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ILLEGAL MANGROVE EXPLOITATION IN JOLO SULU: BASIS FOR PROGRAM DEVELOPMENT

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ABSTRACT

This study explored the lived experiences and perceptions of local government officials, community representatives, and affected individuals regarding illegal mangrove exploitation in Jolo, Sulu. Specifically, it examined their awareness of mangrove protection laws, the underlying causes of illegal extraction, its environmental and socioeconomic impacts, the effectiveness of existing policies and interventions, the challenges encountered in conservation, and strategies for strengthening mangrove protection. The study employed a qualitative research method using a phenomenological design. Seventeen participants were purposively selected, comprising eight local government officials, six community representatives, and three affected individuals. Data were gathered through face-to-face interviews using a researcher-made, semi-structured interview guide validated by experts. The interview data were analyzed using Braun and Clarke's six-phase thematic analysis approach.

The findings revealed that participants generally understood mangrove protection laws and recognized the ecological and socioeconomic importance of mangrove ecosystems. However, illegal exploitation persisted due to poverty, limited livelihood opportunities, cultural practices, inadequate environmental awareness, community tolerance, and weak law enforcement. Mangrove destruction contributed to coastal erosion, flooding, increased vulnerability to natural hazards, declining fisheries productivity, biodiversity loss, and disrupted household livelihoods. Existing interventions, including law enforcement, monitoring, mangrove rehabilitation, environmental education, livelihood assistance, and community participation, had contributed to greater awareness and conservation involvement. Nevertheless, their effectiveness remained constrained by inadequate resources, limited monitoring capacity, economic dependence on mangrove resources, weak institutional coordination, and climate-related threats. The study concludes that sustainable mangrove conservation requires an integrated and community-responsive approach combining stronger law enforcement, continuous environmental education, adequate institutional support, sustainable alternative livelihoods, active community participation, and climate-resilient conservation measures. These strategies may help reduce illegal mangrove exploitation and protect the environment, livelihoods, and safety of coastal communities in Jolo, Sulu.

KEYWORDS: *Illegal Mangrove Exploitation, Mangrove Conservation, Phenomenology, Environmental Protection, Sustainable Livelihoods*

INTRODUCTION

Mangrove forests are among the world's most productive and biologically diverse ecosystems, providing essential ecological services such as shoreline stabilization, coastal protection against storm surges, carbon sequestration, and habitats for marine organisms. They also support the socioeconomic well-being of coastal communities by providing food, fuel, and livelihood resources. In the Philippines, where extensive coastlines support mangrove ecosystems, these forests contribute significantly to environmental stability, coastal resilience, and community subsistence. Despite their ecological and economic importance, mangroves continue to face threats from overharvesting, illegal cutting, land conversion, aquaculture, and urban expansion. These activities contribute to habitat degradation, biodiversity loss, and the weakening of the ecosystem services on which coastal communities depend.

Mangrove degradation remains a global environmental concern despite international conservation initiatives and frameworks promoted by organizations such as the International Union for Conservation of Nature and the Ramsar Convention on Wetlands. In Indonesia, Malik, Fensholt, and Mertz (2015) reported that overharvesting in South Sulawesi resulted in mangrove stands dominated by saplings, potentially reducing ecosystem resilience and biodiversity. Similarly, Rudianto and Bengen (2020) observed that illegal logging and land conversion in East Java diminished the capacity of mangrove forests to store carbon. These findings highlight the ecological consequences of unregulated resource extraction and the tension between immediate economic needs and long-term environmental sustainability. Although restoration and regulatory measures remain important components of conservation, understanding the socioeconomic conditions that sustain illegal exploitation is equally necessary, particularly in communities where dependence on natural resources is closely linked to daily survival.

In the Philippines, mangrove conservation is supported by legal and institutional measures, including the Fisheries Code, the National Greening Program, and the Mangrove and Beach Forest Development Project. However, the continued degradation of mangrove ecosystems suggests that the existence of policies does not automatically ensure effective protection. Implementation may be

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constrained by limited institutional capacity, overlapping agency responsibilities, inadequate coordination between national and local governments, and insufficient monitoring resources. Pillodar et al. (2023) highlighted the challenges associated with using satellite and remote-sensing technologies for mangrove monitoring, particularly the high operational costs and limited access to updated datasets. Research by Paz-Alberto et al. (2020) and Ragan et al. (2020) in Zambales and Mindoro also documented pressures on mangrove diversity associated with land conversion, aquaculture, and overharvesting. The expansion of fishponds, in particular, can disrupt natural regeneration and contribute to long-term habitat degradation. Collectively, these concerns indicate the need to complement regulatory and technical interventions with locally grounded strategies that consider community knowledge, livelihood requirements, and the practical conditions affecting conservation implementation.

These challenges are particularly relevant in Jolo, Sulu, where geographic constraints, socioeconomic vulnerability, and security-related concerns may complicate mangrove protection. Some community members depend on mangrove resources for subsistence and household energy, including the collection of wood for firewood and charcoal production. Under these circumstances, restrictions on mangrove cutting may be difficult to sustain when viable alternative livelihoods are unavailable. Although government regulations and conservation initiatives provide a basis for protecting mangrove resources, their implementation may be undermined by limited community participation, inadequate funding and personnel, insufficient livelihood support, and difficulties in conducting regular monitoring and enforcement. Conservation measures that do not adequately account for these local realities may have limited acceptance or sustainability.

Despite existing research on mangrove degradation, restoration, and regulatory interventions, a need remains for localized qualitative evidence explaining why illegal mangrove exploitation persists and how affected communities understand and experience conservation policies. This gap is particularly important in Jolo, Sulu, where socioeconomic conditions, resource dependence, and implementation challenges may shape how environmental regulations are understood, accepted, and practiced. A context-sensitive understanding of these factors can help explain the limitations of existing interventions and identify approaches that are more responsive to community needs. In particular, examining the experiences and perspectives of local government officials, community representatives, and individuals affected by or involved in mangrove exploitation can provide insights into the interaction between livelihood pressures, environmental awareness, enforcement practices, and community participation.

In response to this gap, the present study explored the lived experiences and perceptions of local government officials, community representatives, and affected individuals regarding illegal mangrove exploitation in Jolo, Sulu. Specifically, it examined their awareness and understanding of mangrove protection laws, the factors contributing to illegal cutting and exploitation, the environmental and socioeconomic consequences, the implementation and perceived effectiveness of existing policies and interventions, and the challenges encountered in mangrove conservation. It also sought to identify feasible strategies for strengthening protection efforts in ways that reflect local conditions and community priorities. By generating localized qualitative evidence, the study aims to contribute to more inclusive, practical, and sustainable mangrove conservation policies that integrate environmental protection, effective governance, community participation, and alternative livelihood opportunities.

Theoretical Framework

The theoretical and philosophical underpinnings of this investigation into the illicit exploitation of mangroves in Jolo, Sulu, aid in the explanation of the complex nature of the issue. Fundamentally, Garrett Hardin's 1968 theory, the Tragedy of the Commons, serves as the study's compass. According to this theory, people frequently overuse natural resources when acting in their own best interests, particularly when there is no regulation or sense of collective responsibility. Communities in Jolo that mainly depend on mangroves for charcoal, building materials, and firewood frequently overuse these resources without considering the long-term ecological effects. Individuals' immediate financial needs come first, leading to unsustainable behaviors that are detrimental to society as a whole. As examined in the first and second research questions, this theory directly supports the examination of how people view and react to the illegality of mangrove exploitation.

This study uses the Sustainable Development Theory, which was proposed by the Brundtland Commission in 1987, to better understand the relationship between environmental degradation and socioeconomic circumstances. According to this theory, social justice, economic expansion, and environmental preservation must all be balanced. Given that communities in Jolo rely on mangrove resources for survival, it is extremely pertinent to the local situation. The theory backs the investigation of how alternative livelihood initiatives, conservation plans, and policy interventions can be created to satisfy current economic demands without endangering the environment for coming generations. It provides information for the fourth and sixth research questions, which evaluate the efficacy of the laws in place and offer suggestions for long-term fixes.

Social ecology, which was first proposed by Murray Bookchin in the 1960s, is another significant theoretical framework used in this study. According to social ecology, poverty, marginalization, and unequal access to resources and power are all major social issues that have a direct bearing on environmental issues. Due to a lack of formal employment, education, and decision-making opportunities, many Jolo residents continue to engage in illegal mangrove cutting. This theory clarifies the connection between social injustice and environmental degradation, particularly in areas that are economically underdeveloped and affected by conflict. It offers a framework

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for examining the social issues that impede successful mangrove conservation, especially in light of the third and fifth research questions about preservation issues and community impacts.

Douglass North's Institutional Theory, which he developed in 1990, complements these viewpoints. This theory focuses on the ways that formal institutions, like laws, policies, and local government structures, affect how people behave. Given Jolo's limited governance capacity and frequently under-resourced institutional structures, it is especially helpful in analyzing the lax enforcement of environmental regulations there. A lack of institutional efficacy and accountability, in addition to economic desperation, is reflected in the area's continued illegal activity. The effectiveness of current interventions is the fourth research question, and institutional theory aids in assessing the implementation gaps and policy failures that permit environmental violations to continue.

Environmentalism, which maintains that nature has intrinsic value and that it is our moral obligation to preserve it, serves as the philosophical foundation for this investigation. The idea that mangrove forests and other natural ecosystems shouldn't be sacrificed for immediate financial gain is supported by environmentalism. To preserve ecological balance and guarantee intergenerational equity, it promotes long-term stewardship of natural resources. Utilitarianism, which espouses the notion of attaining the greatest good for the greatest number of people, supports this important philosophy. According to this study, it supports conservation initiatives and legislative measures that might limit private exploitation of mangroves in favor of long-term benefits for the community. Communitarian ethics is also used to emphasize the significance of community involvement in environmental protection as well as the role of shared responsibility. It promotes local voices in decision-making and participatory governance, particularly in areas where top-down methods have not worked.

Statement of the Problem

This study examined the issue of illegal mangrove extraction in Jolo, Sulu, and its far-reaching consequences on the environment, economy, and coastal communities.

Specifically, answers to the following questions were sought:

1. How do the informants describe their awareness and understanding of the illegal mangrove exploitation act?
2. What are the underlying reasons why the respondents continue to engage in the illegal cutting or exploitation of mangroves in Jolo, Sulu?
3. In what ways has the illegal exploitation of mangroves impacted the respondents' community and the surrounding environment?
4. How do the informants describe the implementation and effectiveness of the existing policies, interventions, or alternative livelihood programs that are in place to address illegal mangrove extraction?
5. What are the challenges encountered in the preservation of mangroves in Jolo, Sulu?
6. What measures or strategies can be recommended to enhance the protection and conservation of mangroves in Jolo, Sulu?

METHODOLOGY

The study employed a qualitative research method using a phenomenological research design to explore the lived experiences, perceptions, and meanings associated with illegal mangrove exploitation in Jolo, Sulu. According to Creswell and Poth (2018), qualitative research seeks to understand the meanings individuals or groups assign to social or human problems, while phenomenology focuses on the common meanings of individuals' lived experiences of a particular phenomenon. Similarly, Moustakas (1994) emphasized understanding the essence of human experiences as consciously lived by individuals.

The qualitative phenomenological approach was appropriate because the study sought to understand the experiences of local government officials, community representatives, and affected individuals regarding illegal mangrove exploitation. Specifically, it examined their awareness of environmental laws, the socioeconomic factors contributing to illegal mangrove cutting, the perceived environmental and community impacts, the effectiveness of existing conservation interventions, the challenges encountered, and their proposed strategies for improving mangrove protection.

Data were gathered through participants' firsthand accounts and narratives and analyzed thematically to identify common patterns, experiences, and meanings. The qualitative method provided an in-depth understanding of the phenomenon, while the phenomenological design guided the exploration of participants' lived experiences. The findings served as a basis for developing community-responsive and sustainable mangrove conservation strategies appropriate to the local context of Jolo, Sulu.

The study employed purposive sampling, a non-probability sampling technique, to select participants with relevant knowledge, lived experiences, or direct involvement in illegal mangrove extraction in Jolo, Sulu. These included local government officials involved in mangrove conservation and environmental enforcement, community representatives such as elders and fisherfolk association leaders, and individuals with firsthand knowledge of illegal mangrove extraction. Their perspectives provided insights into policy implementation, socioeconomic factors, environmental impacts, and conservation strategies.

Inclusion criteria required participants to have relevant knowledge or experience of the phenomenon and be willing to share their insights. Individuals involved in illegal mangrove extraction could be included, provided that access was granted and appropriate ethical safeguards were observed. Exclusion criteria covered individuals with no relevant knowledge or experience, those unable to

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provide meaningful information, and those unwilling to participate. Informed consent, confidentiality, and voluntary participation were ensured throughout the research process.

The study population composed of three main groups:

Table 1. ***Population of the Study***

Participant Group	Description	Frequency
Local Government Officials	Include environmental officers, municipal or barangay officials responsible for implementing and monitoring policies related to mangrove conservation.	8
Community Representatives	Include community elders, or fisherfolk association representatives directly engaged in local environmental or livelihood concerns.	6
Affected Individuals	Include individuals who have engaged in illegal mangrove cutting or are affected by such activities, providing first-hand insight into causes and consequences.	3
	Total	17

The study used a researcher-made semi-structured interview guide to explore participants' lived experiences, perceptions, and insights regarding illegal mangrove exploitation and conservation in Jolo, Sulu. The guide contained open-ended questions based on the research objectives and related literature, allowing follow-up questions to clarify responses and obtain deeper insights (Creswell & Poth, 2018; Kvale & Brinkmann, 2015).

Face-to-face interviews were conducted with selected local government officials, community representatives, and individuals with relevant knowledge or experience. Before data collection, experts in qualitative research, environmental studies, and criminology validated the instrument for clarity, relevance, and appropriateness. Their recommendations were incorporated into the final version. The instrument provided rich, contextual data for thematic analysis and the development of responsive mangrove conservation programs.

The study analyzed the interview data using Braun and Clarke's (2006) Thematic Analysis Approach to identify recurring patterns and themes in participants' lived experiences and perceptions of illegal mangrove exploitation in Jolo, Sulu. The analysis followed six phases:

Familiarization with the Data – Interview recordings were transcribed and reviewed repeatedly to understand participants' responses.

Generating Initial Codes – Significant statements and relevant ideas were identified and assigned codes.

Searching for Themes – Related codes were grouped into preliminary themes reflecting common experiences and perceptions.

Reviewing Themes – Themes were examined and refined to ensure consistency and relevance to the data.

Defining and Naming Themes – Each theme was clearly defined and labeled according to its central meaning and the study objectives.

Producing the Report – The final themes were presented and supported by participants' verbatim statements and relevant literature.

Thematic analysis provided a systematic framework for understanding the social, economic, environmental, and institutional factors influencing illegal mangrove exploitation. The resulting themes served as the basis for formulating recommendations and developing a proposed mangrove conservation program for Jolo, Sulu.

RESULTS AND DISCUSSIONS

This section presents presents, analyzes, and interprets the data about illegal mangrove exploitation in Jolo, Sulu, using thematic analysis by Braun and Clarke (2006).

Informants' Description of their Awareness and Understanding of the Illegal Mangrove Exploitation Act

The actual statements of the 17 informants comprising 8 Local Government Officials, 6 community representatives, and 3 affected individuals regarding two questions: "Can you explain what you know about the laws or rules that prohibit mangrove cutting or exploitation in your area?" and "How did you first become aware of these regulations, and how clear are they to you?" are discussed as follows:

Knowledge of Laws and regulations Prohibiting Mangrove Cutting and Exploitation. Mangrove ecosystems provide essential ecological, economic, and social benefits, including shoreline protection, biodiversity conservation, fisheries support, and climate change mitigation. To protect these resources, the government has established laws and local ordinances prohibiting mangrove cutting,

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destruction, and exploitation. Stakeholders' awareness of these regulations is crucial in promoting compliance and effective conservation.

The responses of Local Government Officials, Community Representatives, and Affected Individuals revealed varying but generally substantial awareness of mangrove protection laws. Their narratives highlighted existing regulations, restrictions on unauthorized activities, the value of mangroves, government conservation efforts, and penalties for violations.

Thematic analysis identified five major themes: (1) Awareness of Existing Laws and Regulations Protecting Mangroves; (2) Prohibition of Unauthorized Mangrove Cutting and Exploitation; (3) Recognition of Mangroves as Valuable and Protected Resources; (4) Role of Government in Mangrove Conservation and Protection; and (5) Awareness of Legal Consequences for Violations. These findings emphasize the need to strengthen environmental education, community participation, and law enforcement to ensure sustainable mangrove conservation.

Theme 1: Awareness of Existing Laws and Regulations Protecting Mangroves. The findings revealed that local government officials, community representatives, and affected individuals were generally aware of laws and regulations prohibiting mangrove cutting, destruction, and exploitation. LGO 1 emphasized that these activities are prohibited under national environmental laws and local ordinances, while CR 1 stated, "May mga batas at ordinansa na nagbabawal sa pagputol at pagsira ng mga bakawan." Similarly, AI 1 recognized that mangroves are government-protected and cannot be cut indiscriminately. These responses indicate that awareness of mangrove protection laws is widespread across different community sectors, providing an important foundation for environmental conservation. However, awareness alone may not ensure compliance, emphasizing the need for continuous environmental education and effective law enforcement.

These findings are consistent with Mursyid et al. (2021), who highlighted the importance of clear legal frameworks and coordinated governance in mangrove conservation, and Golebie et al. (2021), who emphasized transparency, stakeholder participation, and clearly defined responsibilities in effective mangrove management. In the Philippine context, Song et al. (2021) discussed the role of evolving governance policies in balancing environmental protection and community interests, while Buot et al. (2022) underscored the value of community-based conservation supported by legal mechanisms. Collectively, these studies reinforce the importance of national laws, local ordinances, and community participation in strengthening mangrove protection and promoting sustainable resource management.

Theme 2: Prohibition of Unauthorized Mangrove Cutting and Exploitation. The findings revealed that local government officials, community representatives, and affected individuals understood that mangrove cutting, harvesting, clearing, and conversion require proper authorization from relevant government agencies. LGO 3 emphasized that regulations prohibit unauthorized cutting and land conversion, while CR 3 stated, "Madalas naming marinig sa mga pagpupulong na bawal ang pagputol ng bakawan nang walang permit." Similarly, AI 2 recognized that mangroves cannot be cut without permission. These responses indicate that stakeholders are aware of the restrictions governing mangrove use. However, continued reports of illegal activities highlight the need for stronger monitoring, consistent enforcement, and community participation to ensure compliance with environmental regulations.

The findings align with Mursyid et al. (2021), who emphasized the importance of clear legal frameworks and coordinated governance in preventing mangrove exploitation. Golebie et al. (2021) likewise highlighted accountability and stakeholder participation as essential elements of effective environmental governance. These studies support the importance of enforcing regulations and clarifying legal responsibilities to protect mangrove ecosystems. Strengthening public awareness of authorization requirements, together with consistent implementation of applicable laws, can help discourage illegal activities and promote responsible mangrove management.

Theme 3: Recognition of Mangroves as Valuable and Protected Resources. The findings revealed that informants recognized the ecological and economic importance of mangroves as a basis for their legal protection. LGO 5 emphasized that regulations prohibit activities that damage mangrove forests because of their ecological and economic value. Similarly, CR 5 explained, "Ang mga batas na ito ay hindi lamang tungkol sa pagbabawal kundi pati sa pangangalaga ng mga bakawan." Affected individuals also acknowledged that mangroves are protected by the government. These responses suggest that stakeholders understand that mangrove protection laws aim not only to prevent illegal activities but also to preserve biodiversity, protect coastal communities, support livelihoods, and maintain ecological balance.

These findings are consistent with Friess et al. (2020), who highlighted the role of mangroves in carbon storage, flood protection, biodiversity conservation, and community welfare. Jakovac et al. (2020) and Arifanti et al. (2022) likewise emphasized the contribution of mangrove conservation to climate change mitigation and carbon sequestration. In the Philippine context, Quevedo et al. (2022) underscored the importance of mangrove rehabilitation in strengthening community resilience to natural hazards. Moreover, Nguyen et al. (2023) highlighted the value of community participation and education in mangrove conservation. These studies reinforce

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the need to sustain environmental education and community-based initiatives that promote appreciation, responsible resource use, and long-term mangrove protection.

Theme 4: Role of Government in Mangrove Conservation and Protection. The findings revealed that informants viewed government institutions as key actors in protecting mangrove ecosystems through national environmental laws, local ordinances, policies, and regulatory mechanisms. LGO 4 emphasized that the government has established legal mechanisms to prevent mangrove destruction and overexploitation, while LGO 8 highlighted the role of local ordinances in supporting national laws. Community representatives similarly recognized government policies as essential to mangrove protection, while affected individuals acknowledged that unauthorized cutting is prohibited. These responses indicate that stakeholders recognize the government's responsibility for environmental governance and regulation. This awareness provides opportunities to strengthen collaboration between government agencies and communities in implementing conservation programs and ensuring compliance with environmental laws.

The findings are supported by Golebie et al. (2021), who emphasized the importance of accountability and effective enforcement mechanisms in environmental governance. Mursyid et al. (2021) likewise stressed that coordinated policies and consistent law enforcement are essential to preventing mangrove exploitation. Furthermore, Song et al. (2021) highlighted the importance of effective policy implementation in mangrove governance, while Pacyao (2024) emphasized the contribution of local conservation initiatives and community awareness to environmental protection. These studies suggest that government leadership must be complemented by community participation, sustained environmental education, and consistent enforcement of applicable laws, incluing appropriate sanctions for violations, to strengthen mangrove conservation efforts.

Theme 5: Awareness of Legal Consequences for Violations. The findings revealed that local government officials, community representatives, and affected individuals were generally aware that violations of mangrove protection laws could result in legal or administrative sanctions. LGO 7 emphasized that "Anyone found illegally cutting or destroying mangroves may face administrative or legal sanctions." Similarly, CR 3 recognized that cutting mangroves without a permit is prohibited, while AI 2 acknowledged that mangroves cannot be cut without permission. These responses indicate that stakeholders understand the legal restrictions and potential consequences associated with mangrove destruction. However, awareness of penalties alone may not ensure compliance, highlighting the need for consistent monitoring, effective enforcement, and appropriate legal action against violators.

These findings are consistent with Nguyen et al. (2023), who identified economic constraints, limited government resources, and insufficient technical expertise as challenges to mangrove conservation. Mursyid et al. (2021) likewise emphasized that weak institutional coordination and inadequate stakeholder participation can undermine environmental protection. In the Philippine context, Raganas et al. (2020) identified human activities and land-use pressures as threats to mangrove sustainability, while Pacyao (2024) highlighted the continuing challenges posed by limited environmental awareness and destructive practices. Collectively, these studies suggest that effective mangrove protection requires not only awareness of legal consequences but also stronger enforcement mechanisms, sustained environmental education, and active community participation to promote compliance and prevent illegal exploitation.

Synthesis of the Themes. The informants' experiences and perceptions reveal a general awareness that mangroves are valuable natural resources protected by laws, local ordinances, and government initiatives. Local government officials, community representatives, and affected individuals recognized that unauthorized mangrove cutting, destruction, and exploitation are prohibited. Their understanding reflects the ecological and economic importance of mangroves, the government's role in conservation and law enforcement, and the penalties imposed for violations.

Overall, the findings suggest that mangrove protection is a shared responsibility involving government institutions and local communities. However, sustained environmental education, active community participation, and consistent enforcement remain essential to prevent illegal exploitation and ensure the long-term conservation of mangrove ecosystems.

Sources of Awareness and Clarity of Mangrove Protection Regulations. Awareness and understanding of environmental regulations are essential for ensuring compliance and promoting mangrove conservation. The effectiveness of these laws depends on how clearly they are communicated and understood by stakeholders, as limited knowledge or confusion may hinder their implementation.

The responses of Local Government Officials, Community Representatives, and Affected Individuals revealed that awareness of mangrove protection regulations was gained through government training, seminars, community meetings, environmental programs, and information campaigns. While participants generally understood the prohibition against mangrove cutting and destruction, some experienced difficulties interpreting technical legal provisions and accessing complete information.

Thematic analysis identified five themes: (1) Multiple Channels of Awareness and Information Dissemination; (2) General Clarity and Understanding of Regulatory Provisions; (3) Complexity of Legal and Technical Information; (4) Variations in Community

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Awareness and Understanding; and (5) Need for Continuous Education and Public Information Campaigns. These findings highlight the need for accessible communication, sustained environmental education, and community engagement to strengthen public understanding and compliance with mangrove protection regulations.

Theme 1: Multiple Channels of Awareness and Information Dissemination. The findings revealed that informants learned about mangrove protection regulations through various formal and informal channels, including government training, seminars, policy meetings, barangay assemblies, environmental programs, and community consultations. LGO 1 cited "environmental governance training, policy meetings, and community consultations," while CR 1 identified "barangay meetings and seminars" as sources of information. Similarly, AI 3 learned about the regulations through "neighbors, barangay officials, and environmental programs." These responses indicate that both institutional initiatives and community-based communication contribute to public awareness. However, sustained coordination among government agencies, community leaders, and environmental organizations is necessary to ensure that accurate and updated information reaches all sectors.

These findings are consistent with Cahyaningsih et al. (2022), who emphasized the importance of community participation in mangrove management, and Chen et al. (2020), who highlighted collaborative governance and stakeholder engagement in environmental sustainability. In the Philippine context, Quevedo et al. (2021) and Marquez and Olavides (2024) likewise emphasized the contribution of local government initiatives and participatory conservation programs to environmental awareness. These studies support the use of diverse information channels to strengthen public understanding, encourage community involvement, and promote sustained mangrove conservation.

Theme 2: General Clarity and Understanding of Regulatory Provisions. The findings revealed that most informants understood the fundamental provisions of mangrove protection regulations, particularly the prohibition against cutting, destroying, and exploiting mangroves without authorization. LGO 1 noted that regulations "specify prohibited activities and penalties," while LGO 5 emphasized that the "prohibition of cutting and destruction is clear." Similarly, affected individuals consistently recognized that mangrove cutting and destruction are prohibited. These responses suggest that the primary objectives of environmental regulations have been effectively communicated to many stakeholders. This general understanding provides a foundation for promoting compliance, supporting conservation initiatives, and preventing environmental violations.

The findings align with Kong, Yang, and Sun (2021), who emphasized the importance of clear environmental policies, institutional capacity, and stakeholder participation in improving public understanding. Saengsupavanich et al. (2023) likewise highlighted the role of legislation, enforcement, and public education in effective coastal management. In the Philippine context, Gevaña et al. (2022) underscored the importance of clear governance structures and cooperative management in mangrove conservation. These studies reinforce the need to communicate regulatory provisions clearly and consistently to sustain public awareness and encourage compliance with mangrove protection laws.

Theme 3: Complexity of Legal and Technical Information. The findings revealed that although informants generally understood the basic prohibitions against mangrove destruction, some experienced difficulties understanding technical provisions, legal terminology, permit procedures, and enforcement mechanisms. LGO 1 observed that "technical provisions are difficult for ordinary residents," while LGO 5 emphasized the "need for simplified information campaigns." Community representatives also identified gaps in understanding permit requirements, while affected individuals expressed the need for additional explanations. These responses indicate that general awareness does not necessarily translate into a comprehensive understanding of environmental regulations. Simplifying legal information and providing practical explanations of procedures and penalties may improve public understanding and support compliance.

These findings are consistent with Kong, Yang, and Sun (2021), who emphasized the importance of capacity-building and specialized guidance in implementing environmental policies. Song et al. (2021) likewise highlighted the need for inclusive governance to ensure that complex conservation policies remain accessible to local communities. Furthermore, Pillodar et al. (2023) illustrated the specialized knowledge required for advanced mangrove monitoring technologies. Collectively, these studies support the use of plain-language materials, local-language information campaigns, and community-based orientations to make legal and technical information more understandable and accessible.

Theme 4: Variations in Community Awareness and Understanding. The findings revealed that awareness and understanding of mangrove protection regulations varied across community members due to differences in educational background, access to information, participation in environmental programs, and personal experiences. LGO 2 observed that "many residents know the prohibition but not the legal and ecological basis," while CR 2 explained that "some people remain confused because they do not attend meetings." These responses suggest that existing information campaigns may not reach all residents equally. Such disparities can affect compliance and participation in conservation initiatives, highlighting the need for inclusive communication strategies that accommodate different learning needs and ensure that information reaches underserved community groups.

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The findings correspond with Cahyaningsih et al. (2022), who emphasized the influence of community participation and environmental knowledge on conservation outcomes. Chen et al. (2020) likewise identified education, socioeconomic conditions, and stakeholder engagement as important factors affecting environmental understanding. In the Philippine context, Quevedo et al. (2021) and Pacyao (2024) highlighted the influence of community experiences, participation, and awareness on mangrove conservation. These studies reinforce the importance of targeted information campaigns, accessible educational materials, and broader community involvement to address disparities in awareness and promote consistent compliance with environmental regulations.

Theme 5: Need for Continuous Education and Public Information Campaigns. The findings revealed a strong need for sustained environmental education and regular information dissemination to strengthen understanding of mangrove protection regulations. LGO 3 emphasized that information "must reach all sectors of the community," while LGO 8 explained that "continuous education is needed because regulations may change." Similarly, CR 4 recommended more frequent information campaigns and simpler explanations, while AI 3 emphasized the need for additional information dissemination. These responses suggest that one-time awareness activities may be insufficient to maintain public understanding. Regular seminars, barangay orientations, community consultations, and accessible information materials can help correct misconceptions, communicate regulatory updates, and reinforce the importance of mangrove conservation.

These findings are consistent with Kong, Yang, and Sun (2021), who emphasized continuous training, stakeholder engagement, and capacity-building in coastal management. Saengsupavanich et al. (2023) likewise advocated integrating public education with policy implementation and restoration activities. In the Philippine context, Marquez and Olavides (2024) and Gevaña et al. (2022) highlighted the value of sustained community engagement and cooperative management in mangrove conservation. Quevedo et al. (2021) further emphasized the importance of continuing educational initiatives and effective enforcement. Collectively, these studies support the institutionalization of regular environmental education and public information campaigns to strengthen legal awareness, encourage community participation, and promote long-term compliance with mangrove protection regulations.

Synthesis of the Themes. The informants' experiences indicate that awareness of mangrove protection regulations is developed through government initiatives, environmental programs, and community activities. Although stakeholders generally understand the prohibition against mangrove cutting and exploitation, their comprehension varies according to access to information, participation in conservation activities, and familiarity with legal concepts. Technical language and complex legal provisions further limit some community members' understanding.

These findings emphasize that effective mangrove conservation requires more than established environmental laws. Sustained environmental education, accessible information, and inclusive public awareness campaigns are essential to strengthen understanding, promote compliance, and foster shared responsibility for the protection and sustainable management of mangrove ecosystems.

Underlying Reasons for the Continued Illegal Cutting and Exploitation of Mangroves in Jolo, Sulu

Personal and Community Circumstances Influencing Continued Mangrove Cutting and Use. Understanding the factors behind continued mangrove cutting and utilization is essential for developing effective conservation strategies. Although laws prohibit unauthorized exploitation, economic hardship, cultural practices, limited alternatives, and community influences may encourage continued dependence on mangrove resources.

The responses of Local Government Officials, Community Representatives, and Affected Individuals revealed that poverty, unemployment, and financial difficulties drive some households to use mangroves for fuel, construction materials, and additional income. Other contributing factors include limited livelihood opportunities, traditional practices, inadequate environmental awareness, perceived minimal environmental impact, and weak law enforcement.

Thematic analysis identified five themes: (1) Economic Hardship and Livelihood Dependence on Mangrove Resources; (2) Limited Access to Alternative Livelihoods and Resources; (3) Cultural Traditions and Intergenerational Dependence on Mangroves; (4) Limited Environmental Awareness and Perceived Minimal Impact; and (5) Social Influence, Community Norms, and Weak Enforcement. These findings highlight the need for integrated conservation strategies that combine effective law enforcement with sustainable livelihood opportunities, environmental education, and community participation to address the underlying causes of mangrove exploitation.

Theme 1: Economic Hardship and Livelihood Dependence on Mangrove Resources. The findings revealed that poverty, unemployment, insufficient income, and rising household expenses contribute to the continued use and cutting of mangroves. LGO 1 explained that "Economic hardship leads families to use mangrove wood for fuel and construction materials," while CR 2 noted that residents depend on mangroves when fishing income is insufficient. Similarly, AI 2 emphasized that the lack of employment and alternative income sources encourages continued mangrove use. These responses suggest that mangrove exploitation may be driven by economic necessity rather than deliberate disregard for environmental regulations. Thus, conservation initiatives should be complemented by livelihood assistance, employment opportunities, and financial support for economically vulnerable households.

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These findings are consistent with Nguyen et al. (2023), who identified economic pressures and limited livelihood opportunities as major challenges to mangrove conservation. Jakovac et al. (2020) likewise emphasized the importance of economic incentives in encouraging sustainable resource management, while Blanton et al. (2024) highlighted the potential of ecotourism and community-based enterprises to provide alternative income. In the Philippine context, Pacyao (2024) and Quevedo et al. (2022) underscored the influence of livelihood demands and community dependence on mangrove ecosystems. These studies reinforce the need to integrate conservation measures with sustainable economic opportunities to reduce dependence on mangrove resources.

Theme 2: Limited Access to Alternative Livelihoods and Resources. The findings revealed that limited access to alternative livelihoods, fuel sources, and construction materials contributes to continued mangrove utilization. LGO 2 observed that "Alternative sources of income are scarce in coastal communities," while CR 4 explained that residents use mangroves when they "lack alternative fuel or building materials." Similarly, AI 2 emphasized that limited livelihood opportunities influence community decisions. These responses indicate that residents may continue relying on mangroves when affordable and accessible substitutes are unavailable. Addressing this concern requires sustainable livelihood programs, alternative fuel options, and access to affordable construction materials to reduce pressure on mangrove ecosystems and encourage compliance with conservation regulations.

The findings align with Nguyen et al. (2023), who identified limited livelihood alternatives and inadequate institutional support as barriers to mangrove conservation. Mursyid et al. (2021) likewise emphasized the need to integrate economic development with conservation policies, while Blanton et al. (2024) highlighted the potential of ecotourism and conservation-based enterprises to support household incomes. In the Philippine context, Pacyao (2024) and Agduma et al. (2024) underscored the importance of alternative livelihoods and institutional collaboration in addressing resource dependence. These studies support the development of accessible and sustainable alternatives that meet community needs while protecting mangrove ecosystems.

Theme 3: Cultural Traditions and Intergenerational Dependence on Mangroves. The findings revealed that cultural traditions and long-established practices influence the continued use of mangrove resources. LGO 2 observed that "Mangrove use is influenced by practices passed down through generations," while CR 3 explained that "Many residents grew up using mangroves and regard it as normal behavior." Similarly, AI 3 noted that community traditions and familiar practices influence individual behavior. These responses suggest that mangrove utilization is shaped not only by economic necessity but also by established community practices that may normalize resource extraction despite existing regulations. Conservation programs should therefore adopt culturally sensitive approaches that engage community elders, families, and local leaders in promoting sustainable practices and encouraging gradual behavioral change.

These findings are consistent with Friess et al. (2020), who highlighted how social, cultural, and economic perspectives influence stakeholder interactions with mangrove ecosystems. Nguyen et al. (2023) likewise emphasized the importance of incorporating community traditions and local perspectives into mangrove management. In the Philippine context, Song et al. (2021) and Quevedo et al. (2022) discussed how historical resource dependence and community experiences shape perceptions of conservation. These studies support conservation strategies that respect local knowledge and traditions while promoting sustainable alternatives, environmental responsibility, and long-term community participation.

Theme 4: Limited Environmental Awareness and Perceived Minimal Impact. The findings revealed that insufficient environmental awareness and the perception that small-scale mangrove cutting causes minimal harm contribute to continued resource exploitation. LGO 7 observed that "Some residents lack awareness of the long-term environmental consequences of mangrove destruction," while LGO 5 noted that "Some individuals believe small-scale cutting has little environmental impact." Similarly, CR 5 explained that residents may underestimate the consequences because environmental damage is not immediately visible. These responses suggest that limited understanding of the cumulative effects of mangrove destruction may weaken compliance with conservation regulations. Strengthening environmental education through community orientations, demonstrations, and local conservation activities may help residents recognize the importance of mangroves in protecting coastlines, supporting fisheries, and preserving biodiversity.

The findings align with Friess et al. (2020), who highlighted the influence of environmental understanding on support for mangrove conservation. Shiau and Chiu (2020) likewise emphasized the importance of understanding mangrove ecosystem functions in promoting sustainable management. In the Philippine context, Pacyao (2024) identified limited public awareness as a challenge to mangrove protection, while Buot et al. (2022) advocated community-based environmental education to strengthen biodiversity conservation. These studies reinforce the need for continuous, accessible, and locally relevant educational initiatives that explain the long-term consequences of mangrove degradation and encourage responsible environmental practices.

Theme 5: Social Influence, Community Norms, and Weak Enforcement. The findings revealed that community norms, peer influence, and perceived weaknesses in law enforcement contribute to the continued use and exploitation of mangroves. LGO 4 explained that "Weak enforcement may create the perception that violations will go undetected," while CR 6 observed that "Seeing others use mangroves without punishment encourages similar behavior." Similarly, AI 3 acknowledged that community influence contributes to the continuation of mangrove use. These responses suggest that when violations appear socially acceptable or carry no visible consequences, individuals may be more likely to imitate such behavior. Addressing this concern requires consistent enforcement,

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regular monitoring, community reporting mechanisms, and collective conservation initiatives that encourage compliance and establish positive environmental norms.

These findings are consistent with Mursyid et al. (2021), who identified weak institutional coordination and inconsistent enforcement as barriers to mangrove conservation. Golebie et al. (2021) likewise emphasized accountability, stakeholder participation, and clearly defined enforcement responsibilities in environmental governance. Nguyen et al. (2023) highlighted the effects of limited government resources and inadequate monitoring, while Song et al. (2021) stressed the importance of balancing enforcement with community participation. Similarly, Pacyao (2024) underscored the value of local government involvement and sustained awareness campaigns. Collectively, these studies suggest that effective mangrove protection requires both consistent law enforcement and community engagement to strengthen compliance, reshape social norms, and promote shared responsibility for environmental conservation.

Synthesis of the Themes. The findings indicate that continued mangrove cutting and utilization are influenced by interconnected economic, social, cultural, and institutional factors. Economic hardship emerged as a major driver, as some households depend on mangroves for fuel, construction materials, and income. Poverty, unemployment, and unstable livelihoods often make immediate economic needs a priority over long-term environmental conservation.

This dependence is reinforced by limited livelihood alternatives and cultural traditions passed down through generations. Inadequate environmental awareness and the perception that small-scale cutting causes minimal harm may also weaken compliance with conservation regulations. Furthermore, community practices and inconsistent law enforcement can normalize mangrove exploitation and reduce the perceived consequences of violations.

Overall, the findings suggest that mangrove exploitation cannot be addressed through law enforcement alone. Effective conservation requires sustainable livelihood opportunities, accessible environmental education, community participation, behavioral change, and consistent enforcement of environmental regulations. Addressing these interconnected factors is essential to promoting long-term compliance and sustainable mangrove management.

Economic, Social, and Environmental Factors Hindering the Cessation of Illegal Mangrove Cutting and Exploitation. Mangrove exploitation persists in coastal communities despite existing environmental laws and conservation programs. Understanding the factors that prevent residents from discontinuing mangrove cutting and utilization is essential for developing effective conservation strategies. Compliance is influenced not only by legal awareness but also by economic conditions, cultural practices, social norms, environmental vulnerabilities, and governance.

The responses of Local Government Officials, Community Representatives, and Affected Individuals revealed that poverty, livelihood insecurity, limited economic opportunities, traditional practices, inadequate environmental awareness, and weak enforcement contribute to continued mangrove utilization. These findings indicate that mangrove exploitation is rooted in broader socioeconomic and environmental challenges rather than solely in regulatory noncompliance.

Thematic analysis identified five themes: (1) Economic Hardship and Survival Needs as Drivers of Mangrove Use; (2) Limited Alternative Livelihood Opportunities and Resource Dependence; (3) Cultural Traditions, Social Norms, and Community Influence; (4) Environmental Vulnerability and Limited Awareness of Ecological Consequences; and (5) Weak Enforcement and Perceived Low Risk of Sanctions. These findings emphasize the need for integrated conservation strategies that promote sustainable livelihoods, environmental education, community participation, disaster resilience, and consistent law enforcement to reduce mangrove dependence and ensure long-term ecosystem protection.

Theme 1: Economic Hardship and Survival Needs as Drivers of Mangrove Use. The findings revealed that poverty, declining income, limited employment opportunities, and rising household expenses contribute to the continued use and cutting of mangroves. LGO 1 explained that “Families depend on fishing and small-scale livelihoods; declining income pushes them to use mangroves for fuelwood and construction materials,” while CR 1 noted that “Poverty forces families to prioritize daily needs over environmental regulations.” Similarly, AI 1 emphasized that financial difficulties compel residents to use mangrove resources despite legal restrictions. These responses suggest that economic survival often takes precedence over environmental compliance, highlighting the need to integrate mangrove conservation with poverty alleviation, employment generation, and livelihood assistance.

These findings are consistent with Bhowmik et al. (2022), who identified socioeconomic pressures and competing livelihood demands as drivers of mangrove degradation. Chen et al. (2020) likewise emphasized the relationship between poverty and environmental degradation in resource-dependent coastal communities. In the Philippine context, Song et al. (2021) and Pacyao (2024) highlighted the importance of considering local livelihood needs in conservation initiatives. These studies support the development of economic interventions that reduce dependence on mangrove resources while promoting sustainable livelihoods and environmental protection.

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Theme 2: Limited Alternative Livelihood Opportunities and Resource Dependence. The findings revealed that inadequate employment opportunities and limited access to alternative income sources contribute to continued dependence on mangrove resources. LGO 4 stated that "Lack of sustainable alternative livelihoods limits compliance with regulations," while CR 2 observed that residents would avoid mangrove use if sufficient employment opportunities existed. Similarly, AI 3 emphasized that government support for alternative livelihoods could reduce dependence on mangroves. These responses suggest that conservation measures may be difficult to sustain when communities lack practical alternatives for meeting their basic needs. Livelihood diversification, skills development, community enterprises, and accessible financial assistance may therefore help reduce resource dependence while improving household welfare.

These findings align with Cahyaningsih et al. (2022), who emphasized the importance of sustainable livelihood opportunities in community-based mangrove management. Aslan et al. (2021) likewise highlighted the need for diversified livelihoods to reduce economic vulnerability associated with resource-dependent activities. In the Philippine context, Marquez and Olavides (2024) and Gevaña et al. (2022) underscored the value of community participation and cooperative management in strengthening conservation outcomes. These studies reinforce the need to integrate livelihood development into mangrove protection programs to make sustainable practices more feasible for coastal communities.

Theme 3: Cultural Traditions, Social Norms, and Community Influence. The findings revealed that cultural traditions, established community practices, and peer influence contribute to the continued utilization of mangrove resources. LGO 2 explained that "Mangrove utilization has become part of local culture and long-standing traditions," while CR 3 observed that "Many residents consider mangrove use a normal activity because it has been practiced for generations." Similarly, AI 3 noted that community influence and long-established habits make behavioral change difficult. These responses indicate that mangrove utilization may persist because it is socially accepted and embedded in everyday practices. Conservation initiatives should therefore engage families, community leaders, and local organizations in promoting sustainable alternatives that respect local traditions while encouraging responsible resource use.

These findings are consistent with Liu, An, and Jang (2020), who highlighted the influence of social norms and cultural values on environmental behavior. Cahyaningsih et al. (2022) likewise emphasized the importance of incorporating local traditions and community participation into mangrove management. In the Philippine context, Quevedo et al. (2021) and Marquez and Olavides (2024) underscored the value of considering local perceptions and ecological knowledge in conservation initiatives. These studies support culturally sensitive approaches that promote collective responsibility and gradually establish community norms favoring mangrove protection.

Theme 4: Environmental Vulnerability and Limited Awareness of Ecological Consequences. The findings revealed that environmental pressures and limited understanding of ecological consequences contribute to continued mangrove cutting. LGO 3 explained that "Extreme weather events increase demand for mangrove wood for repairing homes," while LGO 6 noted that "Limited understanding of environmental impacts weakens compliance." Similarly, CR 4 observed that residents do not always understand how mangrove loss affects fisheries, environmental protection, and community safety. These responses suggest that disasters, declining fish stocks, and insufficient environmental awareness may reinforce dependence on mangrove resources. Environmental education, disaster-resilient housing assistance, and community adaptation programs could help reduce this dependence while strengthening understanding of the protective functions of mangrove ecosystems.

These findings align with Bhowmik et al. (2022), who examined the interaction of environmental pressures and socioeconomic conditions in mangrove degradation. Chatting et al. (2022) likewise highlighted the ecological importance of mangroves, particularly their contribution to carbon storage and ecosystem resilience. In the Philippine context, Baloloy et al. (2023) and Nesperos et al. (2021) discussed the effects of environmental stressors and mangrove loss on ecosystem conditions and services. These studies reinforce the need to combine environmental education with practical support for disaster preparedness and sustainable resource management.

Theme 5: Weak Enforcement and Perceived Low Risk of Sanctions. The findings revealed that inadequate monitoring, limited enforcement capacity, and the perception that violations will go unpunished contribute to continued mangrove cutting. LGO 5 explained that "Weak enforcement and limited monitoring allow violations to continue," while CR 6 noted that "Lack of strict monitoring encourages people to imitate others who violate regulations without consequences." LGO 7 further observed that seeing others benefit economically from mangrove use reinforces continued exploitation. These responses indicate that inconsistent enforcement may weaken the deterrent effect of environmental regulations. Strengthening regular monitoring, ensuring consistent application of appropriate sanctions, and establishing community-based reporting mechanisms may improve accountability and encourage compliance.

These findings are consistent with Kong, Yang, and Sun (2021), who emphasized the importance of effective governance structures, institutional capacity, and enforcement mechanisms in coastal management. Saengsupavanich et al. (2023) likewise highlighted the need to integrate legislation, enforcement, restoration, and public participation. In the Philippine context, Quevedo et al. (2021) and Pacyao (2024) identified enforcement and monitoring challenges in mangrove conservation, while Gevaña et al. (2022)

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emphasized collaborative governance. These studies support a coordinated approach that combines consistent law enforcement with community participation and environmental education.

Synthesis of the Themes. The findings revealed that the continued use and cutting of mangroves are influenced by interconnected economic, cultural, environmental, and institutional factors. Economic hardship emerged as a major concern, as poverty, unstable income, and rising household expenses compel some families to depend on mangrove resources for fuelwood, construction materials, and livelihood support. This dependence is reinforced by limited access to alternative employment and affordable resources, making compliance with conservation regulations difficult for economically vulnerable households.

Cultural traditions and community norms further influence mangrove utilization, as long-established practices and peer behavior may normalize resource extraction. Meanwhile, environmental pressures, including typhoons and declining fish stocks, can increase dependence on mangroves, particularly when communities lack disaster-resilient housing and alternative livelihood options. Limited understanding of the long-term ecological consequences may further weaken the perceived importance of conservation. These challenges are compounded by inadequate monitoring and inconsistent enforcement, which can reduce the deterrent effect of environmental regulations.

Overall, the findings indicate that mangrove conservation requires an integrated approach that addresses both the underlying causes of resource dependence and the institutional barriers to compliance. Recommended strategies include sustainable livelihood development, skills training, community-based enterprises, culturally responsive environmental education, disaster-resilient housing assistance, participatory monitoring, and consistent enforcement of applicable laws. By combining socioeconomic support with environmental education and effective governance, local authorities and communities can strengthen compliance, reduce unsustainable mangrove utilization, and promote long-term ecosystem protection.

Impacts of Illegal Mangrove Exploitation on the Community and Surrounding Environment

This section answers two questions: What changes have you observed in your community or environment as a result of mangrove loss? and How have these changes affected your livelihood, safety, or daily life?

Observed Changes in the Community and Environment Resulting from Mangrove Loss. Five themes were generated on this area.

Theme 1: Increased Coastal Vulnerability, Erosion, and Flooding. The findings revealed that mangrove loss has increased coastal communities' vulnerability to flooding, erosion, storm surges, and strong waves. LGO 1 observed that "the shoreline appears to be retreating," while CR 1 reported that "mas madalas nang bumaha sa aming lugar kumpara noon." These accounts suggest that mangrove degradation has weakened natural coastal barriers, increasing the risks of property damage, displacement, and environmental disasters.

These findings align with Friess et al. (2020), Jakovac et al. (2020), and Arifanti et al. (2022), who emphasized the role of mangroves in coastal protection and climate resilience. Quevedo et al. (2022) likewise highlighted the importance of mangrove rehabilitation in strengthening community resilience to environmental hazards.

Theme 2: Declining Fisheries Productivity and Livelihood Impacts. The findings indicated that mangrove destruction has contributed to declining fish catches, reduced crab populations, and diminished marine resources. LGO 2 observed "a decline in fish and crab populations," while AI 2 reported that "talagang bumaba ang dami ng mga isdang nahuhuli namin." These experiences demonstrate how mangrove degradation threatens fisheries productivity, food security, and the livelihoods of fishing-dependent households.

The findings are consistent with Friess et al. (2020), who identified mangroves as essential habitats and nursery grounds for marine species. Shiau and Chiu (2020) and Choudhury et al. (2021) also emphasized the importance of healthy mangrove ecosystems in sustaining biodiversity and ecological productivity. Philippine studies by Paz-Alberto et al. (2020) and Raganas et al. (2020) similarly highlighted the effects of habitat degradation on mangrove ecosystems and biodiversity.

Theme 3: Environmental Degradation and Reduced Ecosystem Services. The findings revealed that mangrove loss has weakened essential ecosystem services, including water filtration, coastal protection, and environmental regulation. LGO 5 observed "the gradual deterioration of water quality in some coastal areas," while AI 1 expressed concern that the community has "mas mahina na ang proteksiyon ng aming komunidad laban sa mga sakuna." These observations indicate that mangrove degradation affects environmental quality and reduces the capacity of coastal ecosystems to protect communities and sustain ecological balance.

These findings highlight the need to conserve mangroves to maintain environmental stability and ecosystem services. Research by Friess et al. (2020), Jakovac et al. (2020), and Arifanti et al. (2022) underscores the ecological and protective functions of mangroves. Their preservation is therefore essential to strengthening coastal resilience and supporting sustainable resource management.

Theme 4: Economic Hardships and Livelihood Disruptions. The findings showed that mangrove destruction has contributed to declining fish catches, reduced household incomes, and disruptions to fishing-based livelihoods. LGO 2 reported that reduced catches

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negatively affected household income, while CR 6 observed that families were seeking alternative income sources because fishing was no longer sufficient. These accounts demonstrate that environmental degradation also threatens the financial stability and well-being of coastal households.

The findings emphasize the need to integrate mangrove conservation with livelihood assistance and economic diversification. Sustainable aquaculture, ecotourism, mangrove stewardship, and skills development may help reduce dependence on declining fisheries. These measures can strengthen household resilience while encouraging community participation in mangrove protection and rehabilitation.

Theme 5: Growing Community Awareness and Support for Mangrove Conservation. Despite the negative effects of mangrove loss, the findings revealed growing community awareness and support for conservation. LGO 8 observed that many residents were "now recognizing the consequences of mangrove loss," while AI 3 stated that "mas naunawaan ko ang kahalagahan ng pangangalaga sa mga bakawan." These responses suggest that direct experiences with environmental degradation have encouraged greater appreciation of mangroves and participation in conservation activities.

These findings are consistent with Blanton et al. (2024), Golebie et al. (2021), and Nguyen et al. (2023), who emphasized the importance of public awareness, stakeholder participation, and environmental education in conservation. Similarly, Quevedo et al. (2022) and Pacyao (2024) highlighted the value of community involvement in mangrove rehabilitation and sustainable resource management.

Synthesis of the Themes. The findings revealed that mangrove loss has interconnected environmental, economic, and social consequences for coastal communities. Informants reported increased erosion and flooding, declining fisheries productivity, deteriorating environmental conditions, and reduced household incomes. These experiences demonstrate how mangrove degradation weakens coastal protection, threatens biodiversity, and undermines livelihoods dependent on healthy marine ecosystems.

Despite these challenges, the growing community awareness of mangrove conservation presents an opportunity to strengthen environmental protection. The findings underscore the need for integrated programs that combine mangrove rehabilitation, disaster risk reduction, sustainable livelihood development, environmental education, and community participation to promote long-term coastal resilience.

Effects of Mangrove Loss on Livelihood, Safety, and Daily Life. The participants' responses revealed five major themes describing the impacts of mangrove degradation on coastal communities: (1) Declining Livelihoods and Economic Insecurity; (2) Increased Vulnerability to Coastal Hazards and Safety Risks; (3) Reduced Fisheries Productivity and Livelihood Challenges; (4) Environmental Degradation and Coastal Erosion; and (5) Growing Environmental Awareness and Community Participation in Conservation. These themes demonstrate that the effects of mangrove degradation extend beyond environmental loss, influencing economic stability, public safety, daily routines, and community attitudes toward environmental stewardship.

Theme 1: Declining Livelihoods and Economic Insecurity. The findings revealed that mangrove degradation has reduced fisheries productivity, household income, and employment opportunities in coastal communities. LGO 1 noted that declining fish catches have lowered family earnings, while LGO 8 reported that some residents have migrated or sought alternative employment because fishing has become less productive. These experiences demonstrate how mangrove loss increases economic insecurity among households dependent on coastal resources.

These findings are consistent with Bhowmik et al. (2022), Aslan et al. (2021), and Gevaña et al. (2022), who highlighted the socioeconomic consequences of mangrove degradation. The results underscore the importance of mangrove conservation and livelihood diversification in strengthening the economic resilience of coastal communities.

Theme 2: Increased Vulnerability to Coastal Hazards and Safety Risks. The findings indicated that mangrove loss has increased community exposure to flooding, storm surges, coastal erosion, and other environmental hazards. CR 2 observed that "mas madalas nang bumaha kapag may malakas na ulan o bagyo," while AI 2 expressed fear because the community no longer felt adequately protected from disasters. These accounts suggest that mangrove degradation weakens natural coastal defenses and increases safety concerns and disaster-related expenses.

These findings support Bhowmik et al. (2022), Saengsupavanich et al. (2023), and Chatting et al. (2022), who emphasized the protective functions of coastal ecosystems. The results highlight the need to integrate mangrove rehabilitation with disaster risk reduction and community preparedness initiatives.

Theme 3: Reduced Fisheries Productivity and Livelihood Challenges. The findings revealed that declining mangrove cover has contributed to reduced fish catches, increased fishing effort, and higher operational costs. CR 3 explained that fishers must spend more time at sea to obtain sufficient catches, while CR 6 reported that some residents have sought other employment because fishing no longer provides adequate income. These experiences demonstrate how mangrove degradation threatens fisheries sustainability and places additional burdens on fishing households.

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These findings align with Arifanti et al. (2021), Bhowmik et al. (2022), and Gevaña et al. (2022), who emphasized the role of mangroves in supporting biodiversity and fisheries productivity. The results reinforce the need to protect mangrove habitats and provide alternative livelihood opportunities for affected communities.

Theme 4: Environmental Degradation and Coastal Erosion. The findings showed that mangrove degradation has contributed to shoreline instability and increased coastal erosion, threatening homes, infrastructure, and settlements. CR 4 observed that "mas mabilis nang pagguho ng lupa sa tabing-dagat," while LGO 4 identified coastal erosion as a growing concern for residents near the shoreline. These accounts indicate that mangrove loss weakens coastal stability and increases the risk of property damage and displacement.

These findings are consistent with Saengsupavanich et al. (2023), Bhowmik et al. (2022), and Baloloy et al. (2023), who highlighted the relationship between ecosystem degradation and coastal vulnerability. The results emphasize the importance of mangrove restoration and sustainable coastal resource management in protecting communities and infrastructure.

Theme 5: Growing Environmental Awareness and Community Participation in Conservation. Despite the negative effects of mangrove degradation, the findings revealed increased environmental awareness and community participation in conservation. LGO 8 observed that residents increasingly recognize the importance of mangrove protection, while CR 5 reported that "mas naging aktibo ang aming komunidad sa mga programa sa pangangalaga ng bakawan." These responses suggest that firsthand experiences with environmental problems have encouraged greater community responsibility for coastal protection.

These findings support Cahyaningsih et al. (2022), Chen et al. (2020), and Gevaña et al. (2022), who emphasized community participation and collaborative management in promoting conservation. The growing awareness presents an opportunity to strengthen mangrove rehabilitation, environmental education, and community-based resource management.

Synthesis of the Themes. The findings demonstrate that mangrove degradation has interconnected environmental, economic, and social consequences. Reduced fisheries productivity has weakened household income and livelihood security, while diminished coastal protection has increased exposure to flooding, storm surges, and erosion. These impacts threaten community safety, property, and the long-term sustainability of coastal resources.

Despite these challenges, increased environmental awareness and community participation offer opportunities for improved conservation. The findings underscore the need for an integrated approach combining mangrove rehabilitation, sustainable livelihood development, disaster risk reduction, and community involvement. Such initiatives can help restore ecosystem functions, strengthen economic resilience, and protect the long-term well-being of mangrove-dependent communities.

Implementation and Effectiveness of Existing Policies, Interventions, and Alternative Livelihood Programs Addressing Illegal Mangrove Extraction

This section answers two questions: How are these policies or programs being implemented in your community in practice? and "Do you think these interventions are effective in reducing illegal mangrove cutting? Why or why not?"

Implementation of Mangrove Protection Policies and Programs in the Community. Analysis of the interview data revealed five interrelated themes that describe the practical implementation of mangrove protection policies and programs within the community: (1) Monitoring, Law Enforcement, and Inter-Agency Coordination; (2) Community-Based Mangrove Rehabilitation and Conservation Activities; (3) Environmental Education and Information Dissemination; (4) Livelihood Assistance and Sustainable Resource Management; and (5) Community Participation and Shared Responsibility in Enforcement. These themes indicate that the implementation of mangrove conservation policies relies on a combination of regulatory enforcement, environmental restoration, public education, livelihood interventions, and collaborative governance involving both government institutions and community members.

Theme 1. Monitoring, Law Enforcement, and Inter-Agency Coordination. The findings revealed that mangrove protection policies are implemented through regular coastal patrols, inspections, permit systems, and coordination among local government units, barangay officials, community volunteers, and national environmental agencies. Participants emphasized that these activities help prevent illegal mangrove cutting, monitor violations, and ensure compliance with environmental regulations. These findings are consistent with Quevedo et al. (2021) and Gevaña et al. (2022), who highlighted the importance of local government involvement, institutional cooperation, and collaborative governance in mangrove conservation.

As explained by LGO 1, "Environmental laws are implemented through regular coastal patrols conducted by the local government, barangay officials, and community volunteers." Similarly, LGO 3 emphasized the importance of coordinating with national environmental agencies to ensure compliance with conservation policies. These responses demonstrate that effective mangrove protection requires sustained monitoring and cooperation across government levels. This finding is supported by Kong, Yang, and Sun (2021) and Saengsupavanich et al. (2023), who emphasized that institutional capacity, law enforcement, stakeholder participation, and collaborative governance are essential for sustainable coastal management and long-term conservation.

Theme 2: Community-Based Mangrove Rehabilitation and Conservation Activities. The findings revealed that mangrove conservation policies are implemented through planting activities, coastal cleanups, and rehabilitation projects involving schools,

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community organizations, fisherfolk associations, and local residents. LGO 4 reported that the local government regularly conducts mangrove planting, while CR 5 confirmed community participation in these initiatives. These activities promote environmental awareness, community ownership, and long-term commitment to mangrove protection.

These findings are consistent with Cahyaningsih et al. (2022), Chen et al. (2020), and Marquez and Olavides (2024), who emphasized the importance of community participation and local knowledge in successful mangrove restoration. Involving residents in rehabilitation programs strengthens environmental stewardship and supports sustainable resource management.

Theme 3: Environmental Education and Information Dissemination. The findings showed that environmental education is promoted through seminars, information campaigns, barangay meetings, and school-based activities. LGO 2 reported that seminars educate residents about mangrove protection laws, while CR 1 noted that these laws are regularly explained during barangay meetings. Such initiatives increase public awareness, encourage responsible environmental behavior, and promote voluntary compliance with conservation regulations.

These findings support Chen et al. (2020), Liu, An, and Jang (2020), and Quevedo et al. (2021), who highlighted the role of education and awareness campaigns in promoting environmental responsibility. Continuous information dissemination complements law enforcement by helping communities understand conservation policies and their importance.

Theme 4: Livelihood Assistance and Sustainable Resource Management. The findings indicated that local governments and partner agencies provide alternative livelihood opportunities, including aquaculture, ecotourism, skills training, and financial assistance, to reduce dependence on mangrove resources. LGO 5 highlighted these livelihood initiatives, while AI 2 expressed the need to expand access to training opportunities. These responses suggest that livelihood assistance can address economic pressures that contribute to illegal mangrove exploitation.

These findings align with Chen et al. (2020), Cahyaningsih et al. (2022), and Gevaña et al. (2022), who emphasized the importance of integrating economic support into environmental management. Accessible livelihood programs can improve household welfare while reducing pressure on mangrove ecosystems.

Theme 5: Community Participation and Shared Responsibility in Enforcement. The findings revealed that community members help protect mangroves by reporting illegal activities, monitoring coastal areas, and cooperating with government officials and environmental organizations. CR 3 noted that residents are encouraged to report illegal mangrove cutting, while AI 3 observed increased community cooperation in monitoring mangrove areas. These practices strengthen local accountability and promote shared responsibility for conservation.

These findings are consistent with Cahyaningsih et al. (2022), Kong, Yang, and Sun (2021), and Gevaña et al. (2022), who emphasized stakeholder collaboration and community participation in effective environmental governance. Strong partnerships between government institutions and residents can improve monitoring, compliance, and the sustainability of conservation programs.

Synthesis of the Themes. The findings demonstrate that mangrove protection policies are implemented through coordinated law enforcement, community-based rehabilitation, environmental education, livelihood assistance, and shared responsibility. Monitoring and inter-agency coordination support regulatory compliance, while rehabilitation and educational activities strengthen community awareness and participation. Livelihood programs also address economic pressures that may contribute to mangrove exploitation.

Overall, effective mangrove conservation requires an integrated approach that combines consistent enforcement, ecological restoration, public education, sustainable livelihood opportunities, and participatory governance. Continuous collaboration among government agencies, local organizations, and community members is essential to ensuring the effective implementation and long-term sustainability of mangrove protection policies.

Perceived Effectiveness of Interventions in Reducing Illegal Mangrove Cutting. The analysis of participants' responses generated five major themes regarding the perceived effectiveness of existing mangrove conservation interventions: (1) Increased Environmental Awareness and Positive Community Participation; (2) Partial Effectiveness Due to Economic Dependence and Persistent Violations; (3) Weak Enforcement and Limited Monitoring Capacity; (4) Need for Sustainable Alternative Livelihoods; and (5) Importance of Community Engagement and Continuous Environmental Education. These themes suggest that while current conservation interventions have contributed to increased awareness and participation in mangrove protection, their effectiveness remains constrained by socioeconomic factors, limited enforcement capacity, and the continuing need for community empowerment and sustainable development initiatives.

Theme 1. Increased Environmental Awareness and Positive Community Participation. The findings revealed that environmental campaigns, monitoring activities, and rehabilitation programs have increased community awareness and participation in mangrove conservation. Participants observed that residents have become more knowledgeable about environmental laws and more willing to

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protect mangrove areas. As LGO 1 explained, "regular monitoring and information campaigns have increased community awareness of environmental laws." Similarly, CR 1 noted that more people now understand that mangrove cutting is prohibited. These findings are consistent with Blanton et al. (2024), Golebie et al. (2021), Nguyen et al. (2023), Pacyao (2024), and Quevedo et al. (2022), who emphasized the importance of environmental education, community participation, and shared responsibility in conservation.

Theme 2. Partial Effectiveness Due to Economic Dependence and Persistent Violations. Although conservation interventions have produced positive results, participants reported that illegal mangrove cutting persists because of poverty and dependence on mangrove resources for income and daily needs. LGO 5 explained that economic pressures continue to encourage resource exploitation, while CR 2 stated, "May mga tao pa ring gumagamit ng bakawan dahil wala silang ibang mapagkukunan ng kita." These responses indicate that environmental awareness alone cannot eliminate illegal activities when communities lack alternative income sources. This finding supports Nguyen et al. (2023), Jakovac et al. (2020), Mursyid et al. (2021), Pacyao (2024), and Song et al. (2021), who highlighted the influence of economic hardship and limited livelihood opportunities on conservation outcomes.

Theme 3. Weak Enforcement and Limited Monitoring Capacity. Participants identified insufficient personnel, limited resources, and difficulties monitoring remote coastal areas as barriers to effective mangrove protection. LGO 8 emphasized that conservation efforts were constrained by inadequate personnel and monitoring resources, while CR 6 observed that illegal cutting sometimes continues because mangrove areas are not regularly monitored. These findings suggest that weak enforcement reduces compliance and allows environmental violations to persist. The results are consistent with Mursyid et al. (2021), Golebie et al. (2021), Nguyen et al. (2023), Pacyao (2024), and Quevedo et al. (2022), who underscored the importance of institutional capacity, accountability, and sustained monitoring in environmental governance.

Theme 4. Need for Sustainable Alternative Livelihoods. The participants emphasized that sustainable livelihood opportunities are necessary to reduce communities' dependence on mangrove resources. LGO 2 explained that long-term conservation requires alternative livelihoods, while CR 2 stated, "Kung may sapat na hanapbuhay, mas kaunti ang aasa sa pagputol ng bakawan." These responses suggest that livelihood assistance should complement environmental regulations by addressing the economic conditions that contribute to illegal mangrove exploitation. This finding supports Nguyen et al. (2023), Jakovac et al. (2020), Blanton et al. (2024), Song et al. (2021), and Pacyao (2024), who highlighted the role of livelihood development, economic incentives, and community-based enterprises in promoting sustainable conservation.

Theme 5. Importance of Community Engagement and Continuous Environmental Education. The findings highlighted the importance of sustained environmental education and active community participation in maintaining conservation efforts. Participants stressed that cooperation between government agencies and residents encourages shared responsibility and strengthens local support for mangrove protection. As LGO 8 explained, long-term effectiveness requires continuous education and stronger cooperation between government agencies and residents. Similarly, CR 3 stated, "Mas epektibo ang mga programa kapag nagtutulungan ang mga opisyal at mga residente." These findings are consistent with Golebie et al. (2021), Nguyen et al. (2023), Blanton et al. (2024), Buot et al. (2022), Pacyao (2024), and Quevedo et al. (2022), who emphasized the value of community engagement, environmental education, and participatory governance in sustaining conservation initiatives.

Synthesis of the Themes. The findings indicate that mangrove conservation interventions have increased environmental awareness and community participation but remain only partially effective in eliminating illegal mangrove cutting. The five themes reveal that positive changes in environmental attitudes coexist with persistent challenges, particularly economic dependence on mangrove resources and limitations in monitoring and law enforcement.

Overall, the findings suggest that effective mangrove conservation requires an integrated approach combining continuous environmental education, stronger enforcement, adequate monitoring resources, sustainable livelihood opportunities, and active community participation. Conservation policies are more likely to achieve lasting results when they address both environmental protection and the socioeconomic needs of coastal communities while fostering shared responsibility among government agencies and residents.

Challenges in Mangrove Preservation in Jolo, Sulu

Challenges Faced by Authorities and Communities in Mangrove Protection and Conservation. The analysis of responses from Local Government Officials, Community Representatives, and Affected Individuals identified five themes concerning mangrove conservation: (1) Resource and Capacity Constraints; (2) Limited Environmental Awareness and Community Engagement; (3) Socioeconomic Pressures and Livelihood Dependence; (4) Weak Enforcement, Monitoring, and Institutional Coordination; and (5) Environmental and Climate-Related Challenges.

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The findings indicate that mangrove conservation involves interconnected environmental, economic, social, and institutional concerns. Despite existing policies and conservation programs, limited resources, inadequate public awareness, livelihood dependence, weak enforcement, poor inter-agency coordination, and climate-related threats continue to hinder effective mangrove management.

These challenges are interrelated, as resource limitations weaken monitoring, socioeconomic pressures affect compliance, and environmental disturbances complicate rehabilitation efforts. The findings underscore the need for a holistic and collaborative approach that strengthens institutional capacity, promotes community participation, provides sustainable livelihood alternatives, improves law enforcement, and enhances ecosystem resilience.

Theme 1: Resource and Capacity Constraints. The findings revealed that limited funding, insufficient personnel, inadequate equipment, and logistical constraints hinder mangrove conservation efforts. Local Government Official 1 emphasized the insufficiency of funds for monitoring, enforcement, rehabilitation, and community education, while Community Representative 4 noted that some conservation projects cannot continue because of inadequate financial support. These findings indicate the need for sustained funding, adequate staffing, and technical assistance to ensure consistent conservation activities. This is consistent with Nguyen et al. (2023), Mursyid et al. (2021), Jakovac et al. (2020), Pacyao (2024), and Agduma et al. (2024), who highlighted the importance of institutional capacity and sustained investment in mangrove conservation.

Theme 2: Limited Environmental Awareness and Community Engagement. The findings showed that insufficient environmental awareness and difficulty sustaining community participation remain challenges in mangrove conservation. Local Government Official 3 observed that some residents do not fully understand the ecological importance of mangroves, while Community Representative 5 noted the difficulty of maintaining participation in planting and clean-up activities. These findings suggest the need for continuous environmental education and community-based initiatives that encourage long-term involvement and shared responsibility. The results support Nguyen et al. (2023), Golebie et al. (2021), Blanton et al. (2024), Buot et al. (2022), and Pacyao (2024), who emphasized the importance of environmental awareness, stakeholder engagement, and community participation in conservation.

Theme 3: Socioeconomic Pressures and Livelihood Dependence. The findings revealed that poverty, dependence on natural resources, and competing economic activities place considerable pressure on mangrove ecosystems. Community Representative 3 explained that many residents depend on natural resources for their livelihood, while Affected Individual 3 emphasized that immediate family needs often take priority when people experience financial hardship. These responses indicate that conservation efforts must address socioeconomic conditions through sustainable livelihood opportunities and poverty reduction initiatives. This finding is consistent with Nguyen et al. (2023), Jakovac et al. (2020), Mursyid et al. (2021), Song et al. (2021), and Pacyao (2024), who identified economic dependence and limited livelihood alternatives as barriers to effective conservation.

Theme 4: Weak Enforcement, Monitoring, and Institutional Coordination. The findings indicated that inadequate monitoring, difficulties in gathering evidence, and inconsistent coordination among stakeholders weaken mangrove protection. Local Government Official 4 highlighted the challenges of identifying and prosecuting violators, while Community Representative 2 pointed to insufficient regular monitoring of mangrove areas. These findings underscore the need to strengthen enforcement capacity, improve surveillance and evidence gathering, and establish effective coordination among government agencies and community organizations. The results corroborate Mursyid et al. (2021), Golebie et al. (2021), Nguyen et al. (2023), Quevedo et al. (2022), and Pacyao (2024), who emphasized the importance of institutional accountability, monitoring, and collaborative governance.

Theme 5: Environmental and Climate-Related Challenges. The findings revealed that typhoons, flooding, coastal erosion, and climate change complicate mangrove rehabilitation and conservation. Local Government Official 6 identified these environmental disturbances as major challenges, while Community Representative 6 explained that severe weather can destroy newly planted mangroves. These findings suggest that conservation programs should incorporate climate adaptation, disaster preparedness, appropriate species selection, and continuous ecosystem monitoring. The results are consistent with Shiau and Chiu (2020), Arifanti et al. (2022), Jakovac et al. (2020), Quevedo et al. (2022), and Paz-Alberto et al. (2020), who discussed the vulnerability of mangrove ecosystems to environmental disturbances and the importance of resilient conservation strategies.

Synthesis of Themes. The findings revealed that mangrove conservation is affected by interconnected financial, social, economic, institutional, and environmental challenges. Resource and capacity constraints limit the implementation of conservation programs, while insufficient environmental awareness and inconsistent community participation weaken local support. Meanwhile, poverty and livelihood dependence may encourage continued resource exploitation, and inadequate enforcement and institutional coordination make it difficult to prevent violations. Climate-related hazards further threaten mangrove rehabilitation and ecosystem sustainability.

Overall, the findings indicate that effective mangrove conservation requires an integrated approach that combines adequate funding and technical support, continuous environmental education, active community participation, sustainable livelihood opportunities,

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stronger law enforcement, and climate-resilient management. Addressing these challenges collectively can help improve policy implementation, strengthen community ownership, and support the long-term protection of mangrove ecosystems.

Effects of Conservation Challenges on Efforts to Prevent Illegal Mangrove Exploitation. Five themes were generated on this area. **Theme 1: Reduced Enforcement Capacity Due to Resource Limitations.** The findings revealed that inadequate funding, insufficient personnel, limited equipment, and lack of training weaken efforts to prevent illegal mangrove exploitation. Local Government Official 1 explained that budget shortages limit patrols, equipment maintenance, and awareness campaigns, while Local Government Official 2 emphasized that insufficient manpower leaves some mangrove areas inadequately monitored. Community Representative 4 also noted that limited funding affects the continuity of conservation programs. These findings indicate that adequate financial, logistical, and technical support is necessary to strengthen monitoring, enforcement, and community participation.

Theme 2: Low Environmental Awareness and Community Participation. The findings showed that limited environmental awareness and inconsistent community participation contribute to continued illegal mangrove exploitation. Local Government Official 3 observed that some residents do not fully understand the consequences of mangrove destruction, while Local Government Official 7 emphasized the importance of community cooperation in monitoring and reporting violations. These findings suggest that sustained environmental education and active community involvement are essential to improve compliance, strengthen local monitoring, and prevent illegal activities.

Theme 3: Socioeconomic Pressures and Livelihood Dependency. The findings revealed that poverty and dependence on coastal resources complicate efforts to prevent illegal mangrove exploitation. Local Government Official 5 explained that economic hardship may lead residents to prioritize immediate livelihood needs over environmental protection. Similarly, Community Representative 3 noted that poverty drives some individuals to use mangroves as a source of income. These findings suggest that conservation programs should incorporate sustainable livelihood alternatives and economic assistance to reduce dependence on mangrove resources while protecting the livelihoods of coastal communities.

Theme 4: Weak Enforcement and Institutional Challenges. The findings indicated that weak enforcement mechanisms, legal difficulties, inadequate monitoring, and inconsistent inter-agency coordination undermine mangrove protection. Local Government Official 4 highlighted the challenges of apprehending and prosecuting violators, while Local Government Official 8 emphasized that poor coordination can delay decisions and create enforcement gaps. These findings underscore the need to strengthen monitoring systems, improve legal processes, and enhance collaboration among government agencies and community stakeholders to increase compliance with environmental regulations.

Theme 5: Environmental and Climate-Related Disruptions. The findings revealed that natural disasters and climate-related disturbances complicate efforts to prevent illegal mangrove exploitation. Local Government Official 6 explained that disasters divert personnel and resources from enforcement toward emergency response and rehabilitation. Community Representative 6 similarly observed that calamities damage mangroves and shift community attention from monitoring to recovery. These findings highlight the importance of integrating disaster preparedness, climate adaptation, and ecosystem rehabilitation into mangrove conservation strategies.

Synthesis of Themes. The findings demonstrate that preventing illegal mangrove exploitation is challenged by interconnected institutional, social, economic, and environmental factors. Inadequate resources weaken enforcement capacity, while limited environmental awareness and community participation reduce the effectiveness of monitoring and conservation initiatives. Poverty and livelihood dependence may encourage continued resource exploitation, whereas weak enforcement and institutional coordination limit the deterrent effect of environmental regulations. Climate-related disturbances further complicate conservation by damaging mangrove ecosystems and diverting resources toward disaster response.

Overall, the findings indicate that effective mangrove protection requires an integrated approach that ensures adequate funding and personnel, promotes continuous environmental education, strengthens community participation, provides sustainable livelihood opportunities, improves law enforcement and institutional coordination, and incorporates climate resilience and disaster preparedness. Coordinated action among government agencies and coastal communities is essential to address the underlying causes of illegal exploitation and sustain long-term mangrove conservation.

Recommended Measures and Strategies to Strengthen Mangrove Protection and Conservation in Jolo, Sulu. The findings indicate that mangrove conservation in Jolo, Sulu requires integrated interventions addressing financial, social, economic, institutional, and environmental challenges. The following strategies are recommended:

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1. Strengthen Financial Support and Institutional Capacity. Local government units and concerned agencies should increase funding, manpower, equipment, and logistical support for conservation, monitoring, and rehabilitation activities. Regular capacity-building programs should enhance the competencies of conservation personnel and community volunteers.

2. Enhance Environmental Education and Community Awareness. Conduct continuous environmental education campaigns, seminars, and workshops to improve understanding of mangrove ecosystems, their ecological and economic benefits, and the importance of compliance with conservation laws.

3. Promote Community Participation and Resource Management. Involve community members in conservation planning, mangrove rehabilitation, monitoring, and protection. Establish community patrol groups and volunteer monitoring teams to strengthen local ownership and environmental responsibility.

4. Develop Sustainable Livelihood Programs. Provide alternative income opportunities, such as sustainable aquaculture, seaweed farming, ecotourism, and skills training, to reduce dependence on mangrove resources and address the socioeconomic factors contributing to illegal exploitation.

5. Strengthen Law Enforcement and Monitoring. Improve coastal patrols, surveillance, community reporting systems, and the consistent implementation of environmental laws to deter illegal mangrove cutting and other destructive activities.

6. Improve Inter-Agency Coordination. Strengthen collaboration among government agencies, nongovernment organizations, academic institutions, and local communities through regular consultations, coordinated conservation activities, and shared action plans.

7. Integrate Climate Change Adaptation and Disaster Risk Reduction. Incorporate climate-resilient rehabilitation, appropriate mangrove species selection, environmental monitoring, disaster preparedness, and post-disaster restoration into conservation programs.

8. Strengthen Policy Implementation and Long-Term Planning. Develop sustainable mangrove management plans with clear objectives, assigned responsibilities, monitoring mechanisms, and funding provisions. Regularly evaluate conservation policies to ensure continuity and responsiveness to emerging environmental challenges.

Overall, effective mangrove conservation in Jolo, Sulu requires a collaborative and sustainable approach that integrates adequate resources, environmental education, community participation, alternative livelihoods, law enforcement, institutional coordination, and climate resilience. Addressing these interconnected factors can strengthen conservation initiatives and support the long-term protection of mangrove ecosystems.

Conclusions

With the findings derived from the study, the following are concluded:

1. The study concludes that the informants have a generally adequate understanding of the laws and regulations governing mangrove protection and recognize the ecological and socioeconomic importance of mangrove ecosystems. However, variations in awareness, limited community understanding, and challenges in law enforcement continue to hinder effective compliance and conservation efforts. Illegal mangrove exploitation in Jolo, Sulu is primarily influenced by economic hardship, limited livelihood opportunities, cultural practices, inadequate environmental awareness, and weak enforcement of environmental laws. These findings underscore the need for an integrated approach to mangrove conservation that combines continuous environmental education, strengthened public information campaigns, effective law enforcement, and sustainable livelihood opportunities. Addressing both environmental and socioeconomic concerns is essential to reducing illegal exploitation and promoting the long-term protection and sustainable management of mangrove resources.

2. Additionally, illegal mangrove exploitation has caused significant environmental degradation, reduced fisheries productivity, increased vulnerability to natural hazards, and disrupted the livelihoods and safety of coastal communities. At the same time, these adverse experiences have increased public awareness of the importance of mangrove conservation, emphasizing the urgent need for strengthened protection and rehabilitation efforts.

3. Further, existing policies, interventions, and livelihood programs have contributed positively to environmental awareness, community participation, and mangrove conservation efforts. However, their effectiveness remains limited by economic dependence, weak enforcement, inadequate monitoring, and insufficient livelihood alternatives, highlighting the need for more comprehensive and sustainable conservation strategies.

4. Lastly, mangrove preservation in Jolo, Sulu is challenged by limited resources, insufficient environmental awareness, socioeconomic pressures, weak institutional enforcement, and environmental and climate-related threats. Addressing these interconnected challenges requires strengthened governance, increased resource allocation, sustainable livelihood programs, enhanced community participation, and improved conservation management strategies.

Recommendations

Based on the findings of the study, the following recommendations are proposed to strengthen the protection, conservation, and sustainable management of mangroves in Jolo, Sulu:

1. Strengthen Environmental Education and Awareness Programs

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Local government units, environmental agencies, and educational institutions should intensify environmental education campaigns through regular seminars, workshops, barangay assemblies, and school-based programs. Information dissemination activities should emphasize the legal provisions protecting mangroves, their ecological and socioeconomic importance, and the consequences of illegal mangrove exploitation. Educational materials should be simplified and made accessible to all sectors of the community.

2. Expand Sustainable Alternative Livelihood Programs

Government agencies and development partners should establish and expand sustainable livelihood opportunities for coastal communities to reduce dependence on mangrove resources. Programs such as aquaculture, eco-tourism, skills development training, small enterprise support, and livelihood assistance projects should be strengthened and made more accessible to vulnerable households.

3. Increase Funding and Institutional Support for Mangrove Conservation

National and local government authorities should allocate adequate financial resources for mangrove conservation programs. Increased funding should support monitoring activities, law enforcement operations, rehabilitation projects, capacity-building initiatives, and the acquisition of necessary equipment and logistical resources for environmental personnel.

4. Strengthen Law Enforcement and Monitoring Mechanisms

Concerned agencies should improve environmental law enforcement by increasing the number of personnel assigned to coastal monitoring, enhancing surveillance systems, strengthening prosecution procedures, and ensuring consistent implementation of environmental laws and local ordinances. Community-based monitoring and reporting mechanisms should also be institutionalized to improve enforcement effectiveness.

5. Enhance Community Participation and Stakeholder Collaboration

Local government units, environmental organizations, and community leaders should strengthen partnerships and encourage active community participation in mangrove conservation activities. Greater involvement of fisherfolk associations, people's organizations, schools, and barangay officials can promote shared responsibility and increase public support for conservation initiatives.

6. Integrate Climate Change Adaptation and Disaster Risk Reduction Strategies

Mangrove conservation programs should incorporate climate adaptation and disaster resilience measures to address the impacts of typhoons, flooding, coastal erosion, and climate change. Rehabilitation efforts should prioritize climate-resilient mangrove species, continuous ecosystem monitoring, and the development of community-based disaster preparedness plans.

7. Develop Integrated Conservation and Poverty Reduction Programs

Policymakers should adopt integrated approaches that address both environmental conservation and socioeconomic development. Poverty alleviation programs, livelihood diversification initiatives, and social support services should be incorporated into mangrove conservation policies to address the underlying causes of illegal mangrove exploitation.

8. Conduct Further Research on Mangrove Conservation and Community Behavior

Future researchers are encouraged to conduct additional studies on the long-term effectiveness of conservation interventions, community attitudes and behaviors toward mangrove protection, the socioeconomic impacts of conservation policies, and the effectiveness of alternative livelihood programs to provide evidence-based recommendations for improving mangrove management strategies in Jolo, Sulu.

9. Adoption of the recommended measures and the action plan

The proposed measures and the action plan should be adopted for implementation.

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