

Drivers that motivate participation in mangrove forest management among the local people at Barangay Lasang, Davao City, Philippines

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Abstract. Mangrove forests, which are vital for biodiversity, climate regulation, and storm buffering, have lost half their global cover over the past century, emphasizing the essential role of local communities and indigenous peoples in their ecological management. Hence, this study aimed to generate insights and strategies to enhance local participation in mangrove forest management. This study employed a descriptive-correlational research design, and data were collected through a 100% survey of Tambongon Fisherfolks Association (TAMFIAS) members. A structured questionnaire assessed participation levels and drivers influencing mangrove forest management. Results showed a mean average participation score of 4.17, indicating frequent engagement in mangrove forest management activities. Among the drivers tested, monetary-related benefits such as the provision of financial benefits, enhanced career-related skills, and stabilized job emerged as the strongest driver ($r=0.27$) in mangrove forest management participation, followed by perceived ecological values ($r=0.25$) and ecological knowledge ($r=0.24$). Contrarily, nonmonetary-related benefits such as making friends, improving environmental quality, and strengthening relationships hold the weakest influence ($r=0.14$). The correlation between drivers that motivate participation and participation levels had a weak but positive relationship ($r=0.29$). Therefore, the study recommends project planners in Barangay Lasang incorporate monetary incentives during mangrove management initiatives to boost local involvement.

1. Introduction

Mangrove forests have a distinct ecosystem suited to saline intertidal conditions [1]. Mangroves typically occur in tropical subtropical regions. Among all continents, Asia has one of the highest portions of mangrove forest cover; however, this ecosystem faces critical deforestation rates [2]. Mangrove forests have been recognized for having incredible biodiversity, notably in the Southeast [3]. In dealing with the effects of climate change, the majority of mangrove forests' regulating services, particularly their buffering capabilities against storms and floods, are becoming increasingly beneficial and indispensable. More than tropical rainforests, mangrove forests are among the most carbon-rich forests in the tropical ecosystem [4]. However, satellite imagery has shown that throughout the globe, mangrove

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forests have declined in the past couple of years, which has been linked to greater conservation efforts and a scarcity of remaining mangroves to be deforested [1].

The Philippines has 50% of the world's total mangrove species, yet its vast mangrove regions have decreased to around half of their original cover in the last century [5]. The country holds around 250,000 hectares of mangroves after its various restoration and conservation initiatives [6]. Mangrove forest management is closely linked with conservation through community-based initiatives involving the cooperation of communities and decision-making that demand their participation [7]. Mangrove forest management is perceived to be an avenue to preserve the forests while maintaining the welfare of the nearby communities that rely on them for their existence and means of subsistence [8]. Therefore, widespread public participation is one of the most essential requirements of any ecological management program, including forest management projects [9].

In Davao City, a study assessing the mangrove forest in terms of forest structure, abundance and distribution of mangrove regeneration, the status of species diversity, and Importance Value Index (IVI) revealed that 21 of 34 mangrove species identified are said to have low species richness; concluding that the mangrove forest ecosystem in the locality has imbalances, resulting to only a few of the species can thrive [10]. The mangrove ecosystem is home to a wide variety of plant and animal species. But because of the severe anthropogenic pressure and environmental stressors it faces, the ecosystem is deteriorating and biodiversity is diminishing, necessitating conservation and management efforts [11]. The dependence of coastal communities on these ecosystems can encourage them to restore and conserve mangrove forests using their local knowledge [12].

Sattayapanich et al. (2022) state that people's participation in mangrove forest management varies based on their perceptions of different beneficial services [13]. Research on community involvement has shown that there are numerous advantages for people, the community, and society at large. It gives people the chance to acquire new abilities and information as well as life experiences [14]. Furthermore, residents, as institutions, have been associated with successful tree planting according to their neighborhood characteristics rather than their decision-making [15]. In summary, the drivers' influence on mangrove forest management is vital in improving communities [16].

This research holds significant value in terms of the potential benefits to local people and ecosystems directly involved and its broader alignment with global sustainable development goals. This study catalyzes achieving Sustainable Development Goals (SDG) 14- Life Below Water and SDG and 15- Life on Land. SDG-14 underscores the importance of conservation and sustainability by utilizing the oceans, seas, and marine resources for sustainable development. It targets to cover more than 70% of the surface of our planet and play a key role in supporting life on Earth, including the coastal zone where mangrove forests are situated. SDG-15 seeks to prevent and reverse biodiversity loss and land degradation, manage forests sustainably, fight desertification, and preserve, restore, and encourage the sustainable use of terrestrial ecosystems. Mangroves are essential to such an ecosystem, bridging the gap between land and sea. Thus, this study can contribute to the preservation and directly support the management of mangroves; this serves as a bridge between local people and mangrove forest management managers, facilitating a collaborative approach to mangrove forest management. Moreover, this study can empower local communities by encouraging them to participate in and contribute to preservation and protection while equipping restoration managers and researchers with the data necessary to implement ecologically and socially beneficial initiatives.

Although many studies have already been conducted about mangrove forest management activities, more research still needs to be done on how the different factors motivate or influence local participation in mangrove forest management. Hence, this research aims to bridge the gap by determining local participation and identifying the factors motivating

participation in mangrove forest management among the locals residing in Barangay Lasang, Davao City, Philippines. Furthermore, this study also aims to achieve the following specific objectives: (i) to assess the level of participation among locals in mangrove forest management; (ii) to identify the drivers influencing local participation in mangrove forest management; and (iii) to determine the relationship between the drivers motivating local participation and the level of participation among locals in mangrove forest management.

The local communities and indigenous people contribute significantly to ecological management projects as they have first-hand access and knowledge of the resources in their locality and the environmental changes affecting them [17]. Hence, identifying drivers that help stimulate and boost local participation is essential to effectively carry out mangrove forest management projects. By assessing the drivers that motivate participation and the level of participation in mangrove forest management, this study aims to provide valuable insights into the factors influencing community engagement and decision-making processes regarding mangrove management. This study is essential to the following sectors in the fulfillment of this research endeavor: (1) non-governmental organizations (NGOs) will benefit from the findings of this study, including the Tambongon Fisherfolks Association (TAMFIAS), as they can use this information to devise effective community engagement strategies that tailor their interventions to local needs and promote greater collaboration with local communities; (2) the Local Government Unit (LGU). This study can support the LGU in Barangay Lasang, Davao City, by providing evidence-based recommendations for enhancing community engagement in mangrove forest management, which leads to a more effective resource utilization, better coordination among stakeholders, and improved conservation outcomes; (3) academic institutions can benefit from this study by incorporating its findings into teaching curricula related to environmental studies and community development; (4) local communities stand to benefit significantly from this research as it identifies the drivers that motivate participation in mangrove forest management, enabling them to contribute actively to conservation efforts, leading to improved livelihoods and increased resilience to environmental threats; and (5) to future researchers, this study may be cited as a future reference for future research studies specifically studying mangrove forest management, the impact of specific intervention strategies, or comparative studies across different geographical areas. This will serve as baseline data for other researchers who wish to improve the scope of the study.

This study is supported by the theory “Ecological Values Theory”. Ecological Values Theory lies in biodiversity, where natural communities function as finely tuned systems and species diversity enhances an ecosystem's stability, resilience, and adaptability to changing environmental conditions [18]. Ecological Values Theory posits that the value of ecosystems and biodiversity is intrinsic and cannot be fully captured through traditional economic measures alone. It encompasses instrumental and intrinsic values, recognizing that ecosystems provide essential services for human well-being while possessing inherent worth beyond human utility [19]. In relation to the level of participation in mangrove forest management, the Ecological Values Theory motivates people to recognize the positive effects of ecosystems on human lives. On the other hand, the perceived ecological value allows people to assess the worth of service by weighing the ecological benefits. When people perceive mangrove forests as valuable in sustaining life, providing beauty, cultural significance, and supporting recreational activities, they are more likely to attribute higher value to them [20]. The link between Ecological Values Theory and perceived ecological value lies in the recognition that individuals' perceptions of the natural environment are shaped by their understanding of its ecological value [21].

Furthermore, this study tackles people's perspectives and comprehension of mangrove forest management. The “Traditional Ecological Knowledge Theory” emphasizes the crucial role of ecological knowledge in determining the causes that motivate the participation of the

locals in the preservation of mangrove forests [22]. The said theory is commonly known as the “Indigenous Theory”, which guides and offers strategic plans for developing ecological status in a particular area depending on the resources available in the site. This construed the significance of further knowledge in implementing an action toward the environment which covers the gist of the ecological knowledge of the locals as a driver motivating participation in the mangrove forest initiatives.

Apart from that, the theory “Incentive Theory” and “Expectancy-Value Theory” are being adapted to support the factors, expected benefits, and environmental concerns in justifying the motivation for participation in mangrove forest management. It explains the behavior of the participants and the expected monetary and nonmonetary-related benefits when participating in mangrove restoration projects. In relation to Incentive Theory, commitment, engagement, and effort to the social relationship significantly impact one's participation in a particular activity [23]. It incorporates and tackles how people sustain, change, resist, or reject the offered incentives or benefits. In addition, the Expectancy-Value Theory revolves around the idea of an individual's expectations for success, and one of its determinants is their task values, as they are related to their achievement-related choices [24]. In the account of this study, the Expectancy-Value Theory determines people's expectations concerning their choice of tasks, as it would help set significant and specific goals. The expected monetary and nonmonetary benefits are under the Expectancy-Value Theory and Incentive Theory as they conclude people's expectations and rewards by setting a common goal.

Figure 1 illustrates the dependent and independent variables identified in the study. The independent variable encompasses the drivers motivating local participation in mangrove forest management regarding perceived ecological values, ecological knowledge, expected monetary-related benefits, and nonmonetary-related benefits. The identified drivers are obtained from the study “Factors Affecting Community Participation in Environmental Corporate Social Responsibility Projects: Evidence from Mangrove Forest Management Project,” which was emphasized to play a significant role in influencing local participation in mangrove forest management activities.

On the other hand, the dependent variable, as shown in Figure 1, is the level of participation among locals in mangrove forest management. Participation involves local community members determining whether the objectives and completion of tasks have been accomplished [13]. This includes acting in response to their roles and responsibilities outlined in the plan or accords. Thus, in this study, the strength of the relationship between the two variables, “Drivers that Motivate Participation in Mangrove Forest Management” and “Level of Participation of Locals in Mangrove Forest Management,” will help the researchers determine the weight of the different drivers in motivating individuals and communities to participate in mangrove forest management efforts through the determination of the extent of their relationship. The null hypothesis of this study proposes that there is no relationship between the drivers that motivate local participation and the level of local participation in mangrove forest management. The conceptual framework of the study can be seen in Fig. 1.

2. Method

This section encompasses the conceptual framework and the approaches and specific procedures employed for the data collection. The researchers employed the appropriate methods and statistical tools in the data collection and analysis and were able to draw significant information.

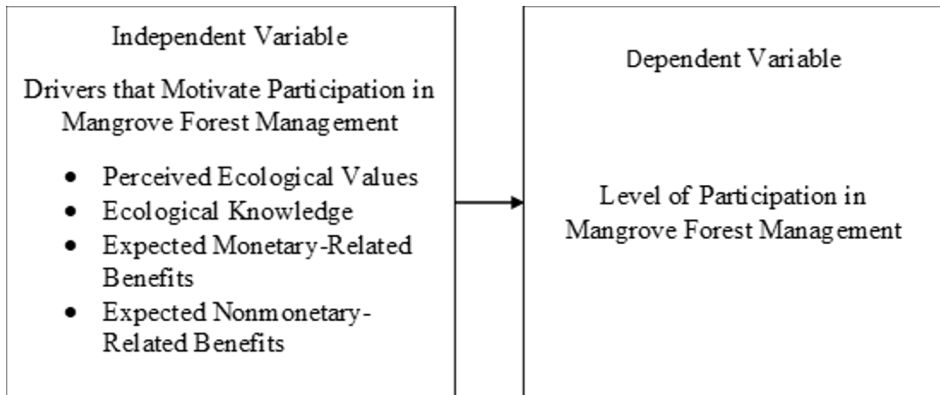


Figure 1. Conceptual framework of the study.

2.1. Research Design

The researchers employed a descriptive-correlational research design to assess and determine the strength of the relationship between the level of participation among the locals and the different drivers motivating local participation in mangrove forest management. In research methodology, descriptive research design aims to describe or document the characteristics, behaviors, attitudes, viewpoints, or perceptions surrounding a population or group being studied. It focuses on providing a comprehensive and accurate representation of the data collected, which aids in the development of hypotheses, the analysis of trends, and the discovery of patterns in the data [25]. On the other hand, correlation research design involves a non-experimental study that examines the connections between two or more variables, wherein the researchers cannot control or manipulate these variables [26]. Studies that use correlational research design can be used to investigate the direction and degree of correlation between variables and to find probable causal relationships [25]. By using a descriptive-correlational research design, this study will be able to describe the relationship of the identified variables to provide systematic information while determining the extent of association between the two variables using statistical information.

2.2. Research Location and Respondents

The study was conducted in Purok Libra, Tambongon, Barangay Lasang, Davao City, Philippines, with a geographical coordinate of 7° 15' 16" North and 125° 39' 53" East, situated 5 meters above sea level. The study area encompasses mangrove forests subject to protection and conservation initiatives carried out by the residents and fisherfolk cooperatives within the area, especially by the members of the Tambongon Fisherfolks Association (TAMFIAS). Barangay Lasang is a Marine Protected Area (MPA) that homes 11 mangrove species mainly dominated by bakauan-lalaki (*Rhizophora apiculata*), api-api (*Avicennia alba*), and bakauan-bato (*Rhizophora stylosa*) with a total percentage of species distribution of 61% [27].

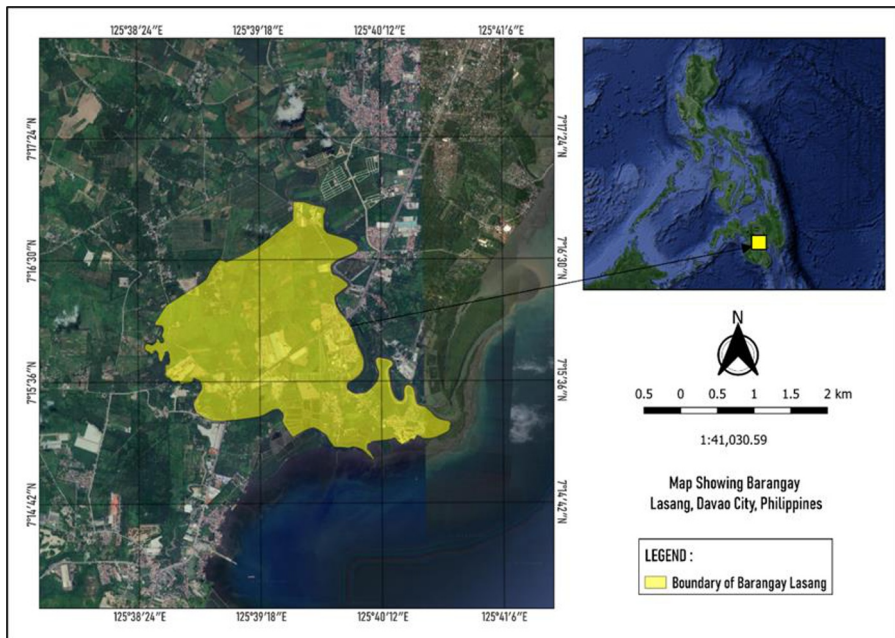


Figure 2. Location map of the study.

The researchers surveyed all the members (100%) of the Tamabongon Fisherfolks Association (TAMFIAS), aged 18 years old and above, as respondents since they are the appropriate and suitable participants for this study. They fit into the criteria that require the respondents to be inhabitants residing around or within mangrove forests and have already participated in mangrove forest management activities. The researchers have already gathered preliminary data for this study to ensure that the prospective respondents are fit for this study. TAMFIAS has 46 male and 37 female members, a total of 83 members, and stands as an example of community-driven environmental protection efforts. Their mission aligns with the SDGs, mainly focusing on the critical goal of protecting marine resources. Their continuous efforts are not only for the association but also for the whole community. They are the recipient of the Lunhaw Award and nominated for Malinis at Masaganang Karagatan (MMK – a nationwide search for sustainable efforts in protecting marine protected areas). The research respondents serve as a foundation for our data analysis and conclusions. Moreover, this study collected demographic data to provide basic information on the socioeconomic characteristics of the respondents.

2.3. Research Materials and Instruments

The research questionnaire is a structured instrument adopted from the of Sattayapanich et al. (2022). The questionnaire comprises a series of well-structured questions pertaining to the drivers that motivate local participation and the level of participation in mangrove forest management that encompasses three distinct sections. Part I of the questionnaire is intended to obtain the demographic profile of the respondents to describe their socioeconomic characteristics. The following demographic factors to be collected are sex, level of education, occupation, source of income, and monthly income of the participants. Part II questions are intended to gather data on the drivers that motivate participation among the locals in mangrove forest management, which includes four subsections: (a) Perceived Ecological Values, (b) Ecological Knowledge, (c) Expected Monetary-Related Benefits, and (d)

Expected Nonmonetary-Related Benefits. Lastly, Part III questions will determine the level of participation among locals in mangrove forest management, including two subsections: (a) Level of Participation in Implementing Mangrove Forest Management Activities and (b) Level of Participation in Monitoring Mangrove Forest Management Activities.

The entire items of the questionnaire used a five-point Likert scale, adopting the measures of level of participation in determining the factors influencing local participation authored by Sattayapanich et al. (2022) [13], ranging from 1-5, indicating strongly disagreeing to strongly agreeing and never participating to always participating on the drivers motivating participation and the level of participation among the locals in mangrove forest management respectively. A five-point Likert scale is used in structured survey questionnaires that enable respondents to express genuine neutral opinions about a matter [28]. As for the mean average scoring of the values, this study employed the scoring of the five ranges: 1– 1.80 for strongly disagree and never participating, 1.81– 2.60 for disagree and seldomly participating, 2.61– 3.40 for neutral and sometimes respectively, which 3.41–4.20 for agree and oftentimes participating, and 4.21–5 for strongly agree and always participating, for the indicators assessing the drivers that motivate participation in mangrove forest management among the locals and their level of participation in mangrove forest management respectively, which is adopted from a study authored by Bhuiyan and Islam (2023) [29].

2.4. Data Collection Procedure

Firstly, the researchers formally wrote a letter of permission to the barangay captain and the chairman of TAMFIAS for the approval of conducting a research survey involving the association's members. Upon approval, the researchers gathered the data following the scheduled date stated in the letter. The researchers gave informed consent forms to the respondents and answered their inquiries related to the study conducted. Next, the researchers handed out survey questionnaires to the respondents who were willing to participate. Finally, the researchers retrieved the survey questionnaires when the respondents had already completed the survey.

2.5. Data Analysis

The statistical treatments used to quantify, interpret, and analyze the data are mean, frequency, percentage, and Pearson correlation coefficient or Pearson-r.

Mean. Calculating the mean will help researchers describe the mean level of participation among locals in mangrove forest management.

Frequency and Percentage. These statistical tools will aid in describing the number and percentage of the demographic profile, the respondents' degree of agreement on the drivers motivating local participation in mangrove forest management, and the respondents' level of participation in mangrove forest management.

Pearson Correlation Coefficient/Pearson-r. The Pearson correlation coefficient, denoted by the symbol r , is a statistical measure of the strength of a linear relationship between two variables. A negative correlation is represented by a value of -1 in this calculation, a positive correlation by a value of $+1$, and no correlation by a value of 0 . [30]. The accurate guide to interpreting Pearson-r calculation is as follows: 0 to 0.20 (insignificant relationship), 0.21 to 0.35 (weak relationship), 0.36 to 0.67 (fair or decent relationship), 0.68 to 0.90 (significant relationship), and 0.91 to 1.00 (very strong relationship) [31]. Therefore, this study employed the Pearson correlation coefficient to determine whether there is a relationship between the drivers influencing local participation and the level of participation among locals in

mangrove forest management and to measure the strength of the relationship between the two variables.

2.6. Ethical Consideration

The researchers disseminated informed consent to the respondents, disclosing the key elements and the role of their participation in this study. Also, the respondents were given adequate time to ask questions concerning the nature of this study. The researchers ensured that the chosen participants did not belong to vulnerable populations. Additionally, the acquired data was handled with the highest confidentiality in order to safeguard the participants' privacy and confidentiality. Access to sensitive information was limited, and anonymity was ensured. Additionally, measures were taken to reduce the participants' risk of injury or discomfort. Moreover, the researchers ensured that the research procedures and questions were not intrusive or would cause distress among the participants [32].

3. Results and Discussion

This section encompasses the results gathered by the researchers, including the comprehensive analysis and interpretation of the findings. The following tables below show the overview of the raw data collated, including the results of the statistical treatments employed in this study.

3.1. Demographic Profile of the Respondents

The first part of the questionnaire contains the demographic information of the respondents to delineate their socioeconomic profile. These data form the basis of Table 1, which provides an overview of the respondents' demographic profile, including their sex, level of education, occupation, and sources of income. The findings are illustrated in Table 1, consisting of 82 respondents, 45 (54.88%) of whom are male and 37 (45.12%) are female. The demographic profile of the respondents can be seen in Table 1.

Table 1. Demographic profile of the respondents.

Respondent Characteristics	f	%
Sex		
Male	45	54.88
Female	37	45.12
Total	82	100
Level of Education		
Elementary Level	5	6.10
Elementary Graduate	1	1.22
High School Level	30	36.58
High School Graduate	26	31.71
College Level	13	15.85
College Graduate	1	1.22
Vocational School Graduate	1	1.22
Others	5	6.10
Total	82	100
Occupation		

Fishermen	34	41.46
Construction Worker	4	4.88
Driver	4	4.88
Housewife	18	21.95
Student	4	4.88
Others	18	21.95
Total	82	100
Source of Income		
Driving	6	7.32
Fishing	42	51.22
Helper	2	2.44
Business	11	13.41
Others	21	25.61
Total	82	100

In terms of education, the highest proportion of respondents is high school level (36.58%; $f=30$), while the least are elementary graduate, college graduate, and vocational school graduate ($f=1$; 1.22%). In occupation, the prominent are fishermen ($f=34$; 41.46), while the least are other occupations comprising various livelihoods including CSR employee ($f=1$), helper ($f=1$), kitchen crew ($f=1$), mechanic ($f=1$), NGO worker ($f=1$), and sari-sari store owner ($f=1$). The primary income source illustrated in Table 1 is fishing ($f=42$; 51.22%), while the least are other sources of income, including agriculture ($f=1$), CSR ($f=1$), laundromat ($f=1$), livestock ($f=1$), manicurist ($f=1$), helper ($f=1$), and water delivery ($f=1$).

3.2. Drivers Influencing Participation in Mangrove Forest Management

One of the useful and successful approach to forest management has been deemed to be participatory forest management [16]. The participants' perceived ecological values were explored to assess the drivers that motivate participation in mangrove forest management among the locals at Barangay Lasang, Davao City.

The indicators under perceived ecological values are: (1) "mangrove forests can help protect land from erosion" ($\bar{x}=4.94$; $\sigma=0.24$); "mangrove forests can help minimize wind speed and weaken ocean currents" ($\bar{x}=4.85$; $\sigma=0.54$); (3) "mangrove forests can refresh the air and improve its quality" ($\bar{x}=4.83$; $\sigma=0.54$); (4) "mangrove trees can be used to produce firewood and charcoal" ($\bar{x}=3.35$; $\sigma=1.69$); (5) "mangrove trees can be used for shelters and production of furniture" ($\bar{x}=3.23$; $\sigma=1.73$); (6) "mangrove forests have diverse species of aquatic animals and some terrestrial animals that are human food" ($\bar{x}=4.60$; $\sigma=0.76$); (7) "mangrove forests have diverse plant species that can be consumed by humans" ($\bar{x}=3.29$; $\sigma=1.52$); (8) "mangrove forests are a primary habitat for young aquatic animals" ($\bar{x}=4.71$; $\sigma=0.65$); (9) "mangrove forests can be a tourist attraction" ($\bar{x}=4.77$; $\sigma=0.59$); (10) "mangrove forests can be used as recreational areas" ($\bar{x}=3.94$; $\sigma=1.37$); (11) "mangrove forests can be a place where community members connect and get together" ($\bar{x}=4.18$; $\sigma=1.21$); (12) "mangrove forests are attached to community beliefs, values, and spirituality" ($\bar{x}=4.18$; $\sigma=0.96$); (13) "mangrove forests can be a learning source for the natural ecosystem" ($\bar{x}=4.59$; $\sigma=0.83$). Perceived ecological value has a mean of $\bar{x}=4.26$ and a standard deviation of $\sigma=0.97$, indicating that the respondents strongly agree with the indicators presented. This study found that the Pearson correlation coefficient of perceived ecological values and the level of participation in mangrove forest management is $r=0.25$, which indicates a weak, positive relationship. The analyzed data of perceived ecological value as a motivator influencing participation in mangrove forest management can be seen in Table 2.

Table 2. Perceived ecological value as a motivator influencing participation in mangrove forest management.

Independent Variable	Indicators	\bar{x}	Classification of the Degree of Agreement	σ	Level of Participation (r)
A. Perceived Ecological Value	1. Mangrove forests can help protect land from erosion.	4.94	Strongly Agree	0.24	0.25
	2. Mangrove forests can help minimize wind speed and weaken ocean currents.	4.85	Strongly Agree	0.54	
	3. Mangrove forests can refresh the air and improve its quality.	4.83	Strongly Agree	0.54	
	4. Mangrove trees can be used to produce firewood and charcoal.	3.35	Neutral	1.69	
	5. Mangrove trees can be used for shelters and production of furniture	3.23	Neutral	1.73	
	6. Mangrove forests have diverse species of aquatic animals and some terrestrial animals that are human food.	4.61	Strongly Agree	0.76	
	7. Mangrove forests have diverse plant species that can be consumed by humans.	3.29	Neutral	1.52	
	8. Mangrove forests are a primary habitat for young aquatic animals.	4.71	Strongly Agree	0.65	
	9. Mangrove forests can be a tourist attraction	4.77	Strongly Agree	0.59	
	10. Mangrove forests can be used as recreational areas.	3.94	Agree	1.37	
	11. Mangrove forests can be a place where community members connect and get together.	4.18	Agree	1.21	
	12. Mangrove forests are attached to community beliefs, values, and spirituality.	4.18	Agree	0.96	
	13. Mangrove forests can be a learning source	4.59	Strongly Agree	0.83	

	for the natural ecosystem.			
	Average Score	4.26	Strongly Agree	0.97

This finding aligns with the research conducted by Nyangoko et al. (2020), which highlights the significance of a weak yet significant relationship during the implementation stages of mangrove forest management. Their study explicitly asserts that a weak but significant relationship is vital in the context of local communities and their reliance on mangrove ecosystem services (MES). Such relationships indicate that local communities perceive and depend on MES, thereby emphasizing the importance of integrating their benefits, priorities, and preferences into conservation efforts [33]. The correlation coefficient of $r=0.25$ between the perceived ecological value and level of participation, indicating a weak positive relationship, aligns with the literature presented since the variables exhibit a positive correlation. This implies that perceived ecological values influence the local people's participation in mangrove forest management.

Table 3 presents the descriptive statistics from assessing ecological knowledge and its influence on participation in mangrove forest management in Barangay Lasang, Davao City. As shown in Table 3, the indicators under ecological knowledge are: (1) "the major cause of mangrove deterioration is the disturbance of local community" ($\bar{x}=4.04$; $\sigma=1.20$); (2) "there are different types of plant species in mangrove forests within the community" ($\bar{x}=4.52$; $\sigma=0.78$); (3) "there are different types of animal species living in mangrove forests" ($\bar{x}=4.60$; $\sigma=0.75$). Ecological knowledge has a mean of $\bar{x}=4.38$ and a standard deviation of $\sigma=0.74$, indicating that the respondents strongly agree with the indicators presented. The Pearson correlation coefficient between ecological knowledge and the level of participation in mangrove forest management is $r=0.24$, which indicates a weak, positive correlation. The analyzed data of ecological knowledge as a motivator influencing participation in mangrove forest management can be seen in Table 3.

Table 3. Ecological knowledge as a motivator influencing participation in mangrove forest management.

Independent Variable	Indicators	\bar{x}	Classification of the Degree of Agreement	σ	Level of Participation (r)
B. Ecological Knowledge	1. The major cause of mangrove deterioration is the disturbance of the local community.	4.04	Agree	1.20	0.24
	2. There are different types of plant species in the mangrove forests within the community.	4.52	Strongly Agree	0.78	
	3. There are different types of animal species living in mangrove forests.	4.60	Strongly Agree	0.75	
	Average Score	4.38	Strongly Agree	0.74	

The result is supported by the study of Alimbon and Manseguiao (2021), wherein they found that people with more knowledge were more likely to get involved in taking care of

the mangroves. However, when it comes to taking actions to help, including planting trees and cleaning up, there needed to be a stronger connection between what people knew and what they did. This suggests that although people knew a fair amount, it sometimes translated into action [34]. Additionally, the findings of Chen and Liu (2022), which indicate that it is challenging for citizens with inadequate ecological knowledge to successfully respond to ecological conservation, further support the mean average score of $\bar{x}=4.38$ [35]. However, the result contradicts the existing study of Tumbaga et al. (2020), which reveals that the knowledge of local people concerning the threats and importance of biodiversity, including their attitudes, is considered highly significant [36]. This suggests that ecological knowledge alone is inadequate to influence the participation level.

Community members' expected benefits can motivate participation in ecological management projects. In this study, the expected benefits are divided into two parts: the expected monetary-related benefits and the expected non-monetary related benefits. Table 4 presents the descriptive statistics of the independent variable on expected monetary benefits as a motivator influencing participation in mangrove forest management in Barangay Lasang, Davao City. As shown in Table 4, it incorporates the indicators as follows: (1) "the major cause of mangrove deterioration is the disturbance of local community" ($\bar{x}=4.57$; $\sigma=0.70$); (2) "participating in activities related to mangrove forest management offered opportunities to enhance career-related skills" ($\bar{x}=4.61$; $\sigma=0.58$); (3) "participating in a mangrove forest management helped make your current job more stable" ($\bar{x}=4.51$; $\sigma=0.78$). Ecological knowledge has a mean average score of 4.56 and a standard deviation of 0.55, while the classification of the degree of agreement shows that respondents generally strongly agree with the indicators. The Pearson correlation coefficient between expected monetary-related benefits and the level of participation in mangrove forest management is $r=0.27$, which indicates a weak, positive relationship. The analyzed data of expected monetary-related benefits as a motivator influencing participation in mangrove forest management can be seen in Table 4.

Table 4. Expected monetary-related benefits as a motivator influencing participation in mangrove forest management.

Independent Variable	Indicators	\bar{x}	Classification of the Degree of Agreement	σ	Level of Participation (r)
C. Expected Monetary-Related Benefits	1. Participating in mangrove forest management provided financial benefits.	4.57	Strongly Agree	0.70	0.27
	2. Participating in activities related to mangrove forest management offered opportunities to enhance - career-related skills.	4.61	Strongly Agree	0.58	
	3. Participating in mangrove forest management helped make your current job more stable.	4.51	Strongly Agree	0.78	
	Average Score	4.56	Strongly Agree	0.55	

In accordance with the result, locals appear to engage themselves in mangrove forest management due to expected monetary-related benefits. Economic incentives have a significant impact on community members' decisions to participate in natural resource management projects since they constantly want to improve their household's financial circumstances [37]. The relationship between the drivers that motivate participation and the level of participation in mangrove forest management shows a weak positive Pearson correlation coefficient. This result has, to some extent, corresponded with the findings from Valenzuela et al. (2020), as the study revealed that through incentives and other monetary benefits, people's participation in mangrove forest restoration activities and projects contributes to effective management and thus has a significant impact on their level of participation [16].

The results, as shown in Table 5, show the analysis of expected nonmonetary-related benefits. The indicators under expected nonmonetary-related benefits as a driver that motivate participation in mangrove forest management in Barangay Lasang, Davao City are: (1) "participating in mangrove forest management helped me make more friends" ($\bar{x}=4.71$; $\sigma=0.51$); (2) "participating in mangrove forest management positively contributed to improving the environmental quality of the community and increasing the availability of natural resources" ($\bar{x}=4.79$; $\sigma=0.51$); (3) "participating in mangrove forest management played a role in strengthening the relationships within the community" ($\bar{x}=4.66$; $\sigma=0.59$). The expected nonmonetary-related benefits have a mean average score of 4.71 and a standard deviation of 0.43. At the same time, the classification of the degree of agreement among the respondents shows that they generally strongly agree with the indicators presented. The Pearson correlation coefficient between expected nonmonetary-related benefits and the level of participation in mangrove forest management is $r=0.14$, which indicates an insignificant positive relationship. The analyzed data of expected non-monetary related benefits as a motivator influencing participation in mangrove forest management can be seen in Table 5.

Table 5. Expected nonmonetary-related benefits as a motivator influencing participation in mangrove forest management.

Independent Variable	Indicators	\bar{x}	Classification of the Degree of Agreement	σ	Level of Participation (r)
D. Expected Nonmonetary-Related Benefits	1. Participating in mangrove forest management helped me make more friends.	4.71	Strongly Agree	0.51	0.14
	2. Participating in mangrove forest management positively contributed to improving the environmental quality of the community and increasing the availability of natural resources.	4.79	Strongly Agree	0.51	
	3. Participating in mangrove forest management played a role in strengthening the relationships within the community.	4.66	Strongly Agree	0.59	

	Average Score	4.71	Strongly Agree	0.43	
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In this study, the analysis shows that expected nonmonetary-related benefit has a significant role in the participation of the locals in mangrove forest management. This can be supported by Sattayapanich et al. (2022), wherein the result of their study also shows that expected nonmonetary-related benefits have little to no influence on the locals' participation in the mangrove forest. This means that to encourage community members to participate in mangrove forest management, aside from the expected monetary-related benefits, it is also necessary to support their perceptions of nonmonetary-related benefits, such as enhanced social cohesiveness, amusement value during the participation, and better community-environmental quality [13].

3.3. Level of Participation of the Respondents in Mangrove Forest Management

To evaluate the level of participation among the local people in mangrove forest management during the implementation stage at Barangay Lasang, the researchers classified their level of participation through their responses in particular situations. As shown in Table 6, the indicators under the level of participation in implementing mangrove forest management activities are: (1) "I participated in seeking plant seeds and young plants for mangrove forest management activities in the community" (\bar{x} =4.17; σ =1.20); (2) "I participated in planting mangrove trees in the community" (\bar{x} =4.33; σ =0.96); (3) "I participated in preparing spaces used for mangrove forest management activities" (\bar{x} =4.21; σ =1.14); (4) "I have participated in inspecting whether volunteers planted mangrove trees correctly" (\bar{x} =4.10; σ =1.14); (5) "I participated in managing solid waste in mangrove areas" (\bar{x} =4.39; σ =0.92); (6) "I participated in donating money used for mangrove forest management activities" (\bar{x} =3.52; σ =1.46); (7) "I participated in donating assets, materials, or resources (e.g., food, planting tools, boats, etc.) that can support mangrove forest management activities" (\bar{x} =3.57; σ =1.51); (8) "I participated in communicating and advertising mangrove forest management activities" (\bar{x} =3.87; σ =1.31); (9) "I participated in encouraging other residents to participate in mangrove forest management activities" (\bar{x} =4.16; σ =1.19). The mean average score of the indicators under the level of participation in implementing mangrove forest management activities is 4.04, indicating that the respondents often participate, and a mean average standard deviation of 1.20. The level of participation among locals in terms of the implementation of mangrove forest management activities can be seen in Table 6.

Table 6. Level of participation among locals in terms of the implementation of mangrove forest management activities.

Independent Variable	Indicators	\bar{x}	Classification of the Degree of Participation	σ
	1. I participated in seeking plant seeds and young plants for mangrove forest management activities in the community.	4.17	Oftentimes participating	1.20
	2. I participated in planting mangrove trees in the community.	4.33	Always participating	0.96

A. Level of Participation in Implementing Mangrove Forest Management Activities	3. I participated in preparing spaces used for mangrove forest management activities.	4.21	Oftentimes participating	1.14
	4. I have participated in inspecting whether volunteers planted mangrove trees correctly.	4.10	Oftentimes participating	1.14
	5. I participated in managing solid waste in mangrove areas.	4.39	Always participating	0.92
	6. I participated in donating money used for mangrove forest management activities.	3.52	Oftentimes participating	1.46
	7. I participated in donating assets, materials, or resources (e.g., food, planting tools, boats, etc.) that can support mangrove forest management activities.	3.57	Oftentimes participating	1.51
	8. I participated in communicating and advertising mangrove forest management activities.	3.87	Oftentimes participating	1.31
	9. I participated in encouraging other residents to participate in mangrove forest management activities.	4.16	Oftentimes participating	1.19
	Average Score	4.04	Oftentimes participating	1.20

In line with the result, the local people in Barangay Lasang are actively engaged in various activities concerning the implementation of mangrove forest management activities, with high levels of participation observed across several indicators. The fact that the local people in Barangay Lasang often participate in most activities in mangrove forest management suggests a consistent level of engagement rather than sporadic involvement. This could indicate a strong sense of community responsibility and commitment to mangrove forest management. Furthermore, the results of a related study by Nitibona et al. (2023) that examined community participation and willingness in mangrove conservation in the Rufiji Delta, Tanzania Open access Citation, which aims to assess local community participation and willingness in mangrove conservation activities, reinforce this finding. Their study's results showed a high level of engagement at large. The majority of respondents (88%) concurred that community involvement in mangrove conservation efforts was crucial, and 50% said they would be immediately willing to help if requested [38].

To evaluate the degree of participation among the local people in mangrove forest management during the monitoring stage at Barangay Lasang, the researchers classified their level of participation through their responses in particular situations. As shown in Table 7, the indicators under the level of participation in monitoring mangrove forest management activities are: (1) "I looked after mangrove trees and forests after the project's implementation" (\bar{x} =4.09; σ =1.25); (2) "I informed responsible staff or organizations when I notice a mangrove tree has died or when there are any problems in the mangrove forest" (\bar{x} =4.29; σ =1.13); (3) "I replaced some mangrove trees that died or were damaged" (\bar{x} =4.33; σ =1.06); (4) "I looked after the mangrove forests and ensured neither invasive human activities nor destruction were done to them" (\bar{x} =4.39; σ =1.07); (5) "I informed responsible staff or organizations when I saw destruction of mangrove forest by the residents" (\bar{x} =4.46; σ =0.98). The mean average score of the indicators under the level of participation in monitoring mangrove forest management activities is 4.31, indicating that the respondents

are generally always participating, and a mean average standard deviation of 1.10. The level of participation among locals in terms of the monitoring of mangrove forest management activities can be seen in Table 7.

Table 7. Level of participation among locals in terms of the monitoring of mangrove forest management activities.

Independent Variable	Indicators	\bar{x}	Classification of the Degree of Participation	σ
B. Level of Participation in Monitoring Mangrove Forest Management Activities	1. I looked after mangrove trees and forests after the project's implementation.	4.09	Oftentimes participating	1.25
	2. I informed responsible staff or organizations when I notice a mangrove tree has died or when there are any problems in the mangrove forest.	4.29	Always participating	1.13
	3. I replaced some mangrove trees that died or were damaged.	4.33	Always participating	1.06
	4. I looked after the mangrove forests and ensured neither invasive human activities nor destruction were done to them.	4.39	Always participating	1.07
	5. I informed responsible staff or organizations when I saw the destruction of mangrove forests by the residents.	4.46	Always participating	0.98
	Average Score	4.31	Always participating	1.10

The collective effort and participation of the local people at Barangay Lasang consistently showed a high level of engagement, shown in the average scoring of $\bar{x}=4.31$ (always participating). This finding is consistent with a recent study by Syahputra and Fernando (2024) that used multicriteria analysis to assess community participation and the effectiveness of mangrove forest rehabilitation efforts in Pasar Rawa, Langkat Regency. The study's objective was to determine a set of criteria and indicators for the evaluation of Forest Land Rehabilitation (FLR) and to analyze the degree of participation. The community participation in the monitoring activities scored high, and the success rate of FLR was 82.3% that included the predicate "good". It is said that this is because of increased awareness of the need to protect mangrove forests. Success in FLR activities depends on the monitoring system and the commitment and capacity of the individuals and organizations involved in the monitoring process. They claimed that the success of monitoring activities is determined by adequate training and resources as well as defined roles and responsibilities. [39].

3.4. Relationship Between the Drivers Influencing Participation and the Level of Participation in Mangrove Forest Management

Table 8 presents the general overview of the drivers that motivate participation in mangrove forest management and the respondents' level of participation in mangrove forest management. As shown in Table 8, the grand mean average score of the drivers under the

"Drivers that Motivate Participation in Mangrove Forest Management" is 4.48, indicating that the respondents strongly agree with the items presented under these drivers. This denotes the degree of their awareness of the drivers that presumably influenced them to participate in mangrove forest management. In the "Level of Participation in Mangrove Forest Management," the grand mean average score of their level of participation in mangrove forest management is 4.17, indicating that the respondents oftentimes participated in mangrove forest management. Moreover, the grand mean average Pearson correlation coefficient between the two variables is 0.29, indicating a weak positive relationship. The grand mean average and the relationship between the drivers that motivate participation and the level of participation among locals in mangrove forest management can be seen in Table 8.

Table 8. Grand mean average and the relationship between the drivers that motivate participation and the level of participation among locals in mangrove forest management.

Variables	Indicators	\bar{x}	Grand Mean	(r)
Independent Variable: Drivers that Motivate Participation in Mangrove Forest Management	Perceived Ecological Values	4.27	4.48	0.29
	Ecological Knowledge	4.39		
	Expected Monetary-Related Benefits	4.57		
	Expected Nonmonetary-Related Benefits	4.72		
Dependent Variable: Level of Participation in Mangrove Forest Management	Level of Participation in Implementation	4.04	4.17	
	Level of Participation in Monitoring	4.31		

The findings of the study show that the "Level of Participation in Mangrove Forest Management" among the locals in Barangay Lasang has a grand mean average score of 4.17, suggesting that the locals "oftentimes" participated in mangrove forest management. In addition, the researchers have identified that they are aware of the "Drivers that Motivate Participation in Mangrove Forest Management" that presumably motivate participation in mangrove forest management among the locals, having a grand mean average score of 4.48, indicating a strong awareness of the drivers. In the analysis using the Pearson correlation coefficient, the results show that the relationship between the drivers that motivate mangrove forest management among the locals in terms of perceived ecological values, ecological knowledge, expected monetary benefits, and expected nonmonetary benefits and the level of participation among locals in mangrove forest management in terms of implementation and monitoring ($r=0.29$), has a weak relationship. Therefore, the result of this study disagrees with the proposed null hypothesis, stating that there is no relationship between the drivers that motivate participation and the level of participation in mangrove forest management.

4. Conclusion and Recommendation

This chapter provides a detailed discussion of the study's conclusions and presents the recommendations that have been formulated. Each section aims to offer a comprehensive understanding of the research outcomes and their implications.

4.1. Conclusion

The outcome of this research shows that the level of participation among locals in mangrove forest management scored a grand mean average of 4.17, denoting that the members of TAMFIAS, to some extent, consistently participated in mangrove forest management activities and programs. Furthermore, the result of the analysis has identified that between the drivers tested, including perceived ecological value, ecological knowledge, expected monetary-related benefits, and expected nonmonetary-related benefits, and the level of participation in mangrove forest management, have a Pearson correlation coefficient (r) of 0.29, which proves to have weak influence on the members' participation in mangrove forest management, since the strength of the relationship between the variables has a weak positive relationship. Additionally, among the drivers identified, expected monetary-related benefits have the most decisive influence on the respondents' participation in mangrove forest management activities. In contrast, the expected nonmonetary-related benefits have the weakest influence.

In conclusion, despite the members' full awareness of the drivers that may influence the locals' participation in mangrove forest management, it does not directly interpret them into participating in the said activities or programs or having higher levels of engagement, specifically during the implementation stage. Finally, this study contradicts the null hypothesis proposed in the study that there is no relationship between the drivers that motivate local participation and the level of local participation in mangrove forest management since the result exhibits a weak positive relationship.

4.2. Recommendation

The key findings of this study revealed that there is a weak positive relationship between the drivers that motivate participation and the level of participation among the respondents in mangrove forest management, which suggests that the drivers identified do have an influence on their engagement in mangrove forest management to some extent; however, are still subjected to further improvement, specifically, in the implementation stage of mangrove forest management. Furthermore, among the drivers identified, the expected nonmonetary-related benefits have the lowest Pearson correlation coefficient, which implies that the driver holds the weakest influence on the respondents' participation.

To address the weak relationship between the drivers influencing participation and the level of participation among the locals in mangrove forest management, the NGOs, especially TAMFIAS, should implement targeted community engagement strategies that prioritize understanding and addressing specific local needs and barriers. Also, the researchers suggest promoting and imparting awareness of the nonmonetary benefits, including improved environmental quality, making friends, and increasing the availability of natural resources that the locals benefit from and may obtain in connection to participating in mangrove forest management activities.

Furthermore, the researchers recommend that the policymakers of the LGU formulate policies and programs that address the locality's needs. Based on the findings, the policymakers from the LGU may introduce and stimulate the locality to participate in mangrove forest management activities in Barangay Lasang by offering monetary-related benefits to incentivize engagement.

Academic institutions can incorporate the findings of this study into discussions or discourse regarding community participation and engagement in mangrove forest management activities and how various factors influence or motivate people and the locality to participate in such movements and programs.

For future researchers conducting similar studies, the researchers recommend conducting a comprehensive mixed-method research design that integrates quantitative surveys and qualitative interviews. This approach may help identify and understand diverse factors that influence their participation in mangrove forest management and other environmental initiatives.

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5. References

1. S. Chamberland-Fontaine, G.T. Estrada, S. Heckadon-Moreno, G. Hickey, Enhancing the sustainable management of mangrove forests: the case of Punta Galeta, Panama Trees, Forests and People. **8**, 100274 (2022). <https://doi.org/10.1016/j.tfp.2022.100274>
2. Rahman, A. Ceanturi, J.W. Tuahatu, F.F. Lokoll, J. Supusepa, M. Hulopi, Y.I. Permatahati, Y.A. Lewerissa, Y. Wardianto, Mangrove ecosystems in Southeast Asia region: mangrove extent, blue carbon potential and co2 emissions in 1996–2020 The Science of The Total Environment. **915**, 170052 (2024). <https://doi.org/10.1016/j.scitotenv.2024.170052>
3. L. Camacho, Sustainable mangrove rehabilitation: lessons and insights from community-based management in the Philippines and Myanmar APN Science Bulletin. **10**, 1(2020). <https://doi.org/10.30852/sb.2020.983>
4. E. Barnes, Mangroves as a solution to the climate crisis. World Wildlife Fund. (2022). <https://www.worldwildlife.org/stories/mangroves-as-a-solution-to-the-climate-crisis>
5. I.A. Eyzaguirre, A.Y. Iwama, M. Fernandes, Integrating a conceptual framework for the sustainable development goals in the mangrove ecosystem: A systematic review Environmental Development. **47**, 100895 (2023). <https://doi.org/10.1016/j.envdev.2023.100895>
6. J. Aguirre, A Philippine community sees life-saving payoffs from restoring its mangroves. Mongabay (2020). <https://news.mongabay.com/2020/11/a-philippine-community-sees-life-saving-payoffs-from-restoring-its-mangroves/>
7. Sukuryadi, N. Harahab, M. Primyastanto, B. Semedi, Collaborative-based mangrove ecosystem management model for the development of marine ecotourism in Lembar Bay, Lombok, Indonesia Environment, Development and Sustainability. **23**, 1-31 (2021). <https://doi.org/10.1007/s10668-020-00895-8>
8. A. Reciproco, J. Suarez, J. Padilla, J.R. Flora, M.C. Cañada, C. Velasco, N. Buhong, Awareness and participation in mangrove management of coastal communities in Baler, Aurora, Philippines Ecology Environment and Conservation. **29**, 928-934 (2023). <https://doi.org/10.53550/EEC.2023.v29i02.064>
9. F. Haji, N. Valizadeh, D. Hayati, The role of local communities in sustainable land and forest management. 473-503 (2020). https://doi.org/10.1007/978-3-030-56542-8_20

10. J. Seniel, L. Jimenez, E. Antonio, Diminishing mangrove forest structures in Davao City, Philippines Davao Research Journal. **15** (2024). <https://doi.org/10.59120/drj.v15iNo.2.186>
11. R.N. Jadhav, H.S. Vanmali, Diversity of mangrove ecosystem from Vaitarna Estuary (Palghar), Maharashtra, India Ecology. **28** (2022). <https://doi.org/10.53550/EEC.2022.v28i02s.024>
12. V. Arifanti, F. Sidik, B. Mulyanto, A. Susilowati, T. Wahyuni, Subarno, N. Yuniarti, A. Aminah, E. Suita, E. Karlina, S. Suharti, P. Pratiwi, M. Turjaman, A. Hidayat, H. Rachmat, R. Imanuddin, I. Yeny, W. Darwiati, N. Sari, N. Novita, Challenges and strategies for sustainable mangrove management in Indonesia: a review Forests. **13** (2022). <https://doi.org/10.3390/f13050695>
13. T. Sattayapanich, P. Janmaimool, J. Chontanawat, Factors affecting community participation in environmental corporate social responsibility projects: evidence from mangrove forest management project J. Journal of Open Innovation: Technology, Market, and Complexity. **8**, 1-28 (2022). <https://doi.org/10.3390/joitmc8040209>
14. B.R. Gamo, D.B. Park, Community capacity influencing community participation: evidence from Ethiopia World Development Perspectives. **27**, 100448 (2022). <https://doi.org/10.1016/j.wdp.2022.100448>
15. N. Geron, D.G. Martin, J. Rogan, M. Healy, Residents' roles as environmental policy actors using an urban governance framework: a case study of a tree planting program Cities. **135**, 104201 (2023). <https://doi.org/10.1016/j.cities.2023.104201>
16. R.B. Valenzuela, Y. Yeo-Chang, M.S. Park, J. Chun, Local people's participation in mangrove restoration projects and impacts on social capital and livelihood: A case study in the Philippines Forests. **11**, 580 (2020). <https://doi.org/10.3390/f11050580>
17. T. Mustonen, S. Harper, G. Pecl, V.C. Broto, N. Lansbury, A. Okem, S. Ayanlade, A. Ayanlade, J. Dawson, The role of indigenous knowledge and local knowledge in understanding and adapting to climate change. **136**, 250-260 (2022). <https://doi.org/10.1016/j.envsci.2022.06.004>
18. E. Pirgmaier, The value of value theory for ecological economics Ecological Economics. **179**, 106790 (2021). <https://doi.org/10.1016/j.ecolecon.2020.106790>
19. F. Amador-Cruz, B.L.F. Rangel, M. Olvera-Vargas, M.E. Mendoza, Ecological Indicators. **129**, 107856 (2021). <https://doi.org/10.1016/j.ecolind.2021.107856>
20. M. Getzner, M.S. Islam, Ecosystem services of mangrove forests: results of a meta-analysis of economic values International Journal of Environmental Research on Public Health. **17**, 5830 (2020). <https://doi.org/10.3390/ijerph17165830>
21. L. Meng, W. Si, Pro-environmental behavior: examining the role of ecological value cognition, environmental attitude, and place attachment among rural farmers in China International Journal of Environmental Research and Public Health. **19**, 17011 (2022). <https://doi.org/10.3390/ijerph192417011>
22. W.K.N.C. Withanage, M.D.K.L. Gunathilaka, Theoretical framework and approaches of traditional ecological knowledge. 27–43 (2023). https://doi.org/10.1007/978-3-031-16840-6_3
23. J. Gallus, J. Reiff, E. Kamenica, A.P. Fiske, Relational incentives theory Psychological Review. **129**, 586 (2022). <https://doi.org/10.1037/rev0000336>
24. C. Nagle, Using expectancy value theory to understand motivation, persistence, and achievement in university-level foreign language learning Foreign Language Annals. **54**, 1-19 (2021). <https://doi.org/10.1111/flan.12569>
25. S. McCombes, Descriptive research | definition, types, methods & examples (Scribbr) (2023). <https://www.scribbr.com/methodology/descriptive-research/>

26. K. Cherry, Correlation studies in psychology research (Very Well Mind) (2023). <https://www.verywellmind.com/correlational-research-2795774>
27. J.R. Agua, H.L. Wong, Carbon stock sequestration in the mangrove forest of Barangay Camudmud MPA, Island Garden City of Samal, Davao del Norte International Journal of Research and Innovation in Applied Science. **8**, 143-155 (2023). <https://doi.org/10.51584/IJRIAS.2023.8615>
28. L. South, D. Saffo, O. Vitek, C. Dunne, M. Borkin, Effective use of Likert scales in visualization evaluations: a systematic review. **41**, 3 (2022). <https://doi.org/10.31219/osf.io/6f3zs>
29. A. Bhuiyan, A. Islam, Assessing citizen satisfaction of urban local government service and infrastructure in Bangladesh: A case study of Pabna municipality Environment and Social Psychology. **8** (2023). <https://doi.org/10.54517/esp.v8i3.1671>
30. Laerd Statistics, Pearson's product moment correlation Statistical Tutorials and Software Guides (2020). <https://statistics.laerd.com/statistical-guides/pearson-correlation-coefficient-statistical-guide.php>
31. R. LOučka, V. Jambor, H. Synková, P. Homolka, D. Kumprechtova, V. Koukolová, P. Kubelková, A. Výborná, Y. Tyrolová, F. Jančík, Effect of calcareous marine algae buffer on high-producing dairy cows during peak lactation Animals. **14**, 897 (2024). <https://doi.org/10.3390/ani14060897>
32. P. Bhandari, Ethical considerations in research| types & examples Art and Design Review. **10** (2021). <https://www.scribbr.com/methodology/research-ethics/>
33. B. Nyangoko, H. Berg, M.M. Mangora, M. Gullström, M. Shalli, Community perceptions of mangrove ecosystem services and their determinants in the Rufiji Delta, Tanzania Sustainability. **13**, 63 (2020). <https://doi.org/10.3390/su13010063>
34. J.A. Alimbon, M.R. Manseguiao, Community knowledge and utilization of mangroves in Panabo Mangrove Park, Panabo City, Davao del Norte, Philippines International Journal of Bonorowo Wetlands. **11** (2021). <https://doi.org/10.13057/bonorowo/w110201>
35. S. Chen, N. Liu, Research on citizen participation in government ecological environment governance based on the research perspective of "Dual Carbon Target" Journal of Environmental and Public Health. **8**, 209 (2022). <https://doi.org/10.3390/joitmc8040209>
36. J.R.A. Tumbaga, M.C. Hipolito, A.G. Gabriel, Community participation toward biodiversity conservation among protected areas in Pangasinan, Philippines Environment Development and Sustainability. **23**, 4698–4714 (2021). <https://doi.org/10.1007/s10668-020-00705-1>
37. H.A. Satti, H. Young, A.M. Adam, Participation in integrated natural resource management projects: reflections from North Darfur (Feinstein International Central Brief) (2021). https://fic.tufts.edu/wp-content/uploads/Taadoud_Brief3-INRM-Participation.pdf
38. L. Nitibona, M. Shalli, M.M. Mangora, Willingness and drivers of community participation in mangrove conservation in the Rufiji Delta, Tanzania Open access Citation Western Indian Ocean Journal of Marine Science. **22**, 31-45 (2023). <https://doi.org/10.4314/wiojms.v22i1.4>
39. O.H. Syahputra, R. Fernando, Community participation and evaluation of mangrove forest rehabilitation activities using multicriteria analysis in Pasar Rawa village, Langkat Regency Global Forest Journal. **2**, 50-60 (2024). <https://doi.org/10.32734/gfj.v2i01.14103>