

Community Participation in the Coral Reef Restoration Project of the Naval Forces Southern Luzon in the Pasig Reef of Legaspi City

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DOI: <https://doi.org/10.47772/IJRISS.2026.100300128>

Received: 07 March 2026; Accepted: 16 March 2026; Published: 28 March 2026

ABSTRACT

In line with Philippine Navy Standard Operating Procedure (SOP) No. 3 on Humanitarian Assistance and Disaster Response (HADR) Protocol and consistent with Republic Act No. 10121 on disaster risk reduction and management, the Naval Forces Southern Luzon (NFSL) initiated the *Coral Reef Restoration Project* in Pasig Reef, Rawis, Legazpi City, officially known as *Project Anchor*. This project responds to the urgent need to address coral reef degradation caused by destructive practices such as illegal fishing and cyanide use, particularly by armed groups exploiting the marine ecosystem. The study applies a descriptive-evaluative research design, anchored on the Ecosystem Services Approach and Reef Reconstruction Restoration Theory, utilizing key informant interviews (KII), focus group discussions (FGD), and document analysis. Findings confirm that coral reefs in Pasig Reef have suffered massive degradation, resulting in significant biodiversity loss and weakened coastal resilience.

Project Anchor proposes an innovative three-phase restoration plan: First, the planting of forty (40) pyramid artificial reefs and fourteen trays of coral branches designed with a wide, stable base and sloping sides that resist waves and strong currents, while the attached trays allow organized placement of coral fragments for easy monitoring and maintenance. Its angled surfaces improve water circulation, reduce sediment accumulation, provide varied light exposure, and create vertical habitat complexity, enabling it to function both as a coral nursery and as a long-term reef structure that supports marine biodiversity. Second, the installation of one hundred twenty (120) jackstone-type structures that features a multi-armed, open design that ensures stability on uneven seabed and creates numerous crevices and shaded spaces that mimic natural reef complexity. This structure enhances water flow, minimizes sediment buildup, and offers multiple surfaces for coral attachment, making it highly effective for promoting coral growth while also providing shelter and habitat for fish and invertebrates. Third, the placement of fifty (50) artificial concrete blocks which is the formation of the anchor fluke. Concrete block artificial reefs are simple, cost-effective, and easily deployed structures that can be stacked or arranged to form stable reef foundations over large areas. Their heavy weight provides durability and resistance to movement, while hollow sections offer shelter for marine organisms, and their flat surfaces serve as suitable substrates for massive and encrusting coral species, making them practical for large-scale coral reef restoration projects. Covering a total coral reef area of 759 hectares—of which approximately 17 hectares form Pasig Reef—the project aims to restore biodiversity, promote sustainable fisheries, protect coastlines, and foster ecotourism as a climate change adaptation and disaster mitigation strategy.

The results underscore that coral reef restoration is not only an environmental intervention but also a climate adaptation and disaster risk reduction measure, as reefs act as natural barriers that absorb wave energy and minimize coastal damage. The project highlights the importance of interoperability and multi-stakeholder collaboration, involving the Armed Forces of the Philippines, local government units, civil society, and active participation of fisherfolk communities in barangay Rawis and Arimbay. Sustainability, however, requires continued monitoring, fiscal support, and institutional partnerships to expand reef restoration efforts beyond Pasig Reef.

Ultimately, *Project Anchor* demonstrates a strategic, scientific, and collaborative model for coral reef restoration that strengthens coastal resilience, enhances marine biodiversity, supports livelihoods, and contributes to community-based disaster preparedness. By integrating environmental stewardship, governance, and community

empowerment, the project provides a scalable and adaptive framework that may serve as a best practice for marine ecosystem rehabilitation and climate change adaptation in the Philippines.

INTRODUCTION

Republic Act 10121 of 2010, otherwise known as the Philippine Disaster Risk Reduction and Management Act, aims to strengthen the country's disaster risk reduction and management system as implemented in the national, regional, municipal, and barangay levels in coordination with national government agencies and local government units. It provides a frame to shift from response-oriented to pro-active disaster risk reduction and management approach strengthening the institutional capacity of disaster risk reduction and management at various levels; in effect, building resilience of local communities to disasters and promoting multi-sectoral participation and community involvement. In essence, the Act establishes NDRRMC, RDRRMC, and LDRRMC with corresponding LDRRMOs. Overall, the law provides a comprehensive framework for DRRM in the country.

There are four phases or thematic areas in the disaster risk reduction and management. disaster prevention and mitigation, disaster preparedness, disaster response and early recovery, disaster rehabilitation and recovery (NDRRMP 2020-2030, 2020). **Disaster prevention and mitigation** refers to actions done to avoid an incident to occur and the measures taken to prevent and reduce the impact of disaster by strengthening resilience during emergency situations. **Disaster preparedness** refers to the activities done in order to respond properly and systematically when a disaster occurs. **Disaster response and early recovery** refers to response operations carried out before, during, and after a disaster event aimed at saving lives, reducing economic losses, and reducing suffering. **Disaster rehabilitation and recovery** refers to the recovery efforts taken to return to normal or near-normal conditions. These four thematic area of disaster management presented as a whole is a complete cycle a community should follow to ensure organized, systematic, and orderly disaster risk management.

Project Anchor, a coral reef restoration initiative by the Naval Forces Southern Luzon of the Philippine Navy, is a disaster management effort focused on **prevention and mitigation**, and **response**. It aims to prevent further degradation of the coral reefs in Pasig Reef, mitigate environmental impacts, restore balance to the marine ecosystem, support the livelihoods of nearby communities, and promote development programs such as tourism for example. As a climate change adaptation initiative at the same time, the project is taken to enhance biodiversity, promote ecosystem health, support fisheries and livelihoods, and protect coastlines.

The study, mainly anchored in RA 10121, is also based on some certain Philippine legislations: Joint DENR-DA-DILG-DND Memorandum Order ensuring sustainable development of country's fisheries and aquatic resources with special focus on coral reefs, Executive Order No. 533 series of 2006 adopting the Integrated Coastal Management (ICM) Strategy, and Executive Order No. 797 series of 2009 implementing the Coral Triangle Initiative (CTI) National Plan of action (NPOA). These are still deemed seen as consistent with United Nations Sustainable Development Goals especially No. 14 'Life Below Water.'

In the context of Naval Forces Southern Luzon, the study, aside from the policies mentioned above, is mainly grounded on Philippine Navy Standard Operating Procedure No. 3 laying the purpose, scope and applicability, mechanisms, and other rules that serve as guidelines for Humanitarian Assistance and Disaster Response (HADR) Protocol. Such protocol prescribes the policies, procedures, and responsibilities of the Philippine Navy in organizing, training, equipping, maintaining, deploying, and sustaining various teams and reservists developing doctrines, standard tactics, techniques, and procedures for HADR operations and the corresponding capabilities and facilities of Disaster Response Tasks/Humanitarian Assistance and Disaster Response units nationwide. Under the protocol, the Naval Operating Forces (NOF) reviews and updates disaster preparedness and contingency plans to address disasters for ready reference. It also adopts a proactive stance in disaster management by encouraging community participation in government-initiated emergency management activities to promote awareness, reduce vulnerabilities, and mitigate effects of disasters to the community.

In response to SOP No. 3 vis-à-vis HADR Protocol specifically the participation of the Philippine Navy to Climate Change Adaptation of the Government and in the light of Republic Act 10121 relative to disaster

prevention and mitigation, and response the NFSL sees coral reefs restoration as the main action initiative to address disaster management concern in Pasig Reef, Rawis, Legazpi City.

Coral Reefs Restoration

Coral reefs are highly significant part of marine ecosystems because they support and preserve marine biodiversity, protect coastlines, and provide livelihood to immediate communities and collective economic life (NOAA Ocean Service, 2025; Scientia Educare, 2025; Earth Organization, 2025). These reefs are destroyed due to illegal fishing, overfishing, pollution, and climate change which are clear threats to marine ecosystems (All About Fishing, 2025; US EPA, 2025; NOAA Ocean Service, 2025). There should be mechanisms in place to secure marine biodiversity, enhance ecosystems resilience, protect coastlines from storm damage and erosion, support fisheries and food security, and promote sustainable development (Marine Bio, 2025; CIMAS, 2025; USGS, 2025). Human agencies with various sectors together with communities need to devise tools and techniques for both short-term and long-term restoration and development of coral reefs. This demands environmental stewardship and collaborative engagement (ELC, 2025; forward Pathway, 2025; Oliwia, 2024). Reef restoration and community engagement should be the main tasks (Baresi, 2025; Coral Reef Alliance, 2025). Creating artificial reefs and structures to support coral growth by involving local sectors and communities is a good groundwork for sustainable practices. This requires careful planning from various stakeholders.

The project (Project Anchor) located at the Pasig Reef with a total coral reef area of 759 hectares situated off the coastlines of the different barangays in Legazpi City with **Grid Coordinates: 123.7576E,13.1763N** . Approximately 17 hectares forms the Pasig Reef the reef serves as the marine sanctuary that shelters various reef fishes belonging to different families.

REVIEW OF RELATED LITERATURE AND STUDIES

The Natural Environment

Planet Earth is beautiful. It is rich in natural environment: the layers of gases surrounding it, the vast oceans, lakes, rivers, and groundwater, earth's crust and soil, all living organisms and their interactions comprise the beauty of the planet. Each is part of global ecosystems governing the planet defining every resource. The natural environment provides everything we need: air and water purification, soil formation, and nutrient recycling, climate regulation, habitat for biodiversity, and resources for human livelihood. There should be ecosystem balance from the past, in the present, and to the future.

Environmental Destruction

There are key issues humanity needs to address. Environmental destruction includes climate change, pollution, deforestation and land degradation, and ocean destruction and overfishing. Such environmental issues may lead to loss of ecosystem services and biodiversity, negative impacts on human health and well-being, and economic costs and loss of natural resources. All these problems can only be resolved if the entire humanity in collective action finds solutions by sustainable practices and renewable energy, conservation and restoration of ecosystems, education and awareness-raising, policy changes and environmental regulations, and community engagement and participation.

Coral Reefs Destruction

Coral reefs are ecosystems part of a larger whole but which role in the environment cannot be underestimated. They are called the 'rainforests of the sea' due to their tremendous role in keeping and sustaining marine biodiversity, which have positive impacts on environmental sustainability and protection and climate change natural initiative. These coral reefs support a vast array of marine life (algae, invertebrates, fishes), provide essential services such as protection of shorelines and for fisheries, serve as nursery grounds for many varied fish species, contribute significantly to local economies.

Coral reefs destruction may result to loss of biodiversity, decline of fisheries, lack of protection in the coastlines/shorelines, and negative impacts to local economies (Reef World foundation, 2024). This is due largely to coastal development, pollution, and overfishing and illegal fishing resulting to coral bleaching and its death and weakening of coral structures that may lead to their damage (NOAA Ocean Service, 2024). There has to be a collective effort and a commitment to sustainability in order to avoid and prevent coral reefs destruction. Sustainable fishing practices, reducing pollution, establishing marine-protected areas, and coral reef restoration can be seen as solutions (Bai Y et al, 2024; Colognoli M, 2024; Oceans Research, 2024, Food Forward, 2025).

Coral Reef Restoration

The best way to combat coral reefs destruction is through coral reefs restoration (NOAA Fisheries, 2021; GBRF, 2023; New Haven, 2016; Mossy Earth, 2025). Restoring coral reefs employ certain techniques that can be used: growing coral colonies in controlled environments before transplanting them to reefs (GVI, 2025), transplanting health coral colonies to damaged reefs (USGS, 2002), establishing protected areas to reduce human impact and promote reef recovery (USCRTF, 1999), collecting coral spawn and settling larvae on artificial substrates (New Haven, 2016), creating artificial reefs or structures to support coral growth (Aloysius SLM, 2020), deploying artificial structures to provide habitat for corals and other marine life (Srinivas, 2025), and regularly monitoring reef health and performing maintenance tasks to ensure restoration success (NOAA, 2020).

The Project Anchor

Project Anchor aims to protect the marine ecosystem and help the communities as they benefit from such ecosystem in terms of their livelihood and other community engagements. This has reference to two meanings: anchor as the symbol of Philippine Navy under the Armed Forces of the Philippines (AFP) and anchor as the tool used in stopping and securing the ship preventing from drifting. These meanings demonstrate Naval Forces Southern Luzon (NFSL) commitment in preserving the ecosystem while sustaining the livelihood of the people benefiting from it. This Project Anchor promotes awareness, reduces vulnerabilities, and mitigates effects of disasters to the communities inclusive of climate change adaptation activities.

MATERIALS AND METHODS

Theoretical Framework

The study has two conceptual underpinnings: The Ecosystems Services Approach and the Reef Reconstruction Restoration Theory. The former focuses on the responsiveness and effectiveness of the restoration efforts, taking coral reefs as essential ecosystem services. The latter creates artificial reefs using of natural and/or artificial materials for coral growth and habit for marine life.

The Ecosystems Services Approach is a perspective recognizing and appreciating the value and significance of ecosystems such as but not limited to food chains, water purification, climate regulation, oxygen production, and nutrient cycling (NatureScot, 2025). This approach encourages public and private sectors to include in the societal thought processes and policy decisions concerns that affect ecosystem services and collective sense of human well-being. Given the fact that this approach promotes sustainable development, it facilitates conservation and restoration and involves various stakeholders. With such approach, it leads to coastal zone management, water resource management, agricultural land management, and climate change mitigation and adaptation (Elliff C & Kikuchi R, 2015). In sum, the Ecosystems Services Approach convinces, reminds, and cautions governments, institutions, and the general public of the value of the natural world and promote all together for environmental stewardship.

The Reef Reconstruction Restoration Theory centers on improving, sustaining, and lobbying for ecological structure and function of degraded coral reefs involving various techniques such as but not limited to out planting corals and creating artificial reefs; addressing the factors for the reef's decline and rebuild the reef through the promotion of the coral growth and support for other reef organisms to recover (Hughes T, Baird A, Morrison T, & Torda G, 2023). It rests on the premise that from identifying the cause of reef degradation to corresponding restoration techniques guided by the principles anchored on collaborative engagement (Lamont T et al, 2022).

These two theoretical underpinnings are relevant to the study because all their concepts and principles are focused on sustainable development grounded on environmental stewardship and collaborative engagement in terms of balance in the ecosystems and participation of stakeholders vis-a-vis all for coral reef restoration.

Research Design

The study is a qualitative type of research. Specifically, it utilizes descriptive-evaluative approach to describe and then evaluate the restoration project and serve as basis for the development of continuity program seen as contributory to sustaining coral reef restoration efforts of the Project.

Tools of Analysis

The main tool of analysis used is content analysis out of qualitative data analysis. Based on the points raised by key informants, focus groups, and questionnaire survey response, their thoughts are given themes to exemplify the status of the project, the challenges encountered, the good practices or best features, the insights to keep forward after the completion of the three phases, and to highlight the participation of the fisher folks communities.

Participants of the Study

The participants of the study are the key informants and the focus groups. For the key informants, they are the most knowledgeable persons as to the programs, projects, and activities of Naval Forces Southern Luzon, one of which is the NFSL Project Anchor. The key informants are: Naval Forces Southern Luzon Commander, Commanding Officer of Naval Special Operating Unit 3, Technical Coordinator of Bantay Dagat Legazpi, Owner of Rarum Dive Legazpi, In-Charge of Bureau of Fisheries Rawis, and the Chairperson of Barangay Rawis. There are three focus groups: The Philippine Navy Personnel (7 Personnel), the Rawis Fisherfolk (11 Fishermen), and the Arimbay Fisherfolk (12 Fishermen); they are the target focus groups and the main responders because they have direct involvement in the Project.

Innovative Solution Development

Based on the KII, FGD, and Survey supported by document analysis with secondary data analysis, the main problem is the coral reefs degradation in Pasig Reef, Rawis, Legazpi City caused by illegal fishing and cyanide use especially of armed groups who exploit the marine ecosystem in the area. The level of coral reefs degradation is massive in the sense that natural coral reefs are no longer seen in the location. To regain marine ecosystem and rebuild the biodiversity under water in the area, there is a need on the part of the Naval Forces Southern Luzon to do some action in consonance with its mandate as stated in SOP No. 3 of the Philippine Navy parallel with Republic Act No. 10121. The innovative solution proposed is called the Project Anchor.

The Project Anchor is a coral reefs restoration project designed by the Naval Forces Southern Luzon of the Philippine Navy. It is a disaster management initiative and collective endeavor designed as a response to prevent further degradation of coral reefs in Pasig Reef and mitigate its effects hopefully bringing balance in marine ecosystem, livelihood of the neighboring communities, and spring forth development programs in tourism for example. As a climate change adaptation initiative at the same time, the project is taken to enhance biodiversity, promote ecosystem health, support fisheries and livelihoods, and protect coastlines. Project Anchor becomes the hope for a marine sanctuary. Once successfully implemented and the impact is high, this may lead to a best practice of stakeholders engagement and community development at the same time with implications on local economy and tourism development.

RESULTS AND DISCUSSION

Implementation Plan

Project Anchor aims to protect the marine ecosystem and help the communities as they benefit from such ecosystem in terms of their livelihood and other community engagements. This has reference to two meanings:

anchor as the symbol of Philippine Navy under the Armed Forces of the Philippines and anchor as the tool used in stopping and securing the ship preventing from drifting. These meanings demonstrate NFSL commitment in preserving the ecosystem while sustaining the livelihood of the people benefiting from it. This Project Anchor promotes awareness, reduces vulnerabilities, and mitigates effects of disasters to the communities inclusive of climate change adaptation activities. The Project has three phases: first, the planting of forty (40) pyramid artificial reefs and fourteen (14) trays of coral branches at the Pasig Reef; second, the adding of one hundred twenty (120) lumps of jackstones; and third, the placement of fifty (50) artificial concrete blocks which is the formation of the anchor fluke. All these are crucial steps to guarantee community-wide and scientific social development in the area. This endeavor is part of the Humanitarian Assistance and Disaster Response (HADR) Protocol Standard Operating Procedure (SOP) No. 3 with one of its objectives is to adopt a proactive stance in disaster management.

Phase 1. Artificial Reef Laying and Coral Restoration in Pasig Reef. The activity was successfully conducted and concluded without any untoward accident. A total of forty (40) pyramid-shaped artificial reefs has been laid at seabed of Pasig Reef and 14 trays of coral branches has been planted.

In this phase, the project is envisioned as a marine sanctuary and at the same time center of the recreational activities in the area such as diving and snorkeling. There was no problem encountered in the process. Continuous monitoring was conducted to ensure successful growth of the transplanted corals.

Phase 2. Deployment of 120 Concrete Jackstones. The activity was successfully conducted and concluded without any untoward incident. The one hundred twenty (120) jackstones were placed to form the project design's anchor stock and shank. Placement of jackstones as artificial reefs is an effective way to attract fishes to thrive. The interlocking feature of the reef allows small fishes to shelter from the predators creating a balance marine ecosystem. There was no problem encountered in the process. Continuous assessment was made to measure progress.

Phase 3. Placement of 50 Artificial Concrete Blocks, which is the formation of the anchor's fluke. The activity was successfully conducted and concluded without any untoward accident. A total of fifty (50) artificial concrete blocks has been laid at seabed of Pasig Reef. The final phase consolidated the achievements from the entire three phases characterized by thorough planning and coordination, operational excellence, and the professionalism and dedication of all personnel engaged in the project. By improving marine ecosystems, the entire project contributes to regional ecological health supporting in effect national food security and economic stability. The entire project reinforces the interconnectedness of local actions and worldwide outcomes. The purpose of which is to foster lasting connections which enhance communities' sense of ownership and responsibility given the natural resources.

Outcomes Measures

The Project Anchor is measured in four ways: Efficiency, Effectiveness, Sustainability, and Community participation. These four measures are based on the feedback gathered from key informants and focus groups and the observations made by the Naval Forces Southern Luzon.

Efficiency. The Project Anchor rests on the principle of collaboration. Its best feature is the power of collaborative engagement. The project is led by the Naval Forces Southern Luzon of Philippine Navy with close collaboration with Philippine Navy, Coast Guard District Bicol, Philippine Port Authority, PAFICIFIC, Rotary Club Legazpi, SM Legazpi Foundation, Junior Chamber International (JCI), Bantay Dagat Legazpi, Philippine Navy Reservists and the fisher folks communities of Rawis and Arimbay. The synergy formed from these organizations, agencies, and communities made possible the implementation of the three phases of the Project Anchor very cost-efficient cost-effective. Most of the resources used are the capabilities of various persons to become volunteers and the readiness of the Philippine Navy to execute the three phases on time, with no untoward incident, and the way things happened according to the collective plan.

Effectiveness. Since the three phases have been completed and regular monitoring of artificial coral reefs in Pasig Reef are done, there are clear and definite indications that the coral reefs are growing. The materials used

to act as artificial reefs are right materials conducive for biodiversity to thrive. Another best feature of Project Reef is the badge of environmental stewardship. This is the clear and specific manifestation of how effective the project itself. It strengthens stakeholders' commitment to become stewards of the environment re-creating consciousness/awareness of the need to promote and protect marine life and the entire marine ecosystems.

Sustainability. Since the Project is efficient in the utilization of resources and that it is also effective since Pasig Reef is restoring itself through the artificial coral reefs and the fishes and other marine life thriving in the area, there is a need to sustain the project by strong community engagement especially by barangays Rawis and Arimbay. As reinforced by the focus groups coming from these communities, they take active role in protecting the Pasig Reef especially that they know the direct impact of the project to their livelihood. They even expressed their commitment to safeguard the area and pledged not to use dynamite and cyanide in their fishing.

Community Participation. Notably, the barangays of Barangay Rawis and Barangay Arimbay serve as the primary beneficiaries of the project and have demonstrated substantial levels of participation and cooperation. Residents actively engaged in project activities, including information dissemination, on-site restoration efforts, and monitoring initiatives. Their involvement reflects a strong sense of ownership and collective responsibility toward marine conservation efforts. The high degree of community participation observed in these barangays suggests that collaborative frameworks between military institutions and local communities can significantly enhance the effectiveness and sustainability of coral reef restoration programs.

RESULTS AND DISCUSSION

The results are based on the interviews conducted to six (6) key informants, three (3) focus groups, and the results of survey questionnaire conducted to a group of fishermen of barangay Rawis and Arimbay. The data generated are classified based on the objectives of the study: 1. the status of NFSL Coral Reef Restoration Project in Pasig Reef, Legazpi City; 2. the Project's best features; 3. the Project's encountered challenges; 4. the insights from the Project; and 5. the recommendations that can be made out of the Project.

1. The Status of NFSL Coral Reef Restoration Project in Pasig Reef, Rawis Legazpi City

There are three phases in the entire NFSL Coral Reef Restoration Project. These are the following:

Phase 1. Artificial Reef Laying and Coral Restoration in Pasig Reef. Forty (40) artificial reefs has been laid at seabed of Pasig Reef and 14 trays of coral branches has been planted.

Phase 2. Deployment of 120 Concrete Jackstones. One hundred twenty (120) jackstones has been placed to form the project design's anchor stock and shank.

Phase 3. Placement of 50 Artificial Blocks, which is the formation of the anchor's fluke. Fifty (50) concrete blocks has been placed to complete the formation of the anchor's fluke.

From the interviews, the status of the Project is seen in terms of the significance of the restoration, perceived project goals, and the corresponding role in disaster management and climate change.

Restoration Significance

Coral reef restoration is an important environmental initiative that also serves as a climate adaptation and disaster risk reduction strategy. Coral reefs act as natural wave breakers, absorbing the impact of strong waves and reducing coastal damage. They strengthen coastal resilience, preserve marine biodiversity, combat climate change, and sustain the livelihoods of present and future generations of fishermen. As noted, *'a healthy coral reef system is critical. Without them, the communities along Albay Gulf would face intensified flooding and erosion, which could devastate homes, agricultural lands, and infrastructure. Coral reefs also serve as a natural barrier for big waves during the habagat or typhoon season'.....*

Project Goals

The project aims to restore coral habitats and provide artificial reefs that support fish reproduction and growth, creating spaces where marine species can thrive. *It also seeks to encourage ecotourism to create alternative income opportunities for communities, while raising awareness on marine conservation among local stakeholders—ensuring that fisherfolk become active partners in protecting the marine environment’.....*

Role in Climate Change

Coral reef restoration directly mitigates the impacts of climate change through carbon sequestration, coastal protection, and biodiversity preservation. *‘Healthy coral ecosystems help reduce ocean acidification, dissipate wave energy, and ensure that marine food chains remain intact’.....*

The status of the project is expressed in terms of three aspects: the significance of the project. Its goals, and its role in climate change. Across the key informants and focus groups, there is a recognition that the coral reefs rehabilitation is seen both as an intervention in the environment on the fact that coral reefs in the Pasig Reef are destroyed and as a climate adaptation strategy in the context of disaster reduction. As NFSL Commander put it, “...a healthy coral reef is critical;” for “...without them, the communities along Albay Gulf would face intensified flooding and erosion, which could devastate homes, agricultural lands, and infrastructure.” they even serve as “...natural barrier for big waves during habagat/typhoon season.” this project then strengthens coastal resilience, preserves marine biodiversity, sustains livelihood of present and future generations of fishermen, and combat climate change. The project has further goals, from restoring coral habitats and providing artificial reefs to raising awareness on marine conservation among local stakeholders and encouraging ecotourism. As the NFSL Commanding Officer remarks, “...ensuring the fisherfolk become active partners in marine conservation.” The NFSL Commander on climate adaptation is asserting its mitigating impact on climate change: “...reducing orcean acidification...(carbon sequestration),” “...dissipating wave energy...(coastal protection),” and “...ensuring marine food chains intact...(biodiversity preservation).” The NFSL Commanding Officer rightfully puts it, with the mandate to actively participate in all climate change adaptation program, the Naval Operational Forces need “...to promote awareness to the community about the importance of the taking good care and protecting the coral reefs which is the natural habitat of the fish and other species especially the communities of Rawis and Arimbay because they are the beneficiaries” and engaging them to the project goals the communities should be seen as partners in the efforts of climate change management. These extrapolations leads us to three things in reference to the status: leadership and governance, external relations, and resource management.

The project is materializing because of the NFSL leadership to gathering people internally, conversing how to put it in action, strategizing in realizing the goals, determining resources, and tapping the stakeholders, involving various external agencies both from public and private sectors, and empowering the neighboring communities to harnessing all to a concerted effort for addressing the the problem in the Pasig Reef. This speaks of governance. The task is difficult but executed because of how NFSL leadership is able to assert its governance. The key to such governance is external relations. Essentially, the project is there because of the participation of the Philippine Navy, Philippine Coast Guard, Philippine Port Authority, PAFCIFIC, Rotary Club Legazpi, JCI, Bantay Dagat Legazpi, and Arimbay and Rawis communities. Their direct and indirect roles in the project strengthen its capability to gain resources management vital to the whole operations. The project is succesful because of the harmonious relationship of leadership and governance, external relations, and resources maangement. There are limitations but the project is able to mobilize itself nonetheless.

Project’s Best Features

With leadership and governance, external relations, and resources management at play, the project is successful. This has resulted primarily because the design of the project is strategic, scientific, and collaborative. The project is strategic because it is implemented in three phases: the planting of the forty-ring pyramid of artificial reefs with 14 trays of coral branches; the adding of the stock and shank of 120 lumps of jackstones; and the implementation of the fluke. The project uses multi-phase approach. It is scientific because the project rests on scientific data on Pasig Reef and the requirements for coral reefs rehabilitation are based on science especially

its composition and implementation. It is collaborative because many agencies have stakes in the entire project. The whole project is grounded on interoperability and stakeholder engagement "...ensuring collective responsibility..." the use of artificial reefs would promote "...Pasig Reef as a diving site..." integrating ecotourism in the project. The outcomes of the project then are sustainable, scalable, and adaptive. It becomes sustainable if leadership and governance, external relations, and resources management continue to be at play. It manifests itself as scalable given the depth and breadth of the Pasig Reef implying its significantly high impact as the artificial reefs satisfy marine biodiversity. In effect, the project is adaptable. Since stakeholders have collective responsibility, the project is deemed to be continued and be expanded to rehabilitate the entire reefs facing vast coast shorelines.

Project's Encountered Challenges

Regardless of the best features in the project, there are challenges encountered. These challenges can be seen as other ways in order for the project to get improved. The main challenges are on the sustainability and maintenance of the project and at the same time the corresponding protection and preservation. For Pasig Reef to be restored, it has to be collective efforts of the local residents, government, NGOs, and the private sector. All agencies involved in the Project need to contribute in protecting and preserving the Project for it to be successful. The focus group of Navy personnel asserted that "the community should be involved in the project..." this is recognized by the focus groups among the fisherfolks both in Arimbay and Rawis that they see their responsibility in protecting and safeguarding it." Primarily, there are some groups, allegedly outside Arimbay and Rawis according to the focus groups, responsible for illegal ways of fishing. These people "use dynamite, cyanide, 'susa,' 'sensoro,' and 'compressor,' which in effect destroy the coral reefs." According to the fisherfolks, "...illegal way of fishing is rampant..." and they cannot drive these people away because these people are armed. Indeed, "the main contributor of death and destruction of coral reef in Pasig Reef is human himself." The Philippine Coast Guard (PCG) should have an active role on this part. More than patrolling of the PCG, the communities should have a strong stake on this project for they are the main recipients of the positive impact the project would create; the impact on their livelihood, their future collective economic life, and the role they need to play in order to achieve the balance in the ecosystem and biodiversity. They need to be fully aware of all the things that matter in the Pasig Reef. There are also challenges that warrant attention such as lack of manpower in mounting coral reefs, the issue on the transportation and howling of artificial coral reefs, and the artificial coral reefs are expensive. These things can be addressed by external relations and stakeholders engagement especially in terms of future work relative to the protection and preservation and sustainability and maintenance.

Insights and Feedforward

The study leads us to some insights and points for feedforward based on the status, challenges, and best features of the project. The thoughts here are anchored on environmental stewardship and collaborative engagement.

Badge of Environmental Stewardship

Environmental stewardship is a moral duty of humanity. All of us are expected to have ways and means to take care of the planet. As rational animals, we have the social responsibility to sustainable development. The balance between and among ecosystems, flora and fauna, and food chains in the natural environment side by side with the evolution and adaptation of human societies should be preserved, maintained, and sustained. We owe to our sense of posterity the way we take care of our environment. We do not create nature. We are stewards of nature. This implies the so-called moral duty. Such environmental stewardship is owned by all sectors and communities.

The Philippine Navy is committed in safeguarding our oceans and preserving our marine ecosystem. In line with this, the Naval Forces Southern Luzon launched a coral reef restoration project dubbed as, "Project Anchor" at the Pasig Reef, Legazpi City, Albay, that aims to improve the marine biodiversity of the area and eventually enhance the livelihood of the fisherfolk in nearby communities. The project helps to enhance and preserve the natural maritime environment at Pasig Reef that will benefit nearby communities that thrive on fishing and as their main source of livelihood. The project intends to raise awareness on the importance of coral reefs and marine conservation. By involving the communities, the project encourages a sense of social responsibility and

promote sustainable practices among the members of these communities. The Project envisions not only as a maritime sanctuary but also as a way to attract recreational activities like diving and snorkeling at the area which in turn may help grow local businesses and create local employment opportunities in nearby communities. In collaboration with different government organizations and various NFSL stakeholders, who collectively share expertise and resources to develop effective strategy for the coral reef restoration, also share on the firm commitment in safeguarding our maritime environment.

Power of Collaborative Engagement

In any purposeful collective activity, the key to success is collaborative engagement. When all stakeholders see themselves as having the fundamental responsibility and moral duty to take some action and establish standards and protocols and develop mechanisms and guidelines to ensure sustainable development, then every stakeholder (public sector, private sector, non-government organizations, people's organizations, interest groups) recognizes and appreciates such concern and realize collectively worthwhile endeavors. This is the power of collaborative engagement. When everyone sees clearly their roles and the corresponding responsibility attached to those roles, they are motivated and reinforced to act with precision and significant value.

Relative to coral reef restoration at the Pasig Reef, the project rests on the principle of interoperability and stakeholder engagement. Without such, no part of the project will be in fruition. With three phases, each phase requires a different set of people for any or all of the totality of the project in terms of leadership and governance, external relations, and resources management. Every phase is realized due to the commitment of every stakeholder involved in the project. "The Project serves as the Civil-Military engagement because it makes us closer to the civilians and win their trust...", as remarked by the focus group of Navy personnel. The affirmation of the focus groups from Arimbay and Rawis that "...the active involvement of the fisherfolks and other stakeholders are critical for the success of the project." The key informants believe that there has to be concerted effort to "...promote awareness to the community about the importance of taking good care and protecting the coral reefs..." If the badge of environmental stewardship is anchored on the power of collaborative engagement, the project will be sustained and maintained and in effect the vision of environmental protection and preservation especially in the Pasig Reef has truth in it becoming reality.

RECOMMENDATIONS

Given the best features and the challenges encountered based on the status of the Project Anchor, there are recommendations needed to be made.

1. Involve other agencies to participate in the Project with the fisherfolks of Rawis and Arimbay.

One best feature of the project is interoperability and stakeholders engagement. The coral reef restoration in itself cannot happen without the active participation of various agencies and sectors where each play a crucial role to the implementation of the project from the beginning phase to the last phase. From human resources to material resources within the bounds of financial resources, the project becomes a reality. Implementing a project does not actually end in the last phase. Such implementation is just one stage opening itself to the next stages; that is, monitoring and evaluation, sustainability, and impact measurement. These next stages demand more than ever firm collaboration from the stakeholders: the sectors, agencies, and communities ensuring the success of the project up to the last stage.

2. Enhance Community-based Conservation Training

It may be said that the project is highly significant due to its nature and goal; that is, coral reef restoration as an environmental initiative (or intervention) and as a climate adaptation strategy (or as a disaster risk reduction strategy) given the fact that coral reefs as natural wave breakers absorbing the impact of strong waves and reducing coastal damage, which in effect contributory to coastal resilience and preservation of marine biodiversity. These efforts may lead to restoring coral reefs by providing artificial reefs, sustaining livelihood of communities, encouraging ecotourism, and combating climate change. But all these may come to nothing and everything becomes meaningless if the communities, such as of Arimbay and Rawis, that utilize the Pasig Reef,

are not responsible enough and do not see themselves as having the duty to preserve and protect the coral reefs. There has to be a community-based conservation training for all residents especially the fisherfolks. Empowering them would mean having active agents of protection and preservation of marine biodiversity and the entire marine environment making them and others as responsible fishermen doing the right things for their own collective good their sense of posterity.

3. Establish long-term funding Mechanisms

Project Anchor is expensive. To restore coral reefs in Pasig Reef is not inexpensive. To gather people to do a collective work requires costs. Materials for this project are not common and cheap. To think of sustainability of the project, especially going beyond of simply implementing it and mounting the artificial reefs in the seabed, demands fiscal resources and management. The fund for this has to be secured. The project needs to strengthen its interoperability and stakeholders engagement and invite other agencies to take part in this endeavor. Seeing that this project's sustainability is their corporate social responsibility and the extending their reach to community involvement would provide the fund adequate in completing all the stages. Various governmental instrumentalities, non-government organizations, people's organizations, and other interest groups may be tapped and partake in the project and they may even support in the expansion component of the project extending the project to other parts needing coral reefs restoration.

4. Develop typhoon-resilient coral structures

With the knowledge that coral reefs serve as disaster risk reduction strategy, all projects on coral reef restoration by way of artificial reefs should be secured as typhoon-resilient coral structures. To do this is suggestive that this project should not only end in Pasig Reef but in all neighboring reefs needing reef restoration. Communities would do extra mile in supporting these efforts, protecting these reefs, making them empowered communities on marine biodiversity, climate adaptation, and inclusive economy.

5. Propose Program for Disaster Preparedness and Environmental Preservation

The Project Anchor extends its way to propose program for disaster preparedness and environmental protection. The focus is on resource management, external relations, leadership and governance, and community empowerment and development. Crucial areas of the program are protection, sustainability, and engagement.

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary

In response to SOP No. 3 vis-à-vis HADR Protocol specifically the participation of the Philippine Navy to Climate Change Adaptation of the Government and in the light of Republic Act 10121 relative to prevention, mitigation, and response, the NFSL sees coral reefs restoration as the main action initiative to address disaster management concern in Pasig Reef, Rawis, Legazpi City. There is a need to address issues on coral reefs along the basins of Rawis, Legazpi City to contribute to ensure disaster mitigation along and environmental protection of coral reefs mentioned. The study aims to evaluate the Coral Reef Restoration Project in Pasig Reef of Naval Forces Southern Luzon (NFSL) known as the Project Anchor. Based on the KII, FGD, and Survey supported by document analysis with secondary data analysis, the main problem is the coral reefs degradation in Pasig Reef, Rawis, Legazpi City caused by illegal fishing and cyanide use especially of armed groups who exploit the marine ecosystem in the area. The level of coral reefs degradation is massive in the sense that natural coral reefs are no longer seen in the location. To regain marine ecosystem and rebuild the biodiversity under water in the area, there is a need on the part of the NFSL to do some action in consonance with its mandate as stated in SOP No. 3 of the Philippine Navy parallel with Republic Act No. 10121. The innovative solution proposed is called the Project Anchor. The project (Project Anchor) located at the Pasig Reef with a total coral reef area of 759 hectares situated off the coastlines of the different barangays in Legazpi City. Approximately 17 hectares forms the Pasig Reef the reef serves as the marine sanctuary that shelters various reef fishes belonging to different families. The study on Pasig Reef in Legazpi City is anchored on Ecosystems Services Approach and Reef Reconstruction Restoration Theory in order to determine the status, identify best features and challenges, and provide insights

and recommendations through descriptive-evaluative research design to create a manual of operations contributory to sustainable coral reef restoration project of the Naval Forces Southern Luzon. The Project Anchor is a coral reefs restoration project designed by the Naval Forces Southern Luzon of the Philippine Navy. It is a disaster management initiative and collective endeavor designed as a response to prevent further degradation of coral reefs in Pasig Reef and mitigate its effects hopefully bringing balance in marine ecosystem, livelihood of the neighboring communities, and spring forth development programs in tourism for example. As a climate change adaptation initiative at the same time, the project is taken to enhance biodiversity, promote ecosystem health, support fisheries and livelihoods, and protect coastlines. Project Anchor becomes the hope for a marine sanctuary. Once successfully implemented and the impact is high, this may lead to a best practice of stakeholders engagement and community development at the same time with implications on local economy and tourism development. The Project has three phases: first, the planting of 40-pyramid artificial reefs and 14 trays of coral branches at the Pasig Reef; second, the adding of 120 lumps of jackstones; and third, focusing on community engagement to make the artificial reefs successful. All these are crucial steps to guarantee community-wide and scientific social development in the area. This endeavor is part of the Humanitarian Assistance and Disaster Response (HADR) Protocol Standard Operating Procedure (SOP) No. 3 with one of its objectives is to adopt a proactive stance in disaster management.

Conclusion

The Coral Reef Restoration Project of the Naval Forces Southern Luzon, known as the Project Anchor symbolizing the Philippine Navy and the strong commitment of the naval forces in safeguarding the marine environment, aims to improve marine biodiversity in the Pasig Reef and contribute in the livelihood of communities that benefit from the coral reefs. With the ring of forty-pyramid artificial reefs and 14 trays of coral branches, stock and shank of 120 lumps of jackstones, and the fluke, the Project Anchor is expected to strengthens coastal resilience, preserve marine biodiversity, combat climate Change, and sustain livelihood of present and future generations of fishermen. The Project has proven to be strategic, scientific, and collaborative in its design and approach and proceeds as sustainable, scalable, and adaptive. Anchored on the badge of environmental stewardship and power of collaborative engagement, there is a need to involve other agencies to participate in the Project with the fisherfolks of Rawis and Arimbay and enhance community-based conservation training. This Project Anchor rests on collaboration with different sectors, groups, and organizations with NFSL stakeholders sharing expertise and resources collectively that developed efficient and effective strategy for coral reef restoration.

Recommendations

One best feature of the project is interoperability and stakeholders engagement. The coral reef restoration in itself cannot happen without the active participation of various agencies and sectors where each play a crucial role to the implementation of the project from the beginning phase to the last phase. From human resources to material resources within the bounds of financial resources, the project becomes a reality. Implementing a project does not actually end in the last phase. Such implementation is just one stage opening itself to the next stages; that is, monitoring and evaluation, sustainability, and impact measurement. These next stages demand more than ever firm collaboration from the stakeholders: the sectors, agencies, and communities ensuring the success of the project up to the last stage.

It may be said that the project is highly significant due to its nature and goal; that is, coral reef restoration as an environmental initiative (or intervention) and as a climate adaptation strategy (or as a disaster risk reduction strategy) given the fact that coral reefs as natural wave breakers absorbing the impact of strong waves and reducing coastal damage, which in effect contributory to coastal resilience and preservation of marine biodiversity. These efforts may lead to restoring coral reefs by providing artificial reefs, sustaining livelihood of communities, encouraging ecotourism, and combating climate change. But all these may come to nothing and everything becomes meaningless if the communities, such as of Arimbay and Rawis, that utilize the Pasig Reef, are not responsible enough and do not see themselves as having the duty to preserve and protect the coral reefs. There has to be a community-based conservation training for all residents especially the fisherfolks. Empowering them would mean having active agents of protection and preservation of marine biodiversity and the entire

marine environment making them and others as responsible fishermen doing the right things for their own collective good their sense of posterity.

Project Anchor is expensive. To restore coral reefs in Pasig Reef is not inexpensive. To gather people to do a collective work requires costs. Materials for this project are not common and cheap. To think of sustainability of the project, especially going beyond of simply implementing it and mounting the artificial reefs in the seabed, demands fiscal resources and management. The fund for this has to be secured. The project needs to strengthen its interoperability and stakeholders engagement and invite other agencies to take part in this endeavor. Seeing that this project's sustainability is their corporate social responsibility and the extending their reach to community involvement would provide the fund adequate in completing all the stages. Various governmental instrumentalities, non-government organizations, people's organizations, and other interest groups may be tapped and partake in the project and they may even support in the expansion component of the project extending the project to other parts needing coral reefs restoration.

With the knowledge that coral reefs serve as disaster risk reduction strategy, all projects on coral reef restoration by way of artificial reefs should be secured as typhoon-resilient coral structures. To do this is suggestive that this project should not only end in Pasig Reef but in all neighboring reefs needing reef restoration. Communities would do extra mile in supporting these efforts, protecting these reefs, making them empowered communities on marine biodiversity, climate adaptation, and inclusive economy.

The Project Anchor extends its way to propose program for disaster preparedness and environmental protection. The focus is on resource management, external relations, leadership and governance, and community empowerment and development. Crucial areas of the program are protection, sustainability, and engagement.

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Table: Survey Questionnaire

Respondents: Twenty-Three (23) members of Bantay Dagat and Fisher Folks of Barangay Rawis and Arimbay

Level Of Awareness

Indicators	4	3	2	1
I am aware of coral restoration efforts in Legazpi City Pasig reef.	23			
I have sufficient knowledge about coral reefs and their importance.	23			
Coral restoration is important for health of marine ecosystems.	23			
Coral restoration has benefits for the community and the environment.	23			
The community should be involved in coral restoration efforts.	20	2		
Coral restoration efforts can improve the health of the reef.	21	1		
I am aware of the threats to coral reefs in Legazpi City Pasig Reef.	19	2	2	

The local government plays a crucial role in coral restoration efforts.		12	6	
There is a need for more education and awareness about coral restoration in Legazpi Pasig Reef.	18	2		
I am willing to learn more about coral restoration and its importance.	19	3		

Legend:	Rating Scale	Interpretation
	3.26-4.00	Highly Aware (HA)
	2.51-3.25	Moderately Aware (MA)
	1.76-2.50	Less Aware (LA)
	1.00-1.75	Not Aware (NA)

Level Of Community Participation

Indicators	4	3	2	1
I have participated in coral restoration activities in Legazpi Pasig Reef.	8			
I am willing to volunteer for coral restoration efforts Legazpi Pasig Reef.	23			
The community is involved in coral restoration efforts in Legazpi Pasig Reef.	19			
I am aware of the community activities related to coral restoration in Legazpi Pasig Reef.	20	1		
I contribute to coral restoration in Legazpi Pasig Reef through donations or other means.	4	6	2	
Stakeholders (e.g. government, NGOs) collaborate with the community on coral restoration efforts.	12	10		
The community is engaged in decision-making processes related to coral restoration in Legazpi Pasig Reef.	12	11		
Community participation in coral restoration efforts benefits the community and the environment.	21			
There are challenges that hinder community participation in coral restoration efforts.			13	10
Community participation is essential for the sustainability of coral restoration efforts.	21			

Legend:	Rating Scale	Interpretation
	3.26-4.00	Very High Participation (VHP)
	2.51-3.25	High Participation (HP)
	1.76-2.50	Low Participation (LP)
	1.00-1.75	Very Low Participation (VLP)

Level Of Implementation

Indicators	4	3	2	1
Coral restoration projects exist in Legazpi City Pasig reef.	21			
Coral restoration efforts are effectively implemented in area.	20	2		
Sufficient funding is allocated for coral restoration projects in Legazpi City Pasig reef.			6	4
Community is involved in the implementation of coral restoration projects.	18	2		
Regular monitoring and evaluation of coral restoration projects are conducted.	12			
Stakeholders (e.g. government, NGOs) collaborate effectively in coral restoration efforts.	15	2	5	
Coral restoration efforts have a positive impact on the health of the reef.	23			
Coral restoration efforts are sustainable and long-term.	21			
There are significant challenges to implementing coral restoration projects.	17	3		
The local government provides sufficient support for coral restoration efforts.	3	9	10	

Legend:	Rating Scale	Interpretation
	3.26-4.00	Very High Implementation (VHI)
	2.51-3.25	Highly Implemented (HI)
	1.76-2.50	Moderately Implemented (MI)
	1.00-1.75	Not implemented (NI)

Level Of Effectiveness

Indicators	4	3	2	1
Coral restoration efforts have improved coral cover in Legazpi City Pasig Reef.	20			
Coral restoration has led to an increase in marine life in the area.	23			
Coral restoration efforts have improved water quality in Legazpi City Pasig Reef.	19	2		
Coral restoration efforts have increased community awareness about the importance of coral reefs.	21			
Coral restoration efforts are sustainable and will continue to benefit the reef in the long term,	19	3		
Stakeholders (e.g. government, NGOs) are effectively engaged in coral restoration efforts.	12	8		

Coral restoration projects are well-managed and efficiently implemented.	23			
Funds for coral restoration are utilized effectively and efficiently.	21			
Coral restoration efforts have improved the overall health of the reef.	22			
Coral restoration projects have achieved their intended goals and objectives.	22			

Problems Encountered

Indicators	4	3	2	1
Funding constraints hinder coral restoration efforts in Legazpi City Pasig Reef.	20	2		
Lack of community support is a significant problem for the coral restoration and efforts.				23
Inadequate resources (e.g. equipment, personnel) hinder coral restoration efforts.	2	19		
Climate change impacts (e.g. rising sea temperatures) pose a significant challenge to coral restoration.	23			
Pollution is a major problem affecting coral restoration efforts.	23			
Lack of technical expertise is a challenge for coral restoration efforts.			2	20
Poor project management hinders the success of coral restoration,				23
Overfishing is a significant issue impacting coral restoration efforts.	23			
Limited community engagement is a problem for coral restoration efforts.			1	22

Legend:	Rating Scale	Interpretation
	3.26-4.00	Strongly Agree (SA)
	2.51-3.25	Agree (A)
	1.76-2.50	Disagree (D)
	1.00-1.75	Strongly Disagree (SD)

RESULT:

Based on the survey conducted among 23 fisherfolk in Pasig Reef, Legazpi City, coral restoration efforts are perceived as **highly effective, well-supported by the community, and beneficial to marine ecosystem health.**

The community demonstrates strong awareness and willingness to participate; however, sustainability of these initiatives will depend on:

1. Increased funding allocation
2. Stronger local government support

3. Enhanced technical resources and equipment
4. Continued education and community engagement
5. Mitigation measures addressing climate change, pollution, and overfishing

Overall, coral restoration efforts in Pasig Reef are progressing positively but require strengthened institutional and financial support to ensure long-term sustainability.