

Assessment of Mangrove Sites in Four Selected Areas within the Municipality of Calabanga, Camarines Sur

Jaybee B. Belgado, Jannel Cañotal, Joe Mart B. Emerenciana, Joana Rose Mitra

Central Bicol State University of Agriculture, Sagnay, Pili Camarines Sur, Philippines

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THE EXECUTIVE SUMMARY

The Philippines is composed of three major islands which comprises Luzon, Visayas and Mindanao with vast lands allotted for the Mangrove ecosystem. These mangroves are important to the marine and coastal ecosystem. Local Government has initiated some efforts in order to protect and maintain these ecosystems without consideration to the programs and actions sustainability. The study was conducted to assess the Mangroves in Calabanga, Camarines Sur, specifically the mangrove forest of Brgy. Sabang, Brgy. Belen, Brgy. Sibobo and Brgy. Cagsao for the purpose of analyzing the sustainability of the programs and actions implemented by the barangay and the Local Government Unit. The team conducted actual site validation in the mangrove areas of the abovementioned barangays to properly assess the status and current situation of the mangroves in the site and conducted interviews and focus group discussion with the local community and the Local Government Unit. Based on the result, there are programs initiated by the local government, such as organizing a small group which is called “Bantay Bakawan” to monitor the area, however, in other mangrove areas there are no enough support was provided by the Local Government Unit and the Barangay Local Government Unit to the Bantay Bakawan to sustainably monitor and improve the status of the mangrove site.

This study may aid other researchers to develop local ordinances and develop practices pertaining to the improvement of the mangrove sites. It may also help to make additional income to the locals living within the area since a healthy mangrove can provide a large quantity of food source, from fishes to crustaceans like crabs and shrimps.

INTRODUCTION

Mangrove forests are coastal ecosystems that offer numerous benefits to humans. They play a crucial role in stabilizing coastlines, safeguarding coastal communities against severe weather events, providing essential habitats for numerous animal species, and sequestering substantial amounts of carbon [1]. They are home to a diverse range of life forms, including terrestrial and marine animals, as well as humans [2]. Mangroves have been used as a source of building materials and charcoal in some areas [3].

In addition to their direct benefits, mangrove forests also provide important indirect benefits. For example, they can offer protective services by absorbing wave energy and serving as natural buffers against storms [4]. Mangroves have the ability to filter water by trapping sediments and pollutants with their roots, which prevents these materials from being disposed of to the sea [5]. They serve as a habitat for a diverse range of bird and marine species and can serve as important nurseries and spawning grounds for aquatic life, such as shrimp and milkfish. Furthermore, the detritus food chain which is supported by the organic matter produced by mangroves provides a source of food for many marine animals [4].

Effective ecosystem management, such as the mangrove ecosystem, is essential for achieving sustainability and guaranteeing sustainable health and productivity of these ecosystems. One approach to achieving this is through co-management and community-based mangrove forest management, which involves collaboration

between local communities and government agencies to develop and implement sustainable management practices [6,7]. While co-management between local government and community and sole management of mangrove forests by the community can be effective in promoting sustainability, it is important to recognize that not every management system is sustainable [8,9]. In this case, sustainability evaluation of the management system of the mangrove ecosystem is a practical approach to ensure the proper management of natural resources [7].

In the Municipality of Calabanga located in the Province of Camarines Sur there are several Mangrove Forest Ecosystems which are situated in Brgy. Belen, Cagsao, Sabang and Sibobo. Mangrove Management Efforts and practices, including the provision of the Bantay Bakawan Group was already established in the four mentioned mangrove areas which the goal is to provide livelihood to the community, to have a sustainable protection from calamities and to serve as an ecotourism site in the Municipality of Calabanga. Also, there are initiatives initiated by the LGU such as buying of propagules from the Local Community, and provision of Personal Protective Equipment, specifically to the members of Bantay Bakawan Group. Provided that there are certain actions undertaken by the LGU, the management of the mangrove forest faces several challenges, including illegal cutting of mangrove trees, inadequate monitoring and law enforcement, and unsustainable aquaculture practices including over extraction of crabs that even the smallest crab are being harvested. Therefore, it is essential to assess the sustainability status of various mangrove management approaches to ensure proper management of these valuable resources. This study aims to assess the perception and awareness of the respondents (community and the Bantay Bakawan) towards criteria and indicators of sustainable mangrove management and to assess the sustainability of the mangrove forest management system of the Calabanga, considering these challenges and opportunities for improvement.

SIGNIFICANCE OF THE STUDY

This study is important, especially in terms of environmental protection, climate resilience, and how local communities manage their natural resources. Mangrove forests are not just trees in the shorelines, they are important to the marine and terrestrial ecosystem. They shield our coastlines from strong waves and storm surges [8], serve as nurseries for fish and other marine life [9], help store large amounts of carbon [10], and support the livelihoods of many coastal families [11]. Despite how important those mangrove forests are, there are still insufficient efforts in the protection and conservation of the said ecosystem. There are current programs but still it is currently not well organized, not well funded and not for long term.

This study will be able to point out the specific gaps that need attention, like the absence of clear local ordinances, limited technical support for community groups, and weak enforcement mechanisms. By coordinating with local officials, community members, and Bantay Bakawan volunteers, we got a deeper understanding of both the strengths and limitations of current conservation strategies.

In some areas, local communities are the real driving force behind many of these mangrove protection efforts. They do the planting, monitoring, and reforestation—often with minimal support. This reflects similar observations in community-based resource management literature, where local ownership leads to better conservation outcomes when coupled with external support [13, 12]. But without proper equipment, formal training, or ongoing guidance, even their best efforts are still not effective.

This study also brings attention to policy gaps and uneven LGU support. This study may positively help create more inclusive and consistent local policies. Strengthening ordinances and monitoring systems across all barangays, not just those targeted for tourism but rather it can help ensure that mangrove conservation is fair and far-reaching [14, 15].

Other than conservation, mangroves also play a crucial role in disaster risk reduction. They act as natural buffers against flooding, typhoons, and coastal erosion [16], which makes them vital to local climate adaptation strategies and can strengthen the LGU's Disaster Risk Reduction and Management (DRRM) framework.

In the end, what makes this study valuable is how it connects local community actions with the responsibilities of governance. It offers practical insights that can help develop a more resilient, inclusive, and sustainable approach to managing Calabanga's mangrove forests, benefiting both the environment and the communities that rely on it every day.

The objective of the Study

The objective of this study is to determine the status of mangroves sites with regards to sustainable management in Calabanga, Camarines Sur specifically in Barangays Cagsao, Sibobo, Belen and Sabang. Also, the study aims to:

1. Determine the current local practices for the management and protection of mangrove in Calabanga Camarines Sur.
2. Determine the needs of the local community and the Local Government Unit relative to the conservation of mangroves.
3. Identify possible and attainable solutions to improve the mangrove areas in Calabanga.

Concepts and Ideas or Categories

The building blocks / main points of the paper are the following:

1. Knowing the current conservation practices of the Bantay Bakawan and the Local Communities.
2. Know the history of the Mangrove Forest in the Municipality of Calabanga.
3. Discuss the importance of Mangrove Forest to the community of the four selected barangays.
4. Assist the barangays to provide support to the Local Communities, specifically the Bantay Bakawan in the management and maintenance of the Mangrove Ecosystem.
5. Formulate more sustainable practices in the conservation of Mangrove through the provision of Local Ordinances.

Research Design and Instruments

The study uses a qualitative design of a study as it was used to generate knowledge based on human experience (Sandelowski, 2004). It was used to explore and analyze the effectiveness of programs implemented by the Local Government Unit of Calabanga in the four selected mangrove forests namely Brgy. Sabang, Brgy. Belen, Brgy. Sibobo and Brgy. Cagsao. The qualitative approach is being used as it allows the team to gather insights from various stakeholders involved in the management of the mangrove sites.

The participants are the representatives from the Local Government Unit, Members of the Bantay Bakawan and the Barangay Local Government Unit to gather first hand knowledge and the information based on the actual experiences of the participants. The study was conducted through interviews, focus group discussions and actual field observations.

Data Analysis

This study employed a qualitative data gathering method which consists of Interviews, Focus Group Discussions and Actual field Validation.

The data were analyzed using thematic analysis which is known as a foundational method for qualitative analysis (Nowell et al. 2017), where patterns and recurring issues were identified from the qualitative responses and field observations. The focus was on three primary variables:

- Number and functionality of Bantay Bakawan groups
- LGU actions and support mechanisms
- Challenges in mangrove protection and management

Table 1: Summary of the no. of Bantay Bakawan and the identified LGU Support

Mangrove Site	No of Bantay Bakawan Members	LGU Support Provided
Belen	2	- Provision of Honoraria - Buying of Mangrove Propagules
Cagsao	10	- Provision of Honoraria - Buying of Mangrove Propagules - Financial Support as the Mangrove Site will be converted to an Eco-Tourism Site.
Sabang	15	- Provision of Honoraria - Buying of Mangrove Propagules
Sibobo	2	- Provision of Honoraria - Buying of Mangrove Propagules

Given that the LGU provided financial incentives to the Bantay Bakawan Group, there are no other policies, and programs being implemented by the LGU in the four mangrove sites except for the Cagsao Mangrove Area as it is being funded for its conversion into an Eco-tourism Site. This shows that the programs implemented are not uniform to all mangrove sites.

Figure 1 : Challenges encountered in the four Mangrove Sites

Challenge	Cagsao	Belen	Sibobo	Sabang
No proper site identification before planting	✓	✓	✓	✓
No data recording of planted propagules	✓	✓	✓	✓
No baseline data on mangrove count	✓	✓	✓	✓
No recording of sold propagules	✓	✓	✓	✓
No mangrove nursery	✓	✓	✓	✓
No assistance from DENR or NGOs	✓	✓	✓	✓
No PPE or use of damaged PPE	✓	✓	✓	✓
No training for Bantay Bakawan	✓	✓	✓	✓

No engagement from Barangay LGU	✓	✓	✓	✓
No species zonation for mangrove sites	✓	✓	✓	✓
Inadequate Bantay Bakawan members	✗	✓	✓	✗
Illegal cutting of mangroves	✗	✓	✓	✗
Over Extraction of crustaceans (unique to Cagsao)	✓	✗	✗	✗
Local Ordinances/ Resolution as for the foundation and sustainability of “Bantay Bakawan”	✗	✗	✗	✗

All four mangrove sites experience the same challenges, this can be a result of lack of adequate planning, proper coordination and documentation and technical capacity as there is no National Government Agency currently involved in the conservation of the mangrove sites.

Important information that emerged from the Interviews, FGDs, and actual Observations.

A. Unequal Implementation of LGU Support

While all barangays receive some financial support, only Brgy. Cagsao benefits from provision of funding assistance for the further development of the mangrove site. Other sites are under-supported and under-monitored.

B. Lack of Technical and Institutional Capacity

There is no baseline data, no proper zonation, and no recording mechanisms for planted or sold propagules. These data are important for the sustainable management of the mangrove sites.

C. Limited Manpower Protection and Training

The supplied PPEs are outdated or damaged and no proper training has been conducted for the Bantay Bakawan. Also, two barangays (Belen and Sibobo) only have two members each, which is not enough to monitor large mangrove areas.

D. Inadequate Collaboration with National Agencies

The four mangrove sites are currently not receiving technical or logistical assistance from DENR or other National Government Agencies (NGAs). There is no current collaboration with the NGAs as to the proper management of mangrove sites.

E. Reactive LGU Approach

The LGU interventions are commendable but it is not a long term solution that will help the Bantay Bakawan in their goal to protect and properly manage the mangrove sites. Also, there are no enforcement measures, or sustainable funding for mangrove management that will fully support the management programs.

RESULTS AND DISCUSSION

The results of the study differ between the intentions of the Local Government Unit (LGU) of Calabanga and the actual outcomes of their mangrove management programs. While the LGU has implemented commendable efforts, such as providing honoraria to Bantay Bakawan and sourcing mangrove propagules from the mangrove

sites. The effect of these initiatives to the local community and also to the mangrove forest are still minimal. We present the notable findings noted during the conduct of the study;

i. Insufficiency of LGU Programs

The findings show that the LGU's programs are not for long term and are currently not sustainable. The efforts initiated by the Local Government Unit do not focus on a holistic approach that addresses long-term sustainability, biodiversity conservation, and resource management in the mangrove sites. The LGU does not have a routinary Monitoring and Evaluation activities that will assess the effectiveness of the programs and if the programs initiated do have a positive impact on the mangrove management. Also, the programs do not have a broader policy in terms of the improvement of the mangrove sites except for Brgy. Cagsao mangrove area.

ii. Inadequate Funding and Budgetary Constraints

Currently there are no funds allocated by the LGU and the BLGU for the protection of mangroves other than the provision of Honoraria for the members of Bantay Bakawan and buying of Mangrove Propagules. While this support provides livelihood opportunities to local residents and incentivizes, it does not extend to other essential components such as monitoring and evaluation systems, habitat rehabilitation for fauna, law enforcement for mangrove protection, and capacity-building. Although the LGU has a fund for the conversion of Cagsao Mangrove Site into an eco-tourism area, the initiative does not apply to all mangrove sites.

iii. Lack of Collaboration with National Government Agencies

Another major gap identified is the absence of formal collaboration between the LGU and national government agencies, particularly the Department of Environment and Natural Resources (DENR). As the primary agency mandated to oversee forest and coastal resource management in the Philippines, DENR's technical expertise, regulatory functions, and access to national funding programs are crucial to the effective conservation of mangrove ecosystems. This gap deprives local communities, specifically the Bantay Bakawan, to gain more knowledge in the proper implementation of mangrove conservation and protection programs.

v. Unequal Development of Mangrove Site

The Brgy. Cagsao is receiving notable attention from the LGU, primarily because of its planned development as an eco-tourism site while other mangrove sites are less focus of the LGU. The reason for this is also the lack of funding from the LGU as the LGU has only limited funds allocated for the management of mangrove as currently the funds is only for the honoraria of Bantay Bakawan Members and Buying of Propagules.

vi. Lack of Regulation and Enforcement

A major environmental concern observed during the study is the overharvesting of crustaceans, particularly mangrove crabs, by individuals living outside the local communities. Harvesting of even juvenile crabs illustrates unsustainable practices that could deplete the local resource base. Currently, there is no ordinance or enforcement mechanism in place to regulate harvesting activities. This lack of policies/regulation not only threatens ecological sustainability but also compromises the livelihoods of residents who depend on these resources for income.

vii. Absence of Local Ordinances and Monitoring Mechanisms

The study also highlights the absence of specific local ordinances that address the protection, monitoring, and improvement of mangrove areas. Without legislative support the conservation initiatives are still informal as there is no backbone of the implementation which is the Ordinances which is supposed to be made by the Local Government Unit. Also, the absence of monitoring and evaluation mechanisms makes it difficult for the LGU and communities to assess progress if the programs being implemented are sufficient and cost effective.

Figure 3. Photodocumentation of the Actual Conduct of FGD, Interviews and Field Validation



CONCLUSIONS, RECOMMENDATION AND IMPLEMENTATION PLAN

To better assist the LGU of Calabanga and the local community in preserving the identified mangrove forests, this study aims to identify existing gaps and areas in need of improvement. It will also present practical recommendations on how to enhance the current conservation initiatives being implemented by both the LGU and the local communities.

Through a series of pre-engagement meetings, focus group discussions, and interviews conducted with representatives of the Bantay Bakawan and local residents, the research team was able to gather valuable insights. These engagements helped identify potential gaps, challenges, and unmet needs that must be addressed to improve the overall effectiveness and sustainability of mangrove conservation efforts.

CONCLUSION

In conclusion, the current programs and initiatives of the Local Government Unit (LGU) are not sufficient to sustainably maintain the current condition of the mangrove forests. Although the LGU's programs are commendable and beneficial to the local community, they have not significantly improved the status of the mangrove forests. Most of the effective initiatives contributing to the growth and preservation of the mangrove areas come from local communities, who currently lack proper guidance on how to sustainably manage and enhance these efforts.

At present, the LGU's primary support consists of providing honoraria to the Bantay Bakawan and purchasing mangrove propagules from the areas they protect, which serves as an additional source of income for them.

It has been observed that the existing monitoring activities and improvement initiatives for the mangrove forests remain inadequate. Among the various mangrove sites, only one in Brgy. Cagsao is receiving notable attention, as the LGU plans to develop it into an eco-tourism site that could attract tourists and boost Calabanga's economy. Unfortunately, other mangrove areas are being left behind.

There have also been instances of over extraction of crustaceans, particularly mangrove crabs, where even the smallest or newly hatched crabs are being harvested by individuals who do not reside in the area. There is currently no enforcement in place to regulate crab harvesting, even though this should serve as a vital source of livelihood for the local communities.

Additionally, there are no specific local ordinances focused on the monitoring, improvement, and protection of mangrove forests within the locality. Also, there is no existing Local Ordinance for the creation of the "Bantay Bakawan" as a foundation for a project to be allocated with funding from the LGU and BLGU and other organizations.

RECOMMENDATION

- Regular monitoring and evaluation (M & E) of the community-based mangrove management "Bantay Bakawan" may be conducted. The M & E can be conducted by the local community with the guidance and support of the Barangay LGU of Calabanga, BLGU of the Four Mangrove Sites, NGA (Department of Environment and Natural Resources, Bureau of Fisheries and Aquatic Resources), and Academe (Central Bicol State University, University of Sta. Isabel, University of Nueva Caceres), and other Academic Institutions. This is highly useful in addressing identified weaknesses in the capacity for planning and periodic monitoring and evaluation.
- Academic institutions, national and local governments, as well as NGOs may provide support to the local community in the monitoring and evaluation of the mangrove management system by giving relevant training and workshops, and technical and financial support.
- Focus on the weaknesses of each Mangrove Site from Brgy. Belen, Brgy. Cagsao, Brgy. Sabang, and Brgy. Sibobo. The identified weaknesses of each mangrove site should be improved. The common weaknesses are stability of funding, capacity for planning and management of the local community, absence of forest product industry for the development of the local economy, and implementation of suitable strategies for sustainable mangrove management. Both government and NGOs may give aid by providing financial assistance, planning and M & E workshops, training on the establishment and management of efficient forest product industry and market, and others.
- Looking for continuous funding of the mangrove management initiatives shall be prioritized; this may help the local communities to conduct regular M & E through the provision of enough tools and

instruments in the conduct of M & E. One of the most needed equipment for the M & E is the Personal Protective Equipment (PPEs). This may help the Bantay Bakawan effectively carry out M & E and reforestation efforts without worrying about their safety.

- The maintenance of the mangrove forest can be considered by the LGU to be one of the Local DRRM (Disaster Risk Reduction and Management) Office initiatives of the Local Government Unit of Calabanga. To be specific it should be discussed in the DRRM Plan as the improvement and monitoring of mangroves adds to the protection of the locality from storm surge, high tides and tsunami.
- The Local Government Unit of Calabanga may craft a Local Ordinance focusing the protection of the Mangrove Forest including the fauna that lives in the said environment and also a Local Ordinance for the creation of “Bantay Bakawan” as an organic employee to provide sustainability for the project and address budgetary constraints.

Addressing these identified gaps could help the Calabanga LGU, the Barangay LGUs of the four barangays, and the local communities to establish an effective monitoring and evaluation mechanism, and to formulate a local ordinance that prioritizes mangrove forest protection, monitoring, and development.

This would not only benefit the local communities by providing sustainable livelihoods and protection from disasters, especially storms and rising sea levels such as tsunamis but also support the LGU by enhancing local tourism. In general, these mangroves may serve as a natural barrier for Calabanga against the strong and high waves from San Miguel Bay. This initiative could also be integrated into the LGU’s Disaster Risk Reduction and Management (DRRM) efforts as a preventive measure.

Implementation Plan Based on the results of the Study

1. Pre-Engagement Meetings:

- Pre-engagement meetings shall be organized with Bantay Bakawan, Barangay Local Government Units and the Local Government Units to introduce the output of the study, and discuss the outcome of the study. This may give opportunity to seek input from the community and present the recommendations presented in this study.

2. Identify Programs that shall be implemented

Identify programs that are applicable to each mangrove site based on the result of the study and discuss with the Local Community and the LGU if the programs presented in the study are attainable or needed to discuss further with consideration of financial aspect and human resource aspect.

3. Look for Possible Fund Source

- Look for possible fund source to finance the discussed programs. The fund sources may be coming from the LGU of Calabanga, BLGU of the Four Mangrove Sites, NGA (Department of Environment and Natural Resources, Bureau of Fisheries and Aquatic Resources), Non Government Organizations (World Wide Fund, Greenpeace and other relevant NGO and Academe (Central Bicol State University, University of Sta. Isabel, University of Nueva Caceres and other Academic Institutions that may offer help to the improvement and monitoring of the mangrove sites.

4. Recommend Crafting Local Ordinance and Coordination with National Government Agencies

Recommend the LGU to craft local ordinance to strengthen the implementation of the programs that will be implemented in relation to the protection, management and conservation of mangroves. Also, in coordination with the National Government Agencies to provide technical assistance on

what programs are suitable for the improvement, protection and conservation of the mangrove areas.

5. Conduct Capacity Building Workshops

- Conduct capacity building activities to the Local Community, the BLGU and the LGU in partnership with the DENR as the lead agency in the management and conservation of the environment.

6. Create a Monitoring and Evaluation Tool

- Create an effective monitoring and evaluation tool to properly assess the status of the mangrove forest and the changes brought by the conservation interventions applied in the said areas.

7. Annual Reporting of Accomplishments and Improvements of the Planned Activities

- Annual reporting of accomplishments and improvements is important to properly assess if the identified programs and activities are effective.

8. Conduct Replanning of Activities as needed

- It is necessary to conduct replanning of activities to identify the effects and impacts of the programs initiated to properly identify the suitable program that are effective and cost efficient.

By implementing these recommendations, the Local Government Unit of Calabanga, along with the local communities, bantay bakawan, can establish a more sustainable program for the management of mangrove. This can strengthen environmental protection initiatives and disaster risk reduction efforts, it can also enhance local livelihoods, which encourages community participation. This will also ensure that conservation initiatives are aligned with the long-term goals of the municipality.

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