Al-Jahiz: Journal of Biology Education Research
ISSN 2722-5070 (Print) ISSN 2722-5275 (Online)
Vol. 6 No. 1 July-December 2025
Available online at:
http://e-journal.metrouniv.ac.id/index.php/Al-Jahiz

Coastal Community Perception Towards Disaster Mitigation and The Role of Mangrove Ecosystem in Pekon Way Jambu, Pesisir Barat, Lampung

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Article Information

Article History:
Received: April 10, 2025
Revised: Juni 23, 2025
Published: Juni 30, 2025

Keywords:
Community perception, Disaster mitigation, Mangrove, Tsunami

ABSTRACT

This study aims to investigate the perception of the coastal communities in Pekon Way Jambu, Pesisir Barat, Lampung, towards disaster mitigation and the ecological as well as economic roles attributed to different mangrove ecosystems. The area remains vulnerable to tsunami and coastal erosion but residential development still occurs in hazardous zones. As a result, public awareness and preparedness are brought into suspicion. The survey methods were quantitative; data were collected from 75 respondents purposely selected using a validated questionnaire on a Likert scale concerning four items-perceived coastal settlements, disaster preparedness, knowledge about mangrove, and understanding of mangrove benefits. The findings indicate that the community has generally recognized that it lives in a coastal zone, but limited understanding of the mechanisms of tsunamis and spatial risks associated with them. The preparedness level is also found to be poor as observed from the unavailability of emergency kits, warning systems, and evacuation routes. On the contrary, the community demonstrates fair to good knowledge about the mangrove ecosystem, particularly on its ecological role regarding wave detuning and coastal protection. Nevertheless, there is a lack of awareness regarding mangroves as economic assets-such as for fisheries and ecotourism. The study stresses the significance of environmental education and community-based programs as tools for closing gaps in awareness and participation in disaster mitigation and ecosystem conservation. Strengthening theoretical underpinnings related to mangroves and sustainable uses thereof may serve as a two-pronged strategy to enhance community resilience as well as livelihoods. The findings are informing the development of ecosystem-based disaster mitigation models side events very similar to Way Jambu coastal areas, thus providing a forum for policy experts, educators, and conservation practitioners engaged in integrated community development and coastal sustainability issues.

Published by Al-Jahiz: Journal of Biology Education Research
Website https://e-journal.metrouniv.ac.id/index.php/Al-Jahiz/index

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INTRODUCTION

Indonesia is known as an archipelagic country located between three active tectonic plates, namely the Australian plate, the Pacific plate, and the Eurasian plate. This position makes Indonesia one of the countries with a high risk of various natural disasters, such as earthquakes, tsunamis, and volcanic eruptions (Maulana & Andriansyah, 2024). Lampung Province is included in the category 2 tsunami-prone zone (Najoan & Budiman, 2006), and this is reinforced by findings showing that the West Coast of Lampung—particularly areas directly adjacent to the Indian Ocean—is highly vulnerable to tsunami disasters due to its location at the convergence of the Eurasian and Indo-Australian plates (Pratiwi & Fitri, 2021).

One of the areas with this level of vulnerability is Pekon Way Jambu, Pesisir Selatan District, Pesisir Barat Regency, Lampung Province. This area has a flat coastal topography that directly faces the Indian Ocean, as well as quite high daily rainfall and temperatures. This geographical condition provides economic potential through marine tourism activities, but also carries a high risk of the threat of a tsunami disaster due to high waves from the open sea (Wakhidah, et al., 2020; Pratiwi & Fitri 2021). Unfortunately, based on observations and pre-survey results, most local people continue to build settlements in disaster-prone areas. It's likely the local people still don't know about the threat of coastal area.

This condition shows the importance of sustainable disaster mitigation efforts, both through structural and non-structural approaches. Structural mitigation can be done by maintaining and planting natural protective vegetation, such as mangrove forests, which can reduce the power of tsunami waves before they reach residential areas (Riyandari, 2017; Santoso et al., 2019). Meanwhile, non-structural mitigation includes increasing the capacity and preparedness of coastal communities through education and active involvement in environmental conservation efforts (Qatrunada et al., 2023). Therefore, mapping and understanding community perceptions regarding disaster mitigation and the role of mangrove ecosystems are very important as a basis for designing policies and programs to strengthen communities in coastal areas.

Research on coastal communities' perceptions of mangrove forests has been widely conducted in various regions in Indonesia. Previous studies covered locations such as Enggros Village, Tobati, and Nafri in Papua (Sari et al. 2023), Muara Gembong Bekasi (Sari et al. 2018), Nagari Sungai Pinang (Putri et al. 2024), Kumo Island (Apituley et al. 2023), and Tangkolak Karawang (Abadi et al. 2021). These studies generally discuss community perceptions regarding

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conservation, sustainable management, and the potential for mangrove-based ecotourism. The results of these studies indicate that there is community awareness of the importance of mangrove forests, although the approaches and focuses used are very diverse and contextual to each region.

Different from previous studies, this study has two main aspects: location and focus of the study. The research location, Pekon Way Jambu, West Coast of Lampung, is an area that has a high risk of tsunami disasters but has not been widely studied in terms of community perceptions of ecosystem-based disaster mitigation. Another novelty lies in the approach that not only sees mangroves as environmental or economic resources, but also as a green barrier in the context of tsunami disaster mitigation. Therefore, this study provides a new contribution to the literature on coastal community perceptions, especially those related to the role of mangrove ecosystems in reducing the risk of natural disasters.

Based on the geographical conditions of Pekon Way Jambu and the results of initial observations in the field, a deeper understanding is needed regarding how local communities respond to potential coastal disasters that threaten. The existence of settlements that still stand in disaster-prone zones indicates that community awareness of the risks of living in coastal areas has not been fully formed. In addition, it is important to know the level of community preparedness in responding to disaster threats such as tsunamis, both in terms of knowledge, emergency actions, and the availability of evacuation support facilities.

On the other hand, public perception of the existence and function of the mangrove ecosystem is also an important thing to study. Mangroves have a vital role in coastal protection, but not all people necessarily understand their ecological function or the social and economic benefits that can be generated. Therefore, this study was designed to answer several main questions: (1) how do people understand the risks of living in coastal areas, (2) to what extent are people prepared for disasters, (3) how do people perceive mangrove forests, and (4) what are their views on the benefits of the mangrove ecosystem as a whole. These four aspects will be the basis for developing appropriate educational strategies and interventions in community-based disaster mitigation efforts.

RESEARCH METHODS

This study used the basic principles of quantitative research. Quantitative research is a process of finding knowledge that uses data in the form of numbers as a tool to analyze information about what is to be known (Kasiram, 2008). The stages of implementing this research

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were (a) preliminary survey, (b) preparing research instruments, (c), data collection, (d) data processing, and (e) data interpretation. The location of the research was in Pekon Way Jambu, Pesisir Selatan District, Pesisir Barat, Lampung. The population of the study was the local community who were sampled using purposive sampling as many as 75 people.

This study used a community perception survey method with an assessment questionnaire instrument to obtain an overview of the knowledge and attitudes of coastal communities towards environmental and disaster issues. The questionnaire was compiled in the form of closed statements using a five-level Likert scale (strongly agree to strongly disagree) to measure the extent of community understanding and preparedness. This instrument allowed to collect data systematically and quantitatively from purposively selected respondents, namely residents who live around coastal areas and were involved in local environmental activities. The purpose of using purposive sampling was to obtain accurate knowledge from the Way Jambu community who were still establishing settlements in the coastal area.

The perception aspects measured include four main indicators: (1) community understanding of settlements in coastal areas, (2) community preparedness for disasters, (3) community understanding of mangroves, and (4) community understanding of the benefits of mangrove ecosystems. Before being used in data collection, the questions measuring the four indicators were first validated to ensure their suitability to the social and environmental context in Pekon Way Jambu. This validation process was carried out through expert review in social experiment and discussions with local community representatives so that the questionnaire used truly reflects the reality faced by local residents. The data obtained from this survey were analyzed descriptively to see trends in community perception and used as a basis for formulating strategies to increase community awareness and participation in environmental conservation efforts and disaster risk mitigation.

RESEARCH RESULT & DISCUSSION

Public Perception of Settlements in Coastal Areas

The first aspect measured through a questionnaire is the level of understanding of the Pekon Way Jambu community regarding disaster risks associated with living in coastal areas. The data obtained became the basis for designing a disaster mitigation socialization and training program, including the role of mangroves as a natural fortress. The results of the assessment can be seen in Figure 1.

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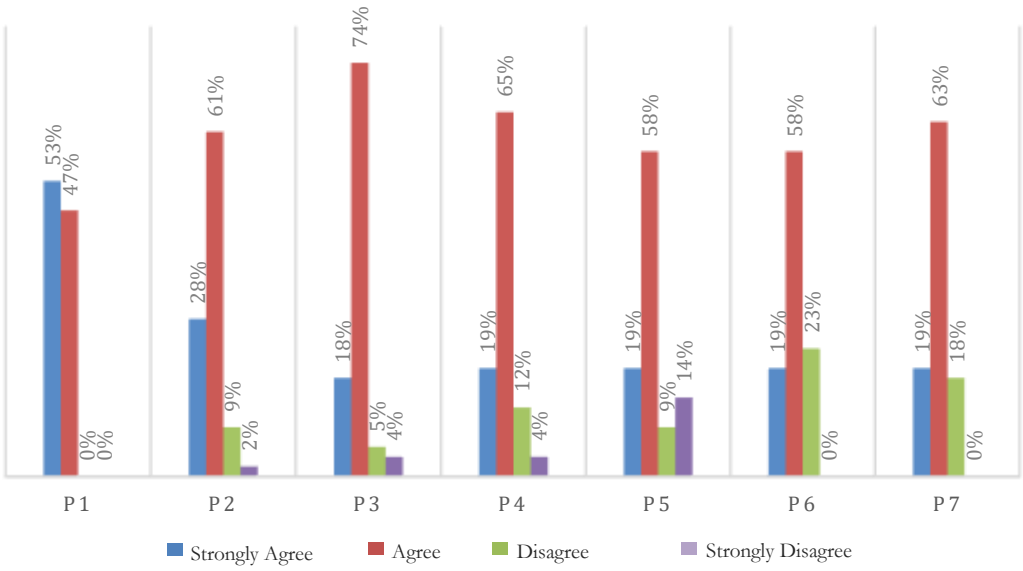

Explanation:

P1: Realizing that his house is on the coast

P2: Knowing the disaster risks of living on the coast

P3: Considering the disaster risks in building a residence

P4: Knowing the dangers of living on the coast, one of which is a tsunami

P5: Knowing the causes of a tsunami

P6: Tsunami is a natural disaster that can occur in coastal areas

P7: Realizing that living on the coast is an area that is easily affected by tsunami

Figure 1. Bar chart showing the level of community knowledge about the risks of living in coastal areas

Community Preparedness for Disasters

The second aspect measured in the discussion activities of the Pekon Way Jambu community is the aspect of community preparedness for disasters. Several key indicators indicate the community's readiness to face the potential for a tsunami disaster. In the questionnaire that we distributed, indicators about preparedness were measured with questions number 8 to 13. The results of the questionnaire showed that there are still limitations in education on individual preparedness and preparation, as shown in Table 2.

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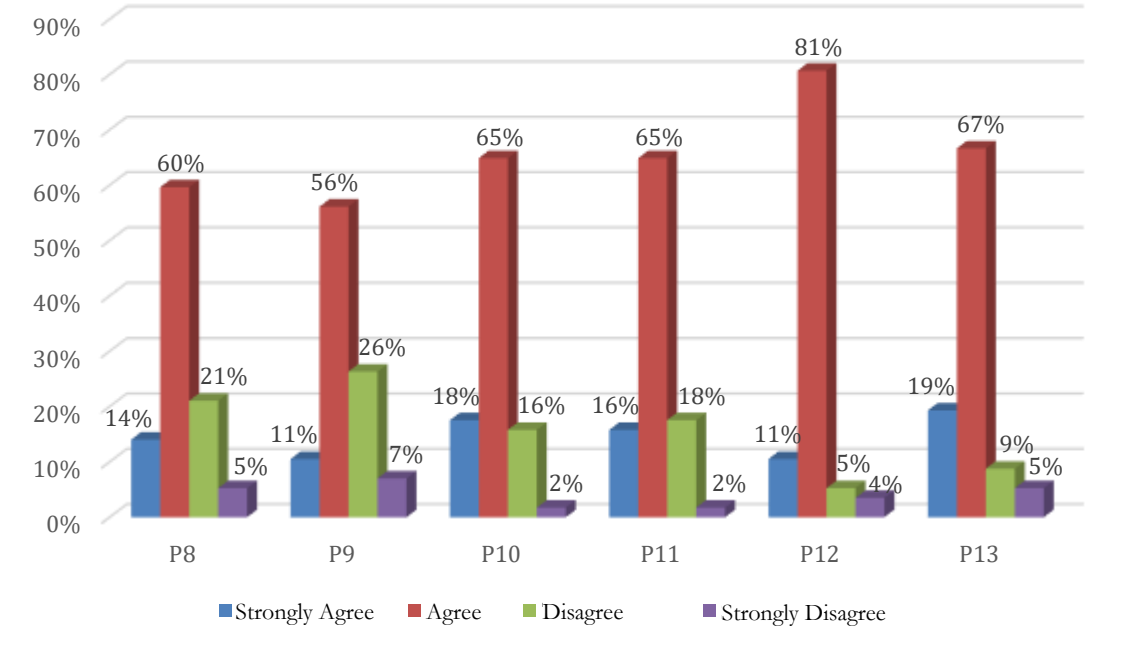

Description:

P8 : The community has received tsunami preparedness education.
P9 : Prepares bags and emergency equipment.
P10 : Tsunami warning information sources are available.
P11 : There are tsunami warning signs.
P12 : There are evacuation routes.
P13 : Temporary evacuation sites are available.

Figure 2. The level of community knowledge about the preparedness of the Pekon Way Jambu community for disasters

Public Perception of Mangroves

The third aspect measured in the discussion activities of the Pekon Way Jambu community is the aspect of community understanding of mangrove plants. There are several important indicators that show community's understanding of mangroves. In the questionnaire that we distributed, the indicator of community understanding of mangroves was measured by questions number 14 to 18.

Based on the results of the questionnaire, the understanding of the Pekon Way Jambu community about mangroves is quite good, but still needs to be improved (Figure 3). As many as 67% of respondents are familiar with mangrove forests, while 60% know that mangrove forests are part of the mangrove ecosystem. However, understanding of the physical characteristics of

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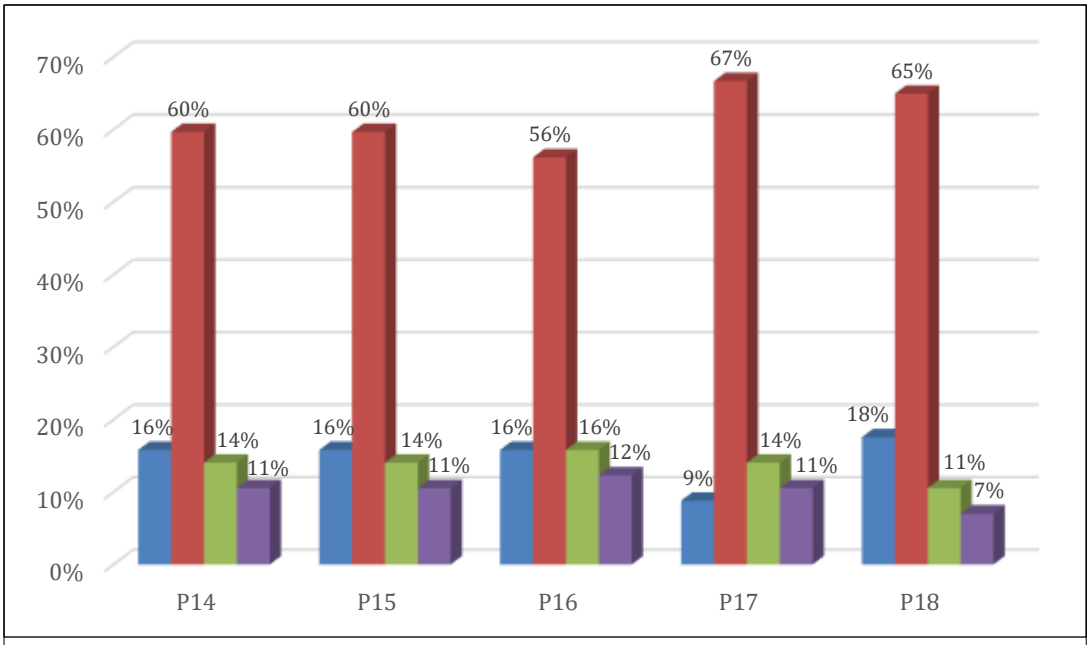
mangroves, such as irregular root shapes (56%) and their typical habitat in coastal areas (67%), still needs to be strengthened so that the community understands their ecological role more deeply.



Description:

P14: the community knows mangrove forests

P15: the community knows that mangrove forests

P16: the community knows that mangrove roots are irregular

P17: the community knows that mangrove habitats

P18: the community participates in mangrove forest extension

Figure 3. The level of local community knowledge about mangrove plants

Public Perception of the Benefits of Mangrove Ecosystems

The fourth aspect measured in the discussion activities of the Pekon Way Jambu community is the aspect of community understanding of the benefits of the mangrove ecosystem. There are several important indicators that show the community's understanding of this. In the questionnaire distributed by the Community Service Team, the indicator of community understanding of mangroves was measured by questions 19 to 24. The results of the questionnaire can be seen in Table 4.

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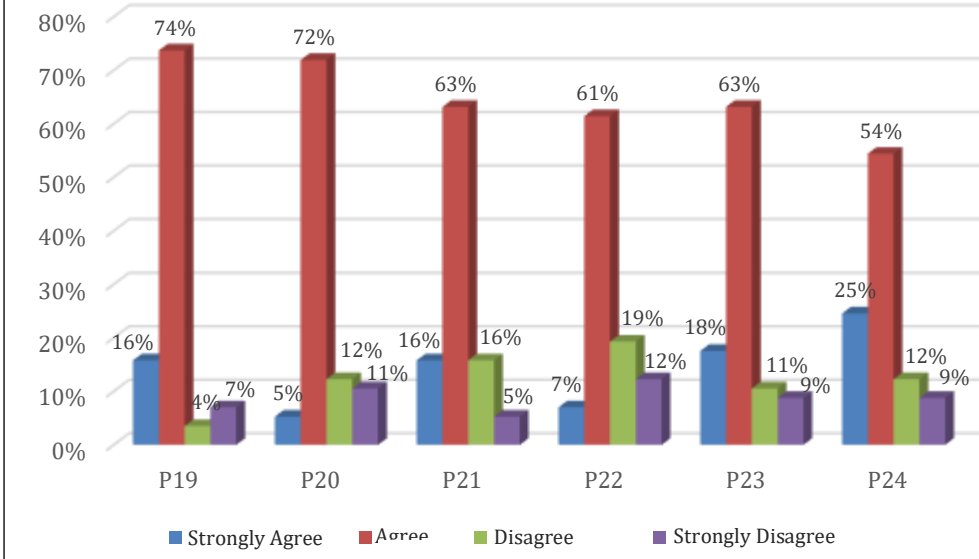

Description:
P19: Knowing that mangroves can protect coastal areas
P20: Knowing that mangroves can break high waves
P21: Knowing that mangrove forests can prevent seawater erosion
P22: Knowing that there are mangrove forests makes it easier for fishermen to catch fish
P23: Planting mangroves can protect people's homes
P24: Knowing that maintaining mangrove forests can attract tourists

Figure 4. The level of public knowledge of the benefits of the mangrove ecosystem

Based on the results of the questionnaire, the understanding of the Pekon Way Jambu community regarding the benefits of mangrove forests is quite good, but still needs improvement. As many as 75% of respondents know that mangroves play a role in protecting coastal areas, while 72% are aware that this forest can also prevent seawater erosion and protect their homes. However, only 68% understand that mangroves are able to break high waves, which is one of the main functions of mangroves in coastal disaster mitigation.

DISCUSSION

Public Perception of Settlements in Coastal Areas

The first aspect measured through a questionnaire is the level of understanding of the Pekon Way Jambu community regarding disaster risks associated with living in coastal areas. The results of the questionnaire show that most people are aware that they live in coastal areas, but do not fully understand the level of vulnerability to disasters such as tsunamis and abrasion. In addition,

the local community knowledge about the causes and mechanisms of tsunamis is still limited, so further socialization is needed regarding early warning signs and mitigation steps that can be applied.

The lack of consideration of disaster risks in home construction is also a concern. Many communities have not applied mitigation principles in selecting locations or building residential structures, which can increase vulnerability to disasters. Therefore, training safety on coastal development, such as selecting higher locations, using earthquake-resistant materials, and providing clear evacuation routes, is urgently needed.

The principle of disaster mitigation in selecting locations and constructing residential structures in coastal areas is crucial for reducing risks and increasing resilience to natural disasters, such as tsunamis, floods, and coastal erosion. One of the main approaches is to avoid development in disaster-prone zones. According to the Guidelines for Natural Disaster Mitigation in Coastal Areas and Small Islands, identification of disaster-prone areas such as coastal erosion and tsunamis must be carried out through hazard and vulnerability analysis, so that development can be directed to harmless areas (Ministry of Marine Affairs and Fisheries 2004).

In addition to location selection, building design and construction must be given attention thank build as disaster-resistant standards. Government Regulation of the Republic of Indonesia Number 64 of 2010 emphasizes the importance of using earthquake-resistant building construction and providing infrastructure that supports disaster mitigation in coastal areas. By implementing these principles, coastal communities can increase disaster resilience and minimize potential losses (Government of the Republic of Indonesia 2010).

Furthermore, public understanding of the role of mangrove ecosystems in disaster mitigation still needs to be improved since they know the risk but still building settlement on coastal area. Mangrove forests play an important role in holding back large waves and preventing abrasion, so their existence must be preserved. Therefore, the training program includes education on the benefits of mangroves, planting techniques, and long-term maintenance strategies. With ongoing socialization and assistance, it is hoped that the community will be better prepared to face potential disasters and play an active role in protecting their coastal environment.

Community Preparedness for Disasters

The second aspect measured in the discussion activities of the Pekon Way Jambu community is the aspect of community preparedness for disasters. The results of the questionnaire showed

that there are still limitations in education on individual preparedness and preparation. If the majority of the community has never received education on disaster mitigation and does not have emergency bags and equipment, then a more intensive socialization program is needed. This program can be in the form of evacuation simulation training, counseling on self-rescue steps, and assistance in compiling emergency bags containing emergency needs such as food, medicine, and important documents.

In addition to individual preparedness, aspects of disaster response infrastructure are also a concern. If there are still shortcomings in the availability of tsunami warning information sources and danger signs in the Pekon Way Jambu area, then efforts need to be made to improve the early warning system. In addition, the existence of evacuation routes and temporary shelters must be ensured to be available and functioning properly so that people can evacuate safely and in a directed manner when a disaster occurs. Collaboration with related parties such as the village government and local communities is essential to improve these facilities.

These findings form the basis for community service programs to improve coastal community preparedness through two main approaches, namely education and ecosystem-based mitigation. Education is carried out by providing a better understanding of disaster risks and how to deal with them. Several programs that have been implemented in coastal areas include the disaster mitigation socialization program in the Tomini Bay coastal area which has succeeded in increasing community knowledge and skills in dealing with the risk of earthquakes and tsunamis, as well as installing evacuation route signs and gathering points (Nonto et al. 2021). A community service program has also been implemented in Ketapang Raya Village, Keruak District, East Lombok, providing education about mangrove forest-based tsunami disaster mitigation, which aims to increase public awareness of the importance of mangrove ecosystems in reducing the impact of tsunami (Santoso et al. 2019).

Meanwhile, ecosystem-based mitigation is carried out by developing mangrove forests as natural fortresses that can reduce the impact of tsunami waves. For example, community service activities at Sawangan Beach, Puring, Kebumen Regency, involve planting mangroves as a strategic step in overcoming the risk of tsunami disasters and increasing environmental conservation. With this program, it is hoped that the Pekon Way Jambu community will be better prepared to face disasters and have a sustainable environmental protection strategy (Suwaryo et al. 2024).

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Public Perception of Mangroves

The third aspect measured in the discussion activities of the Pekon Way Jambu community is the aspect of community understanding of mangrove plants. Based on the results of the questionnaire, the understanding of the Pekon Way Jambu community about mangroves is quite good, but still needs to be improved. As many as 67% of respondents are familiar with mangrove forests, while 60% know that mangrove forests are part of the mangrove ecosystem. However, understanding of the physical characteristics of mangroves, such as irregular root shapes (56%) and their typical habitat in coastal areas (67%), still needs to be strengthened so that the community understands their ecological role more deeply.

In addition, the level of community participation in mangrove forest extension reached 73%, indicating interest and involvement in conservation activities. However, this figure also indicates that there are still some people who are not active in mangrove education programs. Therefore, a more interactive and sustainable approach is needed in socialization, such as field training, direct practice in planting and maintenance, and community discussions that involve more people.

This finding is in line with the focus of the community service program, which is to increase the awareness and involvement of residents in ecosystem-based disaster mitigation efforts. Further education is needed to strengthen public understanding of the benefits of mangroves in protecting the coast from abrasion and high waves. With the right strategy, this program will not only increase environmental awareness but also encourage real action in the rehabilitation and preservation of the mangrove ecosystem in Pekon Way Jambu.

Public Perception of the Benefits of Mangrove Ecosystems

The fourth aspect measured in the discussion activities of the Pekon Way Jambu community is the aspect of community understanding of the benefits of the mangrove ecosystem. Based on the results of the questionnaire, the understanding of the Pekon Way Jambu community regarding the benefits of mangrove forests is quite good, but still needs improvement. As many as 75% of respondents know that mangroves play a role in protecting coastal areas, while 72% are aware that this forest can also prevent seawater erosion and protect their homes. However, only 68% understand that mangroves are able to break high waves, which is one of the main functions of mangroves in coastal disaster mitigation.

In addition to ecological benefits, the economic aspects of mangrove forests are also somewhat understood by the community. Around 66% of respondents are aware that the existence

of mangroves helps fishermen in fishing because this ecosystem is a habitat for various marine biota. Meanwhile, 74% know that mangrove forests can attract tourists and provide economic benefits to the surrounding community. Although this figure is quite high, there is still an opportunity to increase awareness and utilization of mangroves in the conservation-based eco-tourism sector.

These results form the basis for community service programs to strengthen education about the role of mangroves in disaster mitigation and their sustainable use. In addition to planting and maintaining mangroves, this program can also develop mangrove-based economic initiatives, such as ecotourism and mangrove product processing. With this strategy, the community not only understands the importance of mangroves as natural protectors but also as a resource that can improve their welfare sustainably.

Mangrove ecosystems provide significant benefits to coastal communities, both ecologically and economically. Ecologically, mangrove forests function as a natural buffer that protects the coastline from abrasion, and erosion also provide an important habitat for various marine biota species that support fisheries productivity. Economically, the use of mangroves has opened up opportunities for local communities to improve their welfare through various initiatives. In Indramayu Regency, the diversification of processed mangrove products, such as food and beverages, has increased the income of coastal communities (Sugianto, 2019). In Tana Lili District, the development of mangrove ecotourism has created new business and job opportunities for local residents (Ashar, 2023). In addition, in Karawang Regency, the use of mangrove fruits and leaves as processed products with economic value has become an alternative source of income for coastal communities (Fikri et al. 2023). Thus, sustainable management and utilization of mangrove forests not only maintain the balance of the ecosystem but also encourage the economic empowerment of coastal communities in various regions, more specifically for the Pekon Way Jambu community.

Several studies show that socialization and education have succeeded in increasing public understanding of the risks of living in coastal areas and the importance of mangroves as a natural fortress. Thus, socialization can increase local community perceptions (Sugianto, 2019; Ashar, 2023; Fikri, et al., 2023). With a high level of perception of the benefits of mangroves, local communities have great potential to continue to play a role in the management and protection of mangrove ecosystems in a sustainable manner. This shows that education and community participation are very important in maintaining coastal ecosystems and minimizing the impact of

natural disasters (Khairullah & Fatimah 2016; Marzo et al. 2023; Septian et al., 2023). Public understanding of the benefits of mangroves not only as coastal protectors but also as an economic source, is starting to increase. Several publications state that the development of processed mangrove products can be a new source of income (Sugianto, 2019; Ashar, 2023; Fikri et al., 2023).

The findings of this study reveal a clear interrelation between the community's perception of coastal settlements and their preparedness for disasters. Although most residents of Pekon Way Jambu recognize that they live in coastal zones, this awareness does not always translate into informed decisions regarding settlement safety. Many respondents still lack comprehensive understanding about disaster-prone zones, especially in relation to tsunamis and coastal erosion. This gap reflects a phenomenon also noted in previous studies, which found that people living in hazard-prone areas often have a limited understanding of the spatial risks they face, resulting in passive or inadequate disaster responses (Khairullah & Fatimah, 2016; Akola et al., 2023).

This limited spatial awareness directly influences the low levels of individual and community preparedness. The study found that most community members do not own emergency kits, nor are they familiar with evacuation procedures or warning signs. Without these practical measures, even basic knowledge about disaster risks becomes ineffective. Disaster preparedness requires more than just awareness; it demands behavioral change supported by proper education and community-based simulations (Nonto et al., 2021). The lack of integration between perception and action highlights the need for interventions that bridge cognitive understanding with readiness behavior.

Moreover, the study demonstrates a progressive relationship between knowledge of mangrove ecosystems and community participation in mitigation efforts. While general awareness of mangrove existence is moderate, a more nuanced understanding—such as recognizing their root systems and ecological roles—is limited. However, respondents who have participated in mangrove-related educational activities tend to have higher ecological awareness. This connection aligns with previous findings showing that environmental education programs significantly increase community engagement in conservation activities (Santoso et al., 2019; Kamaluddin et al., 2022; Qudrat-Ullah, 2025). This suggests that strategic, localized education can serve as a catalyst for developing ecosystem-based mitigation efforts.

An even stronger linkage emerges when examining how the perception of mangrove benefits influences both environmental behavior and economic potential. Respondents who understood

the ecological benefits of mangroves—wave attenuation, erosion control, biodiversity support—were also more likely to recognize their economic value, such as supporting fisheries and promoting ecotourism. This dual perception fosters a sense of ownership and responsibility, as seen in other regions where communities developed processed mangrove products and ecotourism as income sources (Sugianto, 2019; Ashar, 2023; Fikri et al., 2023). This intersection between ecological knowledge and livelihood opportunities strengthens the sustainability of mitigation strategies.

Lastly, the study confirms that the integration of social education and ecosystem restoration is the most effective path toward coastal resilience. Communities with higher awareness of mangrove benefits are more inclined to participate in both conservation and disaster preparedness. By linking ecosystem services with daily life benefits—safety, food security, income—the study supports a holistic, community-centered approach to resilience. Combining ecological and educational strategies leads to long-term behavioral changes and community empowerment (Suwaryo et al., 2024). Therefore, understanding the interconnectedness of environmental knowledge, disaster preparedness, and economic utilization is essential to developing integrated, sustainable coastal mitigation programs.

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In addition, the level of community participation in mangrove forest extension reached 73%, indicating interest and involvement in conservation activities. However, this figure also indicates that there are still some people who are not active in mangrove education programs. Therefore, a more interactive and sustainable approach is needed in socialization, such as field training, direct practice in planting and maintenance, and community discussions that involve more people.

This finding is in line with the focus of the community service program, which is to increase the awareness and involvement of residents in ecosystem-based disaster mitigation efforts. Further education is needed to strengthen public understanding of the benefits of mangroves in protecting the coast from abrasion and high waves. With the right strategy, this program will not only increase environmental awareness but also encourage real action in the rehabilitation and preservation of the mangrove ecosystem in Pekon Way Jambu.

CONCLUSION

This study shows that the community of Pekon Way Jambu have an initial awareness of the risks of living in coastal areas, but their understanding of disaster mitigation and the principles of disaster-resistant development is still relatively low. This can be seen from the large number of people who still build settlements in vulnerable zones without considering mitigation aspects. On the other hand, the level of community preparedness is also not optimal, both in terms of education, availability of evacuation routes, and emergency response equipment. The lack of disaster response facilities and minimal disaster education are the main challenges in increasing community resilience to potential disasters such as tsunamis.

Meanwhile, public perception of mangroves as part of coastal disaster mitigation is generally quite good, especially in the ecological aspect, but still needs to be improved in the economic and conservation sustainability aspects. The public is beginning to understand that mangroves can reduce high waves, protect the coast from abrasion, and be an important habitat for marine biota. The potential for utilizing mangroves as an alternative source of income through ecotourism and processed products is also beginning to be recognized. Therefore, a more intensive and participatory follow-up education program is needed to strengthen the role of the community in

maintaining and utilizing the mangrove ecosystem as an ecosystem-based and sustainable disaster mitigation strategy.

ACKNOWLEDGMENTS

The author would like to thank all the people of Pekon Way Jambu, village officials, and mangrove conservationists from Pesawaran who have actively participated in this activity, and the IAIN Metro community service team, Fauziyah, F., Rahmadini, A., Suciani, T., Ghifary, M.Q., Wahyi, H.H., Saniah, N., also Hidayat, F. Highly appreciation is given to the Director General of Higher Education Islamic Religion Director General Islamic Education Ministry of Religion of the Republic of Indonesia for community service grant number B-453/Dt.I.III/PP.05/10/2024.

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