technological, economic, environmental, social, and educational factors should lead towards a holistic approach to ecological conservation and balance.



Figure 1. Conceptual Framework

There is a need to strike a balance of the factors that affect coral reefs because they are interrelated and symbiotic. The PESTLE analysis, formerly PEST analysis, (Morrison, 2007) is a framework or tool that can be used to analyze and monitor the macro-environmental factors that have a profound effect on an organization's performance. In addition to PESTLE, there is another E that stands for Education, hence a new acronym, which is PESTLE that applies to the current study. The researcher believes that the political, economic, technological, environmental, social, and legal factors encompass the survival of the coral reefs. Any government policies created, be it local or national, leadership styles and priorities, the employment, demographics, education levels, cultural trends and lifestyles, technology, industrialization, legislations, laws, and ordinances are all external forces that may directly or indirectly strike on ecological balance. As water seeks its level, all the impacts of the policies, processes, and practice will succumb to the ocean, as water flows down to seek its level.

OBJECTIVES OF THE STUDY

This study aims to: Ascertain the degree of response of the community folks in the community extension project; determine the impacts of the artificial coral reef project as perceived by the fisherfolks in Balatan, Camarines Sur, and by the divers from the Bureau of Fisheries and Aquatic Resource, (BFAR), Philippines; draw recommendations from the fisherfolks as to how the community can help conserve marine resources.

METHODOLOGY

Research Design

The study utilized the Impact Evaluation and Study Design in order to measure the impact of the Artificial Coral Reef Rehabilitation Project of the University of Saint Anthony, Iriga City, Philippines, following three steps: (1) defining intervention- answers the question: “what are we evaluating,” (2) measuring performance – answers “what and how to measure,” (3) attributing cause- factual or counterfactual.

According to World Bank, as stated by the (Ng, 2013), Impact Evaluation aims to (a) assess changes in the well-being of individuals, households, communities or firms that can be attributed to a particular project, program or policy (b) provides feedback to help improve the design of programs and policies. The impact measures how well the program delivers an intervention and the outcomes. Impact evaluation is making causal inferences about the effect of a program on a target population.

Steps in the determination of impact contextualized by the researcher: observation, inquiry, actual/factual observation, consultation, and evaluation. The observation was conducted to determine the response of the community folks, their extent of participation, and the evidence of actual and communal participation.

An inquiry was made to ascertain whether the attitudes and behaviors of the community folks have changed before and after the implementation of the project. The factual observation was carried out in the actual diving of experts from the Bureau of Fisheries and Aquatic Resources (BFAR) to determine the effects of the artificial reef environment. Consultation with experts from BFAR as to the technical aspect; the Community Officials on the environmental, social, economic, political, and cultural factors and the members of the academe for

educational implications. Evaluation of the project measures the outcomes according to the degree of participation of the community folks and the actual effect of the artificial reef as an artificial home of the living organisms at sea.



Plate No. 1 Coral Reef Model

The group tried to identify first a coral reef model, which became the pattern in building the reef. The said model is shown in Plate No. 3. From the above model, the USANT group started to build the reef by having a dry run on how the reef will be arranged at the seabed as shown in Plate no. 4



Plate No. 2 Onsite preparation

After the demonstration, the students and volunteer residents enthusiastically started to dismantle the reef to be loaded in the boat in preparation for the actual reef-building on the seabed. The building of the reef was done by two persons but was assisted by the men who boarded the boat to assist those responsible in loading the hollow blocks in the sea. The hollow blocks were unloaded before they started building the reef underwater. The divers were equipped with diving paraphernalia.



Plate No. 3 Building the Coral Reefs

In May 2019, two more modules were installed in addition to the six modules planted in 2017. Surprisingly, the BFAR divers revealed the presence of a school of fishes in the artificial reef areas. The environment is calm and green as several varieties of fish were observed shoaling, such as *tulingan* and *Sweet Lips* or *Plectorhinchus*. These fishes find refuge in the artificial reefs as divers find their way into the reefs for ocular inspection.



Plate No. 4. Actual Ocular Inspection

RESULTS AND DISCUSSION

The support of the barangay folks was immense as their presence was evident in all meetings, consultations, preparation, and actual installation of the artificial reefs or modules.



Plate No. 5. The researcher explaining the importance of coral reefs

According to one of the community folks, expressing with gratitude,

She is thankful for the community extension project that serves as an eye-opener for the people in the community on the plight of the sea, the low fish catch, overfishing, and siltation, and coral reef destruction.



Plate No. 6. The community folks during the Orientation

A year after the reefs were built, the key persons on the “build a reef project” visited the place and found out that algae and mosses have become evident. One of the residents commented: “The fisherfolks have observed fishes shoaling in the vicinity of the artificial reefs, indicating that marine life is starting to rebuild itself.”

As commented by Norma Alamo, a resident of Pararao, a public school teacher, she overheard from the small fishermen that the “build a reef project” will be of great help, especially to the fisherfolks who are entirely dependent on the marine resources. Mrs. Alamo disclosed further that the small fishermen are hoping that more artificial reefs will be constructed and installed to put back life into the sea.

Moreover, based on FGD of the community folks who themselves are fishermen, the impact of the artificial reef project is seen on the change of attitudes of the fisherfolks on marine conservation and protection. People now are more aware of the effects of marine pollution on coral destruction, illegal fishing, and the long term benefit of artificial reefs on sustainable development.

Livelihood programs for women, environmental teaching for the youth, clean-up drive, advocacy programs are a few of the projects that will be further undertaken by USANT based on the recommendations of the local folks. Regular visits, documentation using an underwater camera, and installation of at least two more modules are the upcoming projects of the USANT community extension office in response to the mandate of higher education to deliver quality extension projects towards inclusivity and sustainable development.

CONCLUSIONS

Community involvement is pivotal in the effective and efficient delivery of community extension projects; otherwise, this project will be a failure. People’s stewardship, discipline, and collective efforts combined with continuous engagement with partners are key elements of sustainability. The impact of the project is long-term, but reasonable and obvious results are observable in the community folks’ overt behaviors, actual observations, and underwater evidence divulged by authorities. Community initiatives such as clean-up drive, women empowerment programs, income-generating projects, environmental awareness campaigns, and a strong political will from the barangay folks, youth participation with parental guidance are essential elements.

TRANSLATIONAL RESEARCH

The findings of the study can be translated into a documentary manual that will provide an updated record of the existing marine life in Balatan, Camarines Sur. It will also raise awareness of the local folks and enhance the partnership of the university to the different stakeholders (i.e., BFAR, Phil. Coast Guard). The impacts of the artificial reefs may not be similar to the natural reefs, but their presence can certainly shelter the marginal fishes and become a fish sanctuary towards sustainable development.

ACKNOWLEDGMENTS

The research would like to express his gratitude to the community folks of Pararao, Balatan, Camarines Sur, the University of Saint Anthony Community headed by its President and Chairman of the Board, Atty. Santiago D. Ortega, Jr, and Atty. Butch SD. Ortega, Jr. Engr. Editha Dacara, Dean Carlos Epres, Dr. Marilou Tino, Mrs. Evelyn De Villa, PCGA, BFAR, faculty, students, and the participants who gave their all in the realization and optimization of the project. All your efforts shall pave the way towards a sustainable environment now and in the future.

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