Environmental Conservation Practices of Coastal Communities: Its Implications on The Sustainable Development of Mangrove Ecosystems

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.914MG0027

Received: 08 February 2025; Accepted: 12 February 2025; Published: 12 March 2025

ABSTRACT

In the Philippines, with nearly 356,000 hectares of mangrove forests, deforestation and human pressures such as aquaculture, urbanization, and climate change threaten these ecosystems. This study examined the conservation practices of coastal communities in the Municipality of Dumangas and their impact on mangrove ecosystem sustainability. Using a descriptive-correlational design and purposive sampling, data were collected through questionnaires from 75 coastal community members. The top three conservation practices identified were supporting local mangrove laws, participating in preservation projects, and proper waste disposal in river and mangrove areas. Analysis by sex revealed that males prioritized preservation projects, waste management, and conservation laws, while females emphasized conservation laws, waste disposal, and prevention initiatives. Age analysis showed distinct focuses: respondents aged 40 and below prioritized preservation projects and waste management; individuals aged 41–60 focused on waste disposal, conservation laws, and eco-friendly practices; and those aged 61 and above emphasized preservation projects, conservation laws, and symposium participation. Across educational levels—elementary, high school, and bachelor's degree—similar conservation priorities were observed. The study highlights the implications for mangrove sustainability, particularly in terms of coastal protection, biodiversity, and stakeholder engagement, and recognizes their economic significance for livelihoods and food security. A significant relationship between conservation practices and sustainable mangrove ecosystem development was identified. The study recommends further longitudinal research to evaluate the long-term effectiveness of mangrove conservation practices and management strategies.

Keywords: mangrove ecosystem, environmental conservation practices, coastal communities, sustainable development

INTRODUCTION

Mangroves are vital coastal ecosystems, known for their salt-tolerant vegetation and crucial ecological role in protecting biodiversity and supporting human welfare. They provide essential ecological services like coastal protection from storms, erosion control, and climate regulation through carbon capture. In the Philippines, with nearly 356,000 hectares of mangrove forests, deforestation and human pressures such as aquaculture, urbanization, and climate change threaten these ecosystems. Addition to this, mangroves support cultural values, ecotourism, and educational opportunities, offering a broad range of cultural ES (Niyangko et al., 2021).

In Dumangas, local conservation efforts, including the "Adopt a Mangrove" program led by MENRO, engage diverse community members in planting and protecting mangroves, enhancing awareness and marine life. This study aims to strengthen mangrove management by assessing conservation practices in Dumangas, promoting sustainable development and community-led stewardship for mangrove preservation.

Statement of the Problem

This study aimed to examine the environmental conservation practices of coastal communities and their impact on the sustainable development of mangrove ecosystems.

Specifically, it sought to address the following questions:

1. What are the top three environmental conservation practices of coastal communities when grouped as to sex, age and educational attainment?

2. What are the implications on the sustainable development when grouped as to sex, age, and educational attainment?

3. Is there a significant relationship between the environmental conservation practices of coastal communities and implications on the sustainable development of mangrove ecosystem?

Theoretical and Conceptual Framework

The Social-Ecological Systems (SES) framework, developed by Elinor Ostrom and colleagues, serves as the foundation for this study. This framework provides a holistic approach to understanding the intricate interactions between social and ecological components within a system, emphasizing how human activities and institutions shape, and are shaped by, ecological processes over time (Ostrom, 2009; Folke et al., 2005).

This study uses the Social-Ecological Systems (SES) framework to explore the interconnectedness of social and ecological factors in mangrove conservation within Dumangas. By examining how socio-demographic factors, such as age, sex, and education, influence conservation practices, the framework provides insight into how these elements impact sustainable mangrove management. The conceptual focus is on environmental conservation practices—actions by coastal communities to protect and sustain mangrove ecosystems—and sustainable development, balancing social, economic, and environmental goals. Socio-demographic influences, along with perceived benefits and barriers, are hypothesized to shape individual engagement in mangrove conservation efforts.

In this study, the independent variables consist of socio-demographic factors, specifically sex, age, and educational attainment. These variables are expected to influence the dependent variables, which are the environmental conservation practices adopted by coastal communities and their implications for the sustainable development of mangrove ecosystems. This relationship aims to reveal how individual characteristics impact conservation behaviors and contribute to the long-term sustainability of mangrove ecosystems.

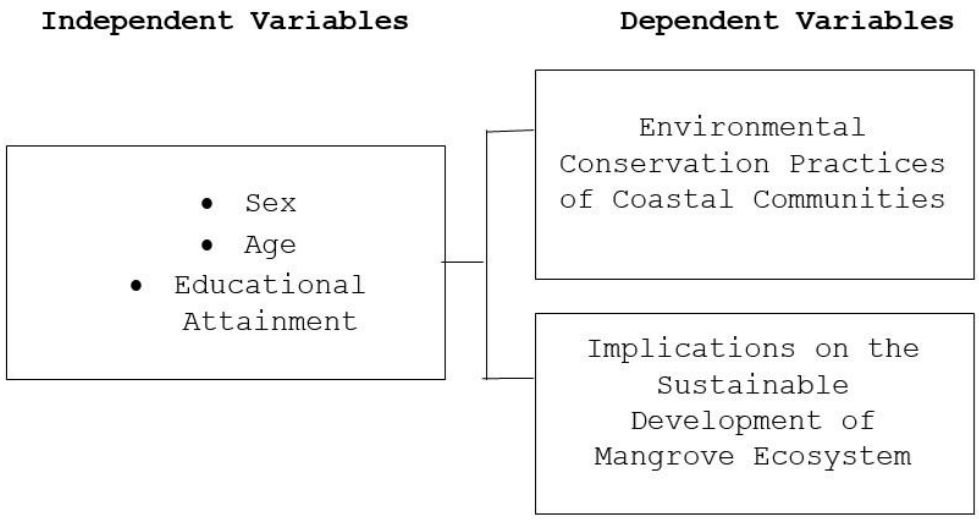

Figure Sex 1. Illustrates the relationships between the independent variables and the dependent variable

Significance of the Study

The results of this study are relevant to the following sectors:

Community: This study highlights the importance of mangrove ecosystems for the local community, emphasizing their role in providing resources, protecting against typhoons and storm surges, and supporting marine biodiversity.

Department of Environment and Natural Resources (DENR): The findings offer valuable support to DENR authorities in enhancing their institutional frameworks, refining management strategies, and strengthening conservation policies

Local Government Unit (LGU) and Non-Government Organizations (NGOs): The findings of this study can guide LGUs and NGOs in making informed decisions, developing effective strategies, and implementing programs for sustainable mangrove management and conservation in coastal municipalities.

Schools: The study advocates for schools to enhance local conservation by educating students and the community on mangrove ecosystem importance. It encourages schools to hold environmental activities—orientations, symposiums, coastal cleanups, and tree-planting—to foster awareness and active involvement in conservation efforts

Future Researchers: This study provides valuable insights for future researchers by highlighting potential outcomes in mangrove preservation and management.

METHODOLOGY

Research Design

This study aimed to assess the environmental conservation practices of coastal communities and their impact on the sustainable development of mangrove ecosystems. A descriptive-correlational survey method was employed. This approach is well-suited for understanding the connection between community practices and environmental outcomes in a real-world setting.

Locale of the Study

The study was conducted in five strategically selected coastal barangays within the Municipality of Dumangas: Brgy. Nanding Lopez, Paloc So-ol, Lacturan, Umba-Bacay, and Sapao. These barangays were purposefully chosen due to their proximity to rich river systems and abundant mangrove forests, making them critical ecological zones.

The selection is significant as it allows for valuable insights into the dynamics of mangrove ecosystems and the environmental conservation practices employed by local communities. Each barangay exhibits distinct characteristics in terms of mangrove species diversity, ecosystem services, and community engagement in conservation efforts. Brgy. Nanding Lopez, Paloc So-ol, Lacturan, Bacay, and Sapao serve as exemplary sites for studying the interplay between coastal communities and mangrove ecosystems.

Respondents of the Study

This study involved a total of 75 respondents selected from specific barangays within the Municipality of Dumangas, with a focus on individuals residing near riverbanks and coastal zones. Each barangay contributed 15 representatives who voluntarily participated in the questionnaire.

The respondents were categorized based on sex, age, and educational attainment. In terms of sex, 32 respondents (42.7%) were male, while 43 (57.3%) were female.

Regarding age distribution,12 (16%)40 years old and below, 24 (32.0%) were aged 41 to 60 years, and 39 (52.0%) were 61 years and above. This demographic breakdown provides a comprehensive overview of the study population, highlighting the diverse perspectives of the coastal community in Dumangas.

Table 1, presents the distribution of the respondents of the study.

Category	f	%
Entire group	75	100%

Sex		
Male	32	42.70%
Female	43	57.30%
Age		
40 yo below	12	-
41 – 60 yo	24	32.00%
61 yo and below	39	52.00%
Educational Attainment		
Elementary	26	34.70%
High school	24	45.30%
Bachelor's degree	15	20.00%

Sampling Size

The sample size for this study comprised 75 individuals residing across the five selected barangays in the Municipality of Dumangas, with fifteen respondents chosen from each barangay through purposive sampling. The decision to select 75 respondents was based on a careful evaluation of multiple factors to ensure the research's practicality, reliability, and representativeness. Given the constraints of available resources—including time, budget, and personnel—a sample size of 75 was considered both feasible and manageable, allowing for effective data collection and subsequent analysis within the scope of the research.

Sampling Techniques

The purposive sampling was used in this study. A purposive sampling is a non-random sampling technique in which the researcher selects respondents based on specific criteria relevant to the research question (Creswell, 2017).

Research Instrument

The researchers developed a survey questionnaire specifically tailored to meet the objectives of the study. This instrument underwent a rigorous validation process to ensure its reliability and validity in collecting the necessary data.

The questionnaire was structured into four distinct sections to systematically gather essential data. **Part 1** contained the title of the instrument, clearly identifying the survey's purpose and scope. **Part 2** collected demographic information, including respondents' personal details such as name, age, sex, educational attainment, and the barangay of residence. **Part 3** provided instructions to guide respondents on how to accurately complete the survey. **Part 4** formed the main body of the questionnaire, which was divided into two categories: the first type focused on inquiries related to environmental conservation practices prevalent in the coastal municipalities under study, while the second type explored the implications of these practices on the sustainable development of mangrove ecosystems.

Respondents were required to indicate their environmental conservation practices by checking the appropriate column corresponding to their level of engagement, which was assessed using a point system. Responses were scored as follows: "Always Practice" (4 points), "Frequently Practice" (3 points), "Occasionally Practice" (2 points), and "Never Practice" (1 point). This scoring method facilitated the computation and analysis of the data collected.

Data Collection Procedure

Before conducting the study, the researchers obtained permission and approval to implement the survey.

For data analysis, the researchers employed descriptive statistical methods, including mean, standard deviation, and rank to summarize the responses. Additionally, Spearman's Rho was utilized as an inferential statistical tool to assess the relationships between variables. The responses were systematically tallied, computed, and recorded for accuracy.

Data Analysis

The study data were analyzed using descriptive and inferential statistics with SPSS software. Descriptive tools—mean, standard deviation, and rank helped summarize and interpret responses. Mean scores identified environmental conservation practices and their impact on sustainable mangrove development, while rank highlighted the top three practices. Spearman's Rho assessed the relationship between conservation practices and mangrove sustainability, and standard deviation measured response variability.

RESULTS AND DISCUSSION

Top Three Environmental Conservation Practices of Coastal Communities when grouped as to Sex, Age and Educational Attainment**.** The study surveyed a total of 75 coastal communities, comprising 32 male and 43 female respondents. Each respondent resided in close proximity to riverbanks and mangrove areas, providing essential insights for the research. The top three environmental conservation practices of coastal communities when grouped according to Sex.

When grouped according to Sex, showed that the top three environmental conservation practices of the male were: They support projects that provide assistance to mangroves to prevent their degradation, with a mean of 3.78 and standard deviation of; They are committed to proper waste disposal and recycling to prevent pollution in the mangrove ecosystems and rivers, with a mean of 3.66 and standard deviation of 0.653; and they actively support local laws and regulations aimed at conserving and protecting mangroves, which recorded a mean of 3.66 and standard deviation of 0.653.

The respondents in the study were categorized into three age brackets: under 40 years old, 41-60 years old, and 61 years and above. Correspondingly, the top three environmental conservation practices, organized based on age groups.

Upon grouping the respondents by age, it was disclosed that among those 40 years old and below, the top three environmental conservation practices were: They support projects that provide assistance to mangroves to prevent their degradation, with a mean of 3.38 and standard deviation of 0.744; They committed to proper waste disposal and recycling to prevent pollution in the mangrove ecosystem and rivers, with a mean of 3.25 and standard deviation of 0.886; and they make sure to properly dispose their trash and waste when they visit river or mangrove forest, with a mean of 3.25 and standard deviation of 0.886.

For the respondents aged 41-60 years old it includes the following practices: they make sure to properly dispose their trash and waste when they visit river or mangrove forest, with a mean of 3.88 and standard deviation of 0.338; they actively support local laws and regulations aimed at conserving and protecting mangroves with a mean of 3.83 and standard deviation of 0.482; they utilized ecofriendly products and materials to avoid negative impacts on the mangrove ecosystem with a mean of 3.71 and standard deviation of 0.550; and they support projects that provide assistance to mangroves to prevent their degradation with a mean of 3.71 with a standard deviation of 0.624.

Lastly, among the respondents aged 61 above the top three environmental conservation practices were: they support projects that provide assistance to mangroves to prevent their degradation, with a mean of 3.69 and standard deviation of 0.614; they actively support local laws and regulations aimed at conserving and protecting mangroves, with a mean of 3.64 and standard deviation of 0.811; and they actively participate in symposiums or

seminars advocating for the conservation and preservation of mangroves, with a mean of 3.64 and standard deviation of 0.584.

Considering the significance of understanding environmental conservation practices, the education level of the respondents was factored into the analysis to discern perceptions across different educational backgrounds. Among the participants, 26 had attained elementary education, 34 had completed high school, and 15 held bachelor's degrees. In this regard,

The top three environmental conservation practices, categorized according to their educational attainment.

Presents the outcomes when categorized based on educational attainment. The findings indicate that among elementary-level respondents, the top three environmental conservation practices included the following: they actively support local laws and regulations aimed at conserving and protecting mangroves, with a mean of 3.85 and standard deviation of 0.464; they support projects that provide assistance to mangroves to prevent their degradation with a mean of 3.69 and standard deviation of 0.679 ; and they make sure to properly dispose of our trash and waste when we visit river or mangrove areas with a mean of 3.69 and standard deviation 0.618.

Similarly, among high school-level respondents, environmental conservation practices were: they support projects that provide assistance to mangroves to prevent their degradation with a mean of 3.65 and standard deviation of 0.597; they make sure to properly dispose of our trash and waste when we visit river or mangrove areas, with a mean of 3.62 and standard deviation of 0.551 ; and they actively support local laws and regulations aimed at conserving and protecting mangroves with a mean of 3.53 and standard deviation of 0.961.

Conversely, among Bachelor’s Degree holders, environmental conservation practices includes: They actively support local laws and regulations aimed at conserving and protecting mangroves, which recorded a mean of 3.60 and standard deviation of 0.632; They are committed to proper waste disposal and recycling to prevent pollution in the mangrove ecosystems and rivers, with a mean of 3.53 and standard deviation of 0.640; and they support projects that provide assistance to mangroves to prevent their degradation, with a mean of 3.53 and standard deviation of 0.743.

Top Three Implications on the Sustainable Development of Mangrove Ecosystem when grouped as to sex, age and educational attainment The table presents distinct insights into the implications for the sustainable development of mangrove ecosystems when grouped as to sex.

Based on the findings presented, among male respondents, the top three implications for the sustainable development of mangrove ecosystems were identified as follows: They noticed that mangroves serve as breeding sites for crabs, fish, birds, and other species, with a mean of 3.75 and standard deviation of 0.672; They observed the interactions among mangrove species, especially their implications on ecosystem change and biodiversity conservation, with a mean of 3.75 and standard deviation of 0.508; and they witnessed the role of mangroves in protecting the coastline from natural calamities such as typhoons and storm surges, with a mean of 3.74 and standard deviation of 0.575.

While on females are: They are aware that stakeholders participate in the management and conservation of mangroves through their programs and activities, with a mean of 3.81 and standard deviation of 0.450; They witnessed the role of mangroves in protecting the coastline from natural calamities such as typhoons and storm surges, with a mean of 3.79 and standard deviation of 0.412; and they noticed that mangroves serve as breeding sites for crabs, fish, birds, and other species, with a mean of 3.70 and standard deviation of 0.558.

In this study, age has been incorporated as a variable to explore the perspectives of coastal communities regarding the implications of conservation practices on the sustainable development of mangrove ecosystems.

The top three implications for the sustainable development of mangrove ecosystems, categorized by age group.

Top Three Implications on The Sustainable Development of Mangrove Ecosystem when grouped according to Educational Attainment. For those at the elementary level, the top three observed implications on the sustainable

development were: They noticed that mangroves serve as breeding sites for crabs, fish, birds, and other species, with a mean of 3.92 and standard deviation of 0.272; they saw the various species of fauna (animals) living in the mangrove ecosystem, including fish, shells, birds, and others, with a mean of 3.77 and standard deviation of 0.587; they observed the different types or species of mangroves present in the ecosystem, with a mean of 3.77 and standard deviation of 0.652.

Relationship between Environmental Conservation Practices of Coastal Communities and Implications on The Sustainable Development of Mangrove. The analysis revealed a significant relationship between the environmental conservation practices of coastal communities and the environmental conservation implications for the sustainable development of mangroves [rho = .425, p = .000]. The obtained p-value of .000 is below the set significance level of .05 alpha, confirming strong statistical significance.

CONCLUSION

The study concludes that coastal communities' top environmental conservation practices—such as protection, restoration, program engagement, and sustainable tourism development—are instrumental in mangrove ecosystem sustainability. These practices vary by demographic factors like sex, age, and educational attainment, with all groups prioritizing species and biodiversity conservation and human welfare. Findings confirm a strong relationship between these practices and sustainable development implications, underscoring the need for comprehensive conservation strategies.

RECOMMENDATIONS

1. Community involvement: Increase awareness, promote eco-friendly practices, and emphasize mangroves' role in disaster preparedness.

2. DENR actions: Strengthen frameworks, support research, and engage stakeholders to ensure effective mangrove management.

3. LGUs and NGOs**:** Use insights to drive policy, create targeted conservation strategies, and foster community collaboration.

4. Educational initiatives**:** Engage schools in conservation activities to foster environmental awareness and advocacy among students.

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