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Coastal Resource Conditions and Management Efforts in Sta. Catalina, Ilocos Sur: A Descriptive Assessment

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ABSTRACT

Degradation happened in the coastal barangays of the Municipality of Sta. Catalina, Ilocos Sur, despite positive efforts made in the Philippines. This study assessed the coastal barangay profile; socio-economic activities in the pelagic, offshore, and foreshore zones; the extent of degradation due to natural and artificial factors; and the extent of coastal barangays' resource protection efforts. Descriptive research with 318 conveniently selected respondents, a structured questionnaire, interviews, documentary analysis, mapping, descriptive statistics, and Mean were utilized. Findings revealed the barangays with the greatest number of FARMC members, the highest population, the most fishing boats, the highest tax allocation, and the most government facilities. The socio-economic activity in the Pelagic zone is fishing; the same is true in the Offshore, with fry collections; and at the Foreshore are restobar, sari-sari stores, motor parts sellers, street food vendors, and others. The degradation of coastal resources is extensive, caused by natural and artificial factors; however, a very great extent of coastal resource protection efforts by organized bodies and residents exists, while it is high only among the LGU. The study provides localized, evidence-based insights that can guide municipal-level coastal resource management and policy formulation. The conclusion states that the coastal barangays of the Municipality of Sta. Catalina, Ilocos Sur, provides physical accessibility and socio-economic opportunities that may support tourism-related activities; the socio-economic activities in the pelagic, foreshore, and offshore zones serve as livelihoods for residents; and the organized bodies and residents are good contributors to coastal resource management. It is recommended that the LGU continue and take additional necessary steps, such as holding regular competitions to manage coastal resources, which cover cleanliness and attractions, to improve the coastal area's appeal to tourists, increase revenue, and provide residents and visitors with better services.

Keywords: *socio-economic activities, pelagic, offshore, foreshore, coastal resource protection effort*

INTRODUCTION

Protecting coastal resources is not just about environmental preservation—it is about ensuring food security, economic stability, disaster resilience, and cultural continuity for present and future generations. The United Nations Environment

Programme [UNEP] (2021) cited that coastal areas support fisheries, aquaculture, and tourism industries, providing income and food security, as it stressed, “Coastal and marine ecosystems generate trillions of dollars annually in goods and services, including food, jobs, and recreational opportunities.”

Coastal resources refer to the wide range of living and non-living assets located in coastal regions, covering both marine and land-based ecosystems. These resources are essential for sustaining human livelihoods, supporting key industries such as fishing and tourism, and contributing significantly to ecological balance and climate change mitigation.

As Kakisina et al. (2015) mentioned, the coastal area today constantly develops due to the growth of the human population living around the vicinity and in the coastal area due to rapid increasing population growth to various problems in the development of the areas; the coastal area also has a high conflict value between the efforts of utilization aspects and the environmental sustainability; the interaction between the community and the land lead to the changes in the use of land; the changes of land utilizations have a potential negative impact for the sustainability of natural resources; and the unplanned coastal areas development may trigger the emergence of biophysical and socio-economic problems.

Coastal resource problems evolve worldwide. In Indonesia, its coastal resources face significant pressure from overfishing, coral reef degradation, mangrove deforestation, and pollution. Studies indicate that around 30% of Indonesia’s coral reefs are in poor condition due to destructive fishing practices and climate change (Burke et al., 2012). Coastal areas in the U.S. face habitat loss, water quality issues, and increasing impacts from hurricanes and sea-level rise. The Gulf of Mexico has experienced hypoxic “dead zones” caused by agricultural runoff, while Florida's coral reefs are threatened by ocean warming and acidification (National Oceanic and Atmospheric Administration, 2021). Australia's Great Barrier Reef is under serious threat from coral bleaching, mainly due to climate change-induced sea temperature rise. Although parts of the reef remain in good condition, repeated bleaching events have caused major declines in coral cover (Great Barrier Reef Marine Park Authority, 2023). Bangladesh’s coastal ecosystems, including mangroves and estuarine fisheries, are increasingly vulnerable due to rising sea levels, salinity intrusion, and land-based pollution (Rahman & Rahman, 2015). Moreover, the coastal resources of the Philippines, including coral reefs, mangroves, and seagrass beds, are experiencing significant degradation due to human activities such as overfishing, coastal development, pollution, and climate change (David et al, 2021). Further, Navarro et al. (2023) found that the poverty gap and the literacy rate were among the reasons why the culprits committed such unfavorable actions towards the protected animals.

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Warguez et al. (2023) reported that in the Philippines, CRM has increased equity and sustainability in fisheries resource management, as cited by Yang and Pomeroy (2017), and has effectively made the conservation of biodiversity less costly than centralized and national-focused management (ADB, 2018). Various CRM initiatives have been considered to sustain fisheries management in the country. These include coastal habitat restoration efforts, such as coral planting, mangrove rehabilitation (Smith, 2012), and the creation of artificial reefs, as well as coastal management efforts, such as coastal clean-up and waste segregation. Other initiatives include livelihood programs (Premakumara et al, 2014) and marine protected areas (Smith, 2012).

Further, this study is encouraged to contribute to the fulfillment of the Sustainable Development Goals (SDGs), particularly SDGs 13 (Climate Action), 14 (Life below water), and 15 (Life on land). Sustainable Development Goal 13 calls for action to address climate change and its impact. SDG 14 states that the marine environment is an important source of jobs (fishing, tourism, etc.) and coastal areas are great places for living and recreational activities. SDG 14 aims to conserve oceans and ensure their sustainable use by implementing international law and developing activities to safeguard marine and coastal ecosystems and prevent marine pollution. Lastly, SDG 15 advocates protecting, restoring, and promoting the sustainable use of terrestrial ecosystems, halting and reversing land degradation, and halting biodiversity loss.

Though positive efforts were made in the Philippines, degradation still happened in the coastal barangays of the Municipality of Sta. Catalina, Ilocos Sur, just like in Indonesia, the US, Australia, and Bangladesh. On the positive side, it has been viewed as a promising prospect for tourism and the residents' livelihood; hence, its promotion motivated the researchers to conduct this study. Despite numerous national and international studies on coastal resource management, limited empirical assessments document the actual conditions, degradation factors, and protection efforts at the barangay level in Ilocos Sur. This study addresses this gap by providing a localized assessment of coastal resources in Sta. Catalina.

This study focuses on assessing existing conditions and perceptions rather than evaluating policy effectiveness or ecological outcomes. With this, the beneficiaries can appreciate the charting of their participation in shaping their future. As Pardo (2012) noted, environmental awareness through education, particularly among youth who bear future responsibility for environmental stewardship and pass on their knowledge to future generations, is a concern. Moreover, Taban et al. (2023) reported improved students' performance with the relay teaching method, which involves taking turns during teaching. The government, both executive and legislative branches, can gain insights into how people perceive the problems affecting their community. The stakeholders, as the

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ultimate beneficiaries, need to be the prime movers of any actions taken to pursue marine conservation programs. As Chan (2025) aimed in his study, the purpose should be to enrich people's spiritual lives and enhance cultural enhancement for the residents, participants, and visitors.

Local authorities could use the findings to formulate policies that could improve LGUs' coastal resource management programs; raise awareness among people about the importance of maintaining coastal resources; and help address the attainment of some SDGs. Moreover, the result may help universities disseminate information or advocate for the protection of coastal and marine resources. It may enhance Public Administration students' knowledge of the strict implementation of ordinances or issuances for community development. Lastly, the researchers may use this study as a reference for related studies.

Objectives of the Study

This study aimed to assess the coastal resources of the Municipality of Sta. Catalina, Ilocos Sur. Specifically, it sought to: 1. describe the profile of the coastal barangays in terms of physical, demographic, and governance characteristics; 2. identify the socio-economic activities in the pelagic, offshore, and foreshore zones; 3. determine the extent of coastal resource degradation due to natural and artificial factors; and 4. assess the extent of coastal resource protection efforts by the LGU, organized bodies, and residents.

METHODOLOGY

Research Design. This study is descriptive research. As a descriptive study, the research describes conditions and perceptions but does not establish causal relationships.

Population and Sample. The respondents were 318 residents—specifically household heads—using convenience sampling from the four identified coastal barangays of Sta. Catalina: Subec, Paratong, Tamorong, and Cabittaogan. The sample size was determined using Cochran's Formula. Although Cochran's formula guided the target sample size, respondents were selected through convenience sampling due to accessibility constraints in the coastal barangays.

Data Gathering Instrument. This study used an interview with a structured questionnaire, validated by three knowledgeable persons, documentary analysis, and mapping to assess coastal resources in the Municipality of Sta. Catalina.

Data Gathering Procedure. To achieve the objectives of this study, the researchers wrote a letter requesting permission from the Barangay Chairmen to conduct the study in their jurisdictions and obtained the required documents from their offices.

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The researchers distributed the checklist questionnaires and then conducted interviews with the respondents. The researchers clarified some terms with the respondents to ensure correct answers, as they requested that they answer honestly. Necessary documentation was also collected, and a map was prepared to improve comprehension of the study's concept.

Data Analysis. Descriptive statistics were used to describe the profiles of coastal barangays and their socio-economic activities, while the mean was used to describe the extent of degradation and coastal resource protection efforts.

RESULTS AND DISCUSSION

1. Profile of the Coastal Barangays

Findings, as shown in Table 1, revealed that on the profile of the coastal barangays in the Municipality of Sta. Catalina, Paratong has the farthest distance from the población with 2.01 km, but through travel time, it is the nearest among the four coastal barangays; Cabittaogan has the largest land area (263.13 ha) and the most number of FARMC members; and Tamorong has the longest area (2.06 km) and the greatest male and female population, as well as government facilities, national tax allocation, and number of fishing boats with same number as that of Subec.

This finding suggests physical accessibility and infrastructure availability that may influence livelihood diversification and coastal use.

The findings may align to the study of Andriesse (2022) in Iloilo Province where he found that variations in environmental pressures, upstream value chain challenges and local coastal governance have led to diverging livelihood outcomes among coastal communities such that more accessible barangays with larger land area, stronger community associations, and better infrastructure tended to diversify and improve livelihoods, while remote barangays lagged. As the findings are associated with those of Andriesse, barangays like Paratong, despite being physically far but faster in travel time, may benefit from better connectivity and infrastructure; Cabittaogan, with its larger land area and more FARMC members, likely reflects active governance and collective resource management; and Tamorong, having a greater population, facilities, fiscal allocation, and fishing resources (e.g., boats), exemplifies the types of coastal barangays that Andriesse describes as enjoying more opportunities due to favorable infrastructure and social capital.

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Table 1
Profile of the Coastal Barangays in Sta. Catalina, llocos Sur

Profile of the Coastal Barangays	Barangay Subec	Barangay Paratong	Barangay Cabittaogan	Barangay Tamorong	Total
A.Physical Characteristics					
Approximate distance from población (km)	1.97	2.01	1.44	1.44	**6.86**
Total land area (ha)	99.107	86.107	263.13	220.9	**669.244**
Length of Coastal Area	0.923	0.777	1.24	2.06	**5**
B.Demographic Characteristics					
Population					
Male	506	553	1,216	1,514	
Female	466	534	1,234	1,520	
Total	**972**	**1,087**	**2,450**	**3,034**	**7,543**
C.Governance / Institutional Characteristics					
Number of Fisheries and Aquatic Resource Management Council members	123	59	191	160	**533**
Government Facilities of the Barangay	4	6	6	**7**	**23**
Number of Fishing Boats	2	1	0	2	**5**
National Tax Allocation (NTA) of the Barangay	2,672,912	Less than 2 million	3.5 million	4, 444 million	**12, 616, 912**

Source: *Municipal Planning and Development Office and Municipal , Office of Agriculture, March 03, 2023*

It also agrees with the study by Pilapil-Añasco et al. (2024), which compared small island communities in Iloilo and Camarines Sur and found that coastal communities with greater population density, longer shoreline, and improved infrastructure tend to report higher perceived sustainability in tourism and fisheries activities. As aligned to the study of Pilapil-Añasco et al., Tamorong, with the longest shoreline (2.06 km), highest population, and more facilities, likely perceives and engages in more diverse resource use—including both fisheries and tourism; Cabittaogan, with the largest land area and a strong FARMC presence, may mirror the more sustainably governed communities identified in the study; and Paratong, despite being physically distant but better connected by travel time, may experience resource dynamics similar to more accessible barangays studied.

2. Coastal Socio-Economic Activities in Sta. Catalina, Ilocos Sur

The socio-economic activities considered in the coastal barangays of Sta. Catalina, Ilocos Sur, is along the pelagic, offshore, and foreshore zones. *The pelagic* zone extends from the surface to the bottom of the open ocean's water column. As

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Vedantu (2024) cited, the elagic zone is the region of the ocean outside the coastal areas and is also known as the open ocean. The Pelagic waters refer to open and free waters in the oceanic body. It extends from the ocean surface to the ocean bottom. *The offshore* zone can be the zone off the shoreface, off the surf zone, or off the littoral zone (Coastalwiki, 2023). *Foreshore* zone is the area most influenced by the high and low water marks and breaking waves (University of California Museum of Paleontology, n.d.). It is also the bed and shore, below the line of high water of ordinary or medium tides, of the sea and of every tidal river and tidal estuary and of every channel, creek, and bay of the sea or of any such river or estuary (Law Insider, n.d.).

Maps are used to present the socio-economic activities per zone. The spatial map shows the socio-economic activities in each zone, while the calendar map presents the peak months for activities that typically generate income for residents and the LGU, as well as recreation for residents, non-residents, or tourists.

There is a separate spatial map for each of the pelagic, offshore, and foreshore zones for the economic and social activities. The same is true for the calendar maps. There are separate calendar maps for each economic and social activity in each zone. The spatial and calendar maps illustrate the seasonal intensity of coastal use, indicating periods when resource pressure and human activity peak.

The primary socio-economic activities at the pelagic zone, as exhibited in Figures 1 to 4, are surfing and fishing; at the offshore zone are fry collection, fishing, and swimming; and at the foreshore zone are resto bar, sari-sari store, street foods, food stall for snacks, selling motor parts, farming, fishpond and livestock raising, shells and crustacean collection, biking, skating, dating, drag racing, biking, site seeing, zumba, beach party, jogging, running, walking, picnic, camping, and *gulgol.*

The findings may indicate that the coastal barangays are favorable for visitors, tourists, residents, and the LGU for livelihood, recreation, and revenue. The concentration of multiple economic and recreational activities within limited coastal spaces suggests increased pressure on coastal resources, particularly in the foreshore zone. The finding supports RJ Gumban's (2023) observation that, in improving the tourist experience, LGUs focused on empowering local communities through digital skills training. This allows residents to participate in the growing tourism industry and benefit from its economic opportunities.

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Figure 1
Spatial Mapping of Economic Activities

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Figure 2
Spatial map of social activities

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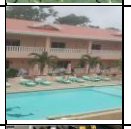
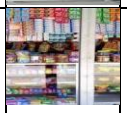
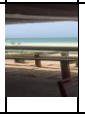
ECONOMIC ACTIVITIES	MONTHS											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Fry collection												
Shells and crustacean												
Fishing												
Street Foods												
Food Stall												
Livestock raising like cows and goats.												
Farming and fishpond raising												
Hotel and resort												
Selling of motor parts												
Sari-sari stores												
Resto-bar												

Figure 3

Calendar map of economic activities

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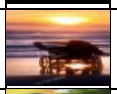
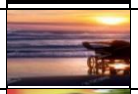
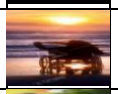
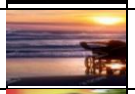
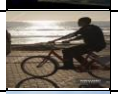
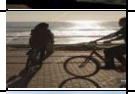
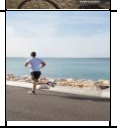
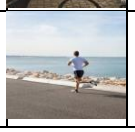
SOCIAL ACTIVITIES	MONTHS											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Surfing												
Skating												
Site seeing												
Drag racing												
Picnic and camping												
Swimming												
Dating												
Biking												
Jogging, running, and walking												

Figure 4
Calendar map of social activities

3. Extent of the Degradation of Coastal Resources

Overall, as presented in Table 2, the extent of degradation of coastal resources is “Very High” (overall mean score =4.26), as supported by the high ratings on natural and man-made factors. It may imply an urgent need for targeted and sustained intervention by local government units and stakeholders. This level of degradation threatens ecological balance, food security, and the economic well-being of coastal communities, indicating that without immediate conservation and rehabilitation measures, the long-term viability of municipal coastal resources may be severely compromised. The very high level of degradation underscores the urgency for targeted coastal rehabilitation and stricter enforcement of environmental regulations at the municipal level

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Table 2
Summary on the extent of the degradation of coastal resources

Degradation of Coastal Resources	Mean Rating	Descriptive Rating
Natural Factors	4.28	VH
Man-Made Activities	4.25	VH
Overall	**4.26**	**VH**

Legend: Range	Overall Descriptive Rating
4.21-5.00	Very High (VH)
3.41-4.20	High (H)
2.61-3.40	Moderate (M)
1.81-2.60	Low (L)
1.00-1.80	Very Low (VL)

This aligns with Nichols et al. (2019), stating that the deterioration of coastal ecosystems endangers species dependent on this environment. Natural hazards like tropical cyclones, climate change, and flooding cause ecosystem degradation. Coastal ecosystems have been used for development, recreation, and industry globally. Excessive population, environmental pollution, the devastation of mangroves and coral reefs due to development, and overfishing harm their well-being. Additionally, Nichols et al. (2019) asserted that natural disasters like tropical storms, climate change, and floods can lead to ecosystem degradation.

This could also reinforce the perspectives of Stacey et al. (2021) that the livelihoods of small-scale fisheries are impacted by the combined effects of a changing climate, leading to alterations in species abundance and distribution, rising ocean acidity and deoxygenation, as well as increased turbulence, which makes fishing endeavors more uncertain and hazardous. Additionally, the viability of livelihoods dependent on small-scale fisheries faces challenges from various factors and processes. These comprise overfishing and harmful fishing methods, unsuitable coastal development, and pollution from land, all of which can jeopardize the productivity of the resource foundation.

Lastly, the study of Mwanaidi & Sanga (2025). assessed residents' perceptions of coastal degradation—a context driven by both natural (wave energy, storm surge) and anthropogenic (destructive fishing, coastal development) forces and found out that a staggering 85.1% of surveyed fishers recognized increased wave energy as the primary cause of erosion, reflecting the natural stressors they are experiencing; the community rated seagrass meadows highly for offering coastal protection (87%), enhancing beauty (97.8%), and supporting fisheries (94.4%), suggesting these ecosystems are valued yet under threat: and destructive fishing emerged as the

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leading human-induced stressor degrading seagrass beds—an example of man-made factors contributing to overall degradation.

4. Extent of the Coastal Resource Protection Effort in the Coastal Barangays of the Municipality of Sta. Catalina, Ilocos Sur

Overall, as presented in Table 3, the extent of the coastal resource protection effort in the Municipality of Sta. Catalina is very high, with an overall mean score of 4.21, as evidenced by the residents' and organized bodies' extremely high ratings. This may indicate a strong community-driven commitment to environmental protection. However, the comparatively lower rating from the LGU suggests potential gaps in institutional support, resource allocation, or enforcement mechanisms. This highlights the need for the local government to align more closely with community efforts, enhance coordination, and possibly strengthen its leadership role to ensure the sustainability and effectiveness of coastal resource management. The disparity between community-led initiatives and LGU involvement suggests the need for stronger institutional support and coordination to sustain existing grassroots efforts.

This is consistent with Tambac et al. (2022), who report that coastal residents in Ipil and Tungawan initially observed their coastal and marine resources in a “deteriorating state” but have since improved, attributing progress to community-driven management actions, including law enforcement and incentive-based programs. Importantly, the study notes that the residents actively participated in most management strategies, and their perceptions of improvement were consistently stronger than those implied by institutional (LGU) initiatives.

Table 3
The extent of the Coastal Resource Protection Effort

Coastal Resource Protection Effort	Mean Rating	Descriptive Rating
Organized Bodies	4.31	VH
Residents	4.23	VH
LGU	4.13	H
Overall	**4.21**	**VH**

Legend: Range	Overall Descriptive Rating
4.21-5.00	Very High (VH)
3.41-4.20	High (H)
2.61-3.40	Moderate (M)
1.81-2.60	Low (L)
1.00-1.80	Very Low (VL)

It also corresponds with The Flood Hub's publication (n.d.), which indicates that carbon sequestration occurs in intertidal coastal habitats, such as salt marshes, which serve as significant carbon sinks. Changes in the environment and human land

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utilization have led to their decline; however, improved coastal management and managed realignment can facilitate their growth. Health and wellness can be enhanced through coastal schemes that permit recreational access to coastal regions, yielding health benefits. Additionally, coastal management reduces flooding risk by slowing erosion, dissipating wave energy, and constructing barriers to hold back waves. Due to climate change and rising sea levels, safeguarding against increasingly frequent and severe storms is crucial; coastal initiatives that shield numerous homes and businesses yield economic benefits by mitigating losses from flooding and erosion. Coastlines attract many day-trippers and vacationers, enhancing the economy; biodiversity, where coastal projects utilizing a natural method, such as dune restoration, salt marsh rehabilitation, and managed retreat, can create valuable habitats for diverse wildlife and plant species; and erosion protection, where hard-engineered coastal projects can prevent or reduce erosion, safeguarding homes and businesses that could be threatened. Binding locations, such as power plants and gas terminals that require proximity to the sea, also benefit from long-term management strategies.

Moreover, it aligns with the findings of Oneocean.org (n.d.): the primary responsibility for coastal management has been largely transferred to local authorities under the Local Government Code of 1991 (Republic Act No. 7160) and, more recently, outlined in the Fisheries Code of 1998 (Republic Act No. 8550). Coastal management can be seen as a fundamental responsibility of local government units, aligned with their overarching authority to oversee areas within their territorial boundaries, encompassing municipal waters extending 15 km from the shoreline. Additionally, coastal management, as an essential function of local government, encompasses all local government authorities and duties, such as planning, safeguarding, legislation and regulation, revenue generation, enforcement, intergovernmental relations, relationships with community and non-governmental organizations, as well as extension and technical support. Additionally, the city or municipal government plays a crucial role in facilitating coastal management through its legal authority to oversee resources in municipal waters. The national agencies, primarily DENR and BFAR, play crucial supportive roles in the coastal management process alongside local government units, including provinces. National and local non-governmental organizations frequently participate in the community-level implementation process by either contracting with government agencies or managing their own externally funded initiatives. Various types of academic institutions play crucial roles in baseline assessment, information management, and analysis for the planning, monitoring, and evaluation of coastal management. In general, managing coastal areas involves cooperation among different sectors and interested parties.

The discovery also reinforces the assertion of Warguez et al. (2023), indicating that community involvement guarantees the sustainability and effectiveness of

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coastal resource management.

It is linked to the assertion by Ferrer and Nozawa (n.d.), stating that, nearly twenty years later, the marine environment in the Philippines remains degraded and its resources are exhausted. Nevertheless, a glimmer of optimism appears on the horizon as increasing numbers of coastal resource management efforts are initiated by non-government organizations (NGOs), people's organizations (POs), local government units (LGUs), and national government agencies, either independently or in collaboration.

Additionally, the result aligns with Faustino and Madela's (2017) perspective, which advocates a CRM monitoring and evaluation framework to assist LGUs in reviewing, revising, and enhancing CRM initiatives.

CONCLUSIONS

From the foregoing findings, conclusions were drawn such that though the main livelihood in Sta. Catalina, Ilocos Sur is based on agriculture; socio-economic activities in the pelagic, foreshore, and offshore zones serve as livelihood and recreation of the residents, non-residents, or tourists of the coastal barangays in Sta. Catalina, Ilocos Sur; coastal resources degradation exists in the Municipality of Sta. Catalina; however, the organized bodies and residents are good contributors to the coastal protection effort in Sta. Catalina, Ilocos Sur. While coastal resource degradation remains a serious concern in Sta. Catalina, strong community participation provides a critical foundation for sustainable coastal management. The findings highlight the importance of aligning institutional actions with community-driven initiatives to ensure long-term resource sustainability.

RECOMMENDATIONS

It is recommended that the LGU strengthen coordination with organized bodies and residents to enhance coastal protection efforts. Regular monitoring and evaluation of coastal conditions should be institutionalized. Socio-economic activities in coastal zones should be managed to balance livelihood needs and environmental sustainability. Capacity-building programs and stricter enforcement of ordinances may further support sustainable coastal resource management. Future studies may examine the effectiveness of specific CRM interventions over time.

ETHICAL STATEMENT

The researchers adhered to the ethical guidelines for social science research. The respondents' full consent was sought first through a letter of consent.

The research objectives were explained to the respondents, who then decided to participate.

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