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Understanding local wisdom as specific knowledge in natural disaster mitigation: An empirical lessons in Tiworo, Indonesia

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Abstract

Disaster mitigation is a crucial action considering the many natural disaster incidents affecting the lives of local communities. This research examines the Bajo community's local wisdom in their efforts toward natural disaster mitigation in West Muna Regency. This study employs a qualitative research method. Data were collected through observation and interviews. Data sources used in this study were obtained from the Bajo community in Santiri Village, North Tiworo Subdistrict, West Muna Regency, Southeast Sulawesi, Indonesia. Seven informants were interviewed, namely, two key informants (village head and head of the fishing group) and five Bajo people; all informants chosen were native Bajo people who had lived in Tiworo for a long time, and they had knowledge of the local wisdom of the Bajo people. The research results showed that the local wisdom employed by the Bajo community for natural disaster mitigation reflects the relationship between the Bajo Tiworo people and the marine environment. The Bajo community interacts with the marine environment through actions and a consciousness of environmental conservation. Local wisdom-based disaster mitigation has existed since ancient times and is a guiding principle for the Bajo community's interaction with the marine environment. The Bajo people's ideas and behaviors adapted to the marine environment are reflected in taboos, rituals, myths, and oral traditions passed down from generation to generation. However, a shift in local wisdom related to natural disaster mitigation influenced by various factors, including Islamic religious beliefs, social actor and agent structures, discrimination against non-Bajo (*orang Bagai*) individuals, and government policies. Through this research, one form of disaster risk management can be achieved by empowering local knowledge.

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Introduction

Disaster is a natural phenomenon that occurs beyond human control (Ardalan & Affun-Adegbulu, 2024). Although experts can predict it using detection tools, natural disasters can happen anywhere and anytime (Bündnis Entwicklung Hilft, 2022). Therefore, we must be prepared, even when no disasters occur (Pearce et al., 2020). Natural disasters are not only threats that harm the economy, education, and the environment but also larger losses such as death and damage to all aspects of human life (Canlas, 2023; Fakhriati et al., 2023; Hemingway & Gunawan, 2018; Marzuki & Gayo, 2022).

Related to disasters, numerous countries around the world have experienced them, such as Japan (Cartwright & Nakamura, 2008; Yadav et al., 2013), Hawaii (Lynham et al., 2017), Thailand (Prendergast et al., 2012), Turkey (Jiang et al., 2023; Ni et al., 2023), and even some categorized as disaster-prone countries like the Philippines, India, Colombia, and (not exempted) Indonesia (Bündnis Entwicklung Hilft, 2022; The World Bank, 2019). Indonesia is one of the disaster-prone countries in the world (The World Bank, 2019, p. 4). According to the WorldRiskIndex 2020, Indonesia ranks third as a country with high potential disaster risk (Bündnis Entwicklung Hilft, 2022). It is also supported by data released by the National Agency for Disaster Countermeasures of Indonesia, which reported that throughout the year 2022, 3.544 disasters occurred. The dominant types of disasters were floods (1.531), extreme weather (1.068), and landslides (634) (BNPB Indonesia, 2022).

This explanation above urges Indonesian society to understand disastermanagement and reduction early. The movement of *lebih baik mencegah daripada mengobati* [prevention is better than cure] should be further emphasized to achieve a better environmental situation (Poratelli et al., 2020). Additionally, disaster research and education also need to be enhanced (Williams, 2024). If necessary, specialized disaster handling technologies can be maximally utilized (Conant & Brewer, 2022; Pearce et al., 2020; Zuccaro et al., 2020). All of these efforts aim to reduce environmental risks and ensure human life's sustainability.

One of the solutions for dealing with natural disasters that people can adopt worldwide is empowering local wisdom (Suarmika et al., 2022). Local wisdom can be defined as specific knowledge that is spatial or culturally context-specific, collective, holistic, and adaptive (Mistry, 2009). In this sense, local communities are more familiar with their environment and even contribute to biodiversity conservation (Sahoo et al., 2022; Imoro et al., 2022). Indigenous communities have proven to have a strong and intergenerational bond with their land. Thus, they can naturally identify natural disasters and develop various disaster management strategies (Altieri, 2001; Jain, 2014; Honward, 2023; Mistry et al., 2020). In conclusion, disaster risk management based on local wisdom is the main foundation (Russell et al., 2023).

In this research, a local community has proven to utilize local wisdom as a form of natural disaster mitigation. This is the Bajo Tiworo community in Santiri Village, North Tiworo Subdistrict, Southeast Sulawesi, who inhabit coastal areas and small islands (Badan Pusat Statistik Muna, 2021).

The location of this community, situated along the coastal areas (Figure 1), often faces natural disaster phenomena such as strong winds and large waves that threaten their lives. To address these issues, they employ various forms of locally-based natural disaster mitigation strategies. The Bajo Tiworo community utilizes self-adjustment strategies to respond to changes in the environment, social factors, and weather conditions (Marfai, 2012, p. 53). This adaptability signifies a mutually dependent relationship. In this case, the local wisdom of the Bajo Tiworo community plays a vital role in natural disaster mitigation efforts. They possess myths, *pamali* (prohibited actions), and rituals closely related to the natural environment (Subyantoro, 2010).

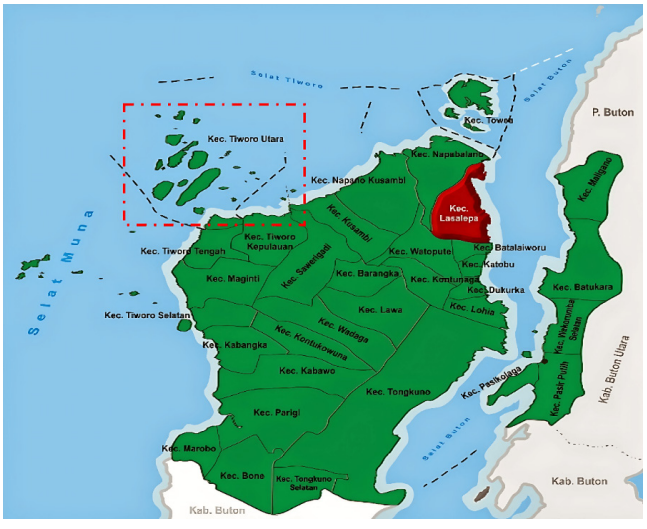

Figure 1 Map of North Tiworo Subdistrict

Furthermore, the Bajo Tiworo indigenous community also implements a cultural ecological approach. The intended principle of this cultural, ecological approach is understanding the environment along with all its consequences and adapting to it. Consequently, they can establish disaster resilience. Secondly, they prioritize the adaptation process to identify the emergence of disaster signs and culturally-based maintenance (Kaplan & Manners, 2002, p. 102).

The Bajo Tiworo community, as a rural community, is certain to be more familiar with their environment. Therefore, they have developed local-based disaster prevention education for generations. This aligns with Howard (2023), who states that local people know about interacting and building a balance with nature. Local people have beliefs and cultures about the environment (Suarmika & Utama, 2017). In this case, the Bajo Tiworo people have rules or norms regarding prohibited things, especially related to the environment; for example, they may not mention *Mbo* (supernatural creatures that guard the sea). The Bajo people believe that there is a role for magical and sacred values in their environment (Ardalan & Affun-Adegbulu, 2024; Osawa, 2022; Suarmika et al., 2022; Williams, 2024). Thus, natural disaster mitigation based on local wisdom is very important.

Based on the above explanation, this present research aims to analyze the form of local wisdom of the Bajo people in natural disaster mitigation and what factors cause a shift in the local wisdom of the Bajo people in efforts to mitigate natural disasters in Santiri Village, North Tiworo Subdistrict, West Muna Regency.

Methodology

This study employs a qualitative research approach, which is used to generate descriptive data in the form of written or spoken words from individuals and observed behaviors. This research aims to explore phenomena experienced by research subjects, such as behaviors, perceptions, motivations, actions, and life perspectives, in a holistic manner (Babbie, 2016; Creswell & Creswell, 2018). Data collection is conducted through observation and interviews.

Data sources regarding disaster mitigation based on local wisdom are obtained from the Bajo community located in Santiri Village, North Tiworo Subdistrict, West Muna Regency, Southeast Sulawesi, Indonesia. There were seven informants who were interviewed, namely, two key informants (village head and head of the fishing group) and five Bajo people. The informants chosen were native Bajo people who had lived in Tiworo for a long time and clearly knew the local wisdom of the Bajo people. The Bajo Tiworo community consists of fishermen who utilize coastal marine resources. In this study, the focal aspect of research is the socio-cultural aspect, particularly related to the relationship between the Bajo community's efforts in disaster mitigation and examining the factors causing the shift in local wisdom among the Bajo community in disaster mitigation efforts in Santiri Village, North Tiworo Subdistrict, West Muna Regency.

Results and Discussion

Local Wisdom of the Bajo Community in Natural Disaster Mitigation in Santiri Village, North Tiworo District, West Muna Regency

Local wisdom-based natural disaster mitigation focuses on long-term actions to reduce the risk of natural disasters (Asmal et al., 2023; Damayani et al., 2022). In this case, the local wisdom developed within the Bajo Tiworo community in Santiri Village is a result of extracting experiences from the past that the Bajo ancestors have passed down through generations. As a traditional community, their belief system and forms of adaptation to nature and their environment manifest in their beliefs about the existence of nature and humans, the existence of spirits and supernatural powers, the existence of souls, and the supernatural powers of flora, fauna, sites, and heirlooms (Endraswara, 2016, p. 27). Furthermore, the local wisdom of the Bajo community in natural disaster mitigation in Santiri Village, North Tiworo District, West Muna Regency, is explained as follows.

Pamali (Prohibition)

Pamali is something that the community must not violate. *Pamali* is the belief of the Bajo Tiworo community about something that should not be violated. They strongly believe that the marine environment is not only inhabited by various forms of life but also by supernatural beings that guard the seas, known as "mbo." *Mbo* is a supernatural creature resembling a feared marine animal (cf. Andayani & Jupriono, 2019). If the Bajo community uses harsh language, behaves arrogantly, or engages in inappropriate actions in the marine environment, it will trigger the anger of *mbo*, the guardian of the seas. As a result, *mbo* can bring natural disasters, such as strong winds,

large waves, diseases, upon the Bajo community, and even harm the Bajo people while they are engaged in activities at sea. Therefore, *pamali* (prohibited actions) represents the local wisdom of the Bajo community in enhancing resilience and avoiding disasters (Asmal et al., 2023; Damayani et al., 2022).

Pamali, as local wisdom, serves as a means of adaptation between the Bajo community and the natural environment. In other words, *pamali* is a part of the norms that regulate the behavior of the Bajo community. Essentially, *pamali* as local knowledge embodies ethical, aesthetic, moral, and ethical values that are highly effective for instilling values and sustaining the ecological function of the sea (Taufiq, 2019, p. 52). The Bajo community perceives themselves as "sea gypsies" and conducts all their activities within the marine environment, including building homes, playing, learning, and earning a livelihood. Hence, they have traditional ways of interacting with the marine ecosystem. *Pamali* is applied through attitudes and actions that preserve the marine environment. When utilizing the sea, the Bajo community always strives to maintain the environmental balance and cultural values.

The Bajo Tiworo community believes that the sea is everything. They also believe in the existence of a sea deity, a cultural hero known as the culture hero (Orme, 2013). Essentially, the sea deity is benevolent and serves as a helper to humans, but can become angry due to the actions of people who pollute the sea. Therefore, the safety of humans depends on the attitudes and words displayed while engaging in activities at sea. Thus, the sea deity remains friendly and not angered by them. In this context, the Bajo community firmly upholds the values of local wisdom, particularly *pamali*, when engaging in activities at sea. Failure to do so might anger the sea guardian (mbo) and jeopardize their survival at sea (Basri, 2018, pp. 142–143). The mentioned *pamali* refers to maintaining a positive attitude and using kind words in the marine environment to avoid disaster. Thus, *pamali* becomes a form of social control in how they behave and treat the marine environment. This practice is necessary to prevent the wrath of the unseen inhabitants of the sea. The Bajo community believes that the anger of these supernatural beings can lead to natural disasters in their settlements.

From an ecological perspective, *pamali* serves as local wisdom for sustainable environmental conservation (Forester, 2019; Kongprasertamon, 2007). The Bajo Tiworo community regards the sea as an educational environment and a source of livelihood (their world). As a result, they take responsibility for caring for the sea, keeping the marine environment clean, and avoiding harming it (Basri, 2018, p. 136). Hence, *pamali* becomes a conduit for interacting with the Bajo community and the marine environment. It represents the local wisdom of the Bajo people, possessing anticipatory value and function in the face of natural disasters. These anticipatory approaches are rooted in the ideas and actions of the Bajo Tiworo community, passed down through generations and integrated with the environment. In other words, *pamali* as local wisdom enables understanding the natural environment's dynamics and guides the adaptation process, allowing the Bajo community to live in harmony and achieve prosperity. The empirical knowledge gained from their surroundings is then passed down to future generations to sustain their way of life.

Maduai Ada (Ritual)

Maduai ada is one of the forms of local wisdom in the form of a ritual for disaster mitigation. Etymologically, "maduai ada" originates from the local language, where "maduai" means 'to descend' and "ada" means 'custom.' In simple terms, "maduai ada" can be interpreted as the ritual of descending customs into the sea to ensure the safety of the village and the Bajo community, particularly protecting them from natural disasters. This ritual is a ceremony, magic, or religious procedure with specific (mysterious) words (Al Barry, 2001, p. 284). The strong belief of the local community in supernatural powers is one of the factors that has sustained the existence of these religious rituals to the present day (cf. Ogilvie et al., 2018). Therefore, the ritual is a manifestation of the local community holding steadfast to their traditions from the past.

The *maduai ada* ritual is a media or bridge between the High World (God) and the Underworld (humans). Through this ritual, the Bajo Tiworo people can ask for protection and safety from humans. In this context, *the maduai ada* ritual is performed to ask for forgiveness for mistakes made by the Bajo people. The Bajo people believe that sea guards (mbo) will bring natural disasters such as bad weather, which hampers activities, reduces catches at sea, and constantly causes strong winds and heavy waves to hit settlements. In other words, the life of the Bajo people will be threatened. Therefore, to ward off the anger of the sea guard (mbo), the *maduai ada* ritual is performed. It is proved by the appearance of natural signs in their settlements, which signal a warning to the Bajo people. Belief in the form of a hunch or natural signs is a belief that contains natural cues for humans about the existence of something that needs to be known or watched out for (Sukatman, 2009, p. 53). This is an effort to overcome natural disasters based on cultural beliefs that have been existed for a long time.

The *maduai ada* ritual is a manifestation of the culture of the Bajo people, which was born from their life experiences on an ongoing basis. It means that the *maduai ada* ritual is one of the local wisdom-based natural disaster mitigations through a cultural approach. The Bajo people still adhere to their noble cultural values and consider the *madua ada* ritual a disaster resilience system. In this case, local wisdom as a result of interaction between society and the environment shows a complex collaboration due to various events experienced by humans in their environment, both individually and experienced by society as a whole (Zulkarnain & Febriamansyah, 2008).

As a rural community living in the coastal area, the Bajo community can be categorized as a society that believes in animism. In this case, the Bajo Tiworo people believe in spirits in the universe and spirits that inhabit every place, such as seas, rivers, mountains, rocks, and trees. The existence of these spirits must be respected and must not be disturbed by humans. With this, the Bajo people believe in the unseen world and supernatural powers such as *mbo* (Ocean guardians) and other supernatural creatures living in certain places that are considered sacred. The Bajo community considers supernatural beings to have powers that can bring disaster and goodness because some of these spirits are incarnations of their ancestors. Therefore, the Bajo community always maintains good relations with supernatural beings through offerings and prohibits people from defecating under trees so that the spirits have a good relationship with them (Bahtiar, 2011, pp. 159–160).

Pakayuang Bangkau Karama (Sanctity)

Pakayuang bangkau karama is a sacred mangrove forest area revered by the Bajo Tiworo community in Santiri Village. This mangrove forest serves as one of the sources of livelihood for the Bajo community, particularly for constructing houses, bridges, *bagang* (fish traps), and meeting household needs such as firewood and so on. When the Bajo community intends to take mangrove wood, they first seek permission from the inhabitants of the mangrove forest. It is done to prevent the anger of the mangrove forest's inhabitants. The Bajo community believes that a fierce creature, a giant snake, inhabits the mangrove forest in Santiri Village. They hold this belief due to the sightings of the snake's tracks around the Bajo Tiworo community settlement.

The belief in the myth of the giant snake guarding the mangrove forest serves as a local knowledge system to preserve the mangrove forest. The revered mangrove forest controls the attitudes and speech of the Bajo community when engaged in activities. It manifests human knowledge as social beings in understanding and interpreting the natural environment (Sudikan, 2016, p. 167). In this context, human knowledge of the environment follows their cultural ways. These cultural ways contain philosophical perspectives of belief values and firmly held norms for the community's interests, which are applied in the sustainable management of natural resources and ecological conservation purposes.

The belief in the giant snake is one form of disaster mitigation based on local wisdom. It is evident from the actions of the Bajo community, who do not indiscriminately cut down mangrove trees. They only take mangrove trees as needed. Based on the Bajo community's belief principle, they avoid greedily harvesting mangrove trees because it could anger the fierce creature, the guardian of the mangrove forest. Therefore, the Bajo community must maintain the balance of the ecosystem. Geertz (1997, p. 8) stated that the existence of mystical beliefs, as seen here in the Bajo community's belief in the guardian of the mangrove forest, provides empirical evidence closely linked to the process of sustainable environmental conservation.

The Bajo community believes that supernatural beings inhabit specific spaces in the universe, such as within the mangrove forest. This belief regulates the actions of the Bajo community, particularly in utilizing the resources of the mangrove forest to prevent excessive exploitation. It is intended to maintain the balance of the ecosystem in the marine environment. Based on this perception, often unnoticed by the Bajo community, they maintain their behavior when engaging in activities in the sacred mangrove forest. It represents local wisdom aimed at conserving the mangrove forest. Local wisdom must be viewed as a strategy that requires management and direction, a design for living within the physical environment while managing production systems and utilizing technology.

The preservation of the mangrove forest will positively impact the Bajo community, acting as a protector against natural disaster threats, thus creating ecosystem balance. The mangrove trees growing along the coast or near their homes serve as a shield against strong winds and powerful waves. Mangrove trees are not only a natural resource utilized by the Bajo community but are also treated with care. This phenomenon aligns with the traditional ecological perspective, intended as part of sustainable conservation to address various

environmental issues, such as the natural challenges faced by local communities. For the Bajo community, besides serving their daily needs, mangrove trees also protect their settlements against natural disaster threats like erosion and the impact of strong ocean waves during adverse weather conditions.

Factors Causing a Shift in Local Wisdom of the Bajo Community in Natural Disaster Mitigation

Every society will experience changes in its social and cultural life. These changes can be caused by various factors such as the economy, education, external cultural influences, technology, and the perspectives of the community. This condition also occurs in the local wisdom system of the Bajo community. Essentially, the Bajo community is a maritime society that engages with the world of the sea. This is their identity for treating the marine environment well and sustainably.

The Influence of Islamic Beliefs

The phenomenon of society's way of life, seen from the perspective of religion and culture, is interconnected. Islam, a substantial religion, provides many norms and rules about life. The significant traditions of Islam have become original doctrines deeply ingrained in its followers. In the context of global life, Islamic teachings have a fundamental role in faith ideology and Sharia, as well as Islamic laws that serve as guidance for the actions and activities of the Islamic community.

The acceptance of Islamic beliefs results in a change in the mindset of the society and displaces local community beliefs. It leads to the perception that local traditions differ from Islamic views and traditions. This phenomenon has also occurred in the life of the Bajo community, causing local wisdom to contradict Islamic teachings. Beliefs in myths, rituals, and superstitions become essential issues from the perspective of Islamic teachings. When the Bajo community has performed Hajj and Umrah, and with the influence of various Islamic sects that label local beliefs as shirk (associating partners with God), significant changes occur in local wisdom. According to Geertz (1992, p. 107), religion as a cultural system does not play an integrative role and does not create social harmony in society but rather contributes to division. These differing views become one of the factors causing tensions within the local community. The current emergence of shirk-related stigmas among certain groups is tangible evidence of the marginalization of local wisdom.

The influence of Islamic ideological beliefs has caused the local wisdom system of the Bajo community, such as *pamali* practices, rituals, and myths, to begin losing their roles in the interaction process between the Bajo society and marine ecology. The impact of this phenomenon will potentially divide the Bajo community, which has diverse belief backgrounds. Beliefs in sea deities or guardians of the sea as traditional Bajo beliefs have faded away because they do not align with the teachings of Islam.

The Influence of Social Structure, Actors, and Agents

The roles of capital owners (actors) and fishermen (agents) in managing marine resources are integral parts of the social structure within the Bajo community. This event is a component of the social structure within the Bajo community environment. Giddens (1976, p. 161) explains that the formation of social structure is not solely understood as a constraint and regulator for actors but also serves as a medium for actors to interact. Social structure is built through actors' actions, while simultaneously, actions are realized within the structure. Additionally, structure should not be equated with constraint and enablement. The structure serves as a means and results from repeated organized agent actions.

The established social structure between capital owners (actors) and fishermen (agents) should be understood as a social production within the Bajo community environment, aiming to utilize technology to produce natural marine resources. This condition reflects the dominance of capitalism. It is no surprise that capitalism has become the most significant force today, shaping the global order and transforming societal structures into systems centered around differences that lead to the formation of statuses and classes with specific orientations. Every social practice becomes part of identity politics, positioning individuals within a value framework with new principles that lead to concepts of greater value or differentiation (Abdullah, 2006, pp. 169–170).

Furthermore, the process of human interaction mediated by technology can connect layers of society from various parts of the world, making it more open. As a result, the local wisdom of the Bajo community in natural disaster mitigation has undergone shifts influenced by the social structure. Structured or not, changes in mindset have shifted the role of local wisdom towards modern technology, impacting the degradation of the marine environment.

The Influence of Discrimination from Orang Bagai (non-Bajo)

The settled lifestyle and interactions with *orang bagai* (non-Bajo) lead to changes in knowledge and shifts in cultural and social values within the Bajo community. The presence of outsiders around their settlements compels the Bajo community to exploit marine resources (cf. Maharani et al., 2022). Consequently, the values of local wisdom regarding natural disaster mitigation lose their significance. In this context, the Muna and Bugis communities exploit natural resource management, leading to competition with the Bajo community. The Bajo community will struggle to uphold its local wisdom values in this position.

The presence of cultural practices among outsiders (Muna and Bugis communities), which differ from the Bajo community, has an impact on changing the attitudes of the Bajo community towards their natural environment. The management of natural resources conducted by the Bajo community differs from that of the outsiders, who tend to exploit resources. In this case, the Bajo community is compelled to manage natural resources informally. If they do not, the outsiders might take over these resources. As a result, local wisdom related to environmental preservation no longer functions as it should. Activities such as sand mining, coral extraction, and mangrove deforestation, carried out by the Muna and Bugis people, have eradicated the role of local wisdom in nurturing the interaction between the Bajo community and their surrounding environment.

The shift in local wisdom within the Bajo community is a result of the Bajo people's adaptation to the practices of the Muna and Bugis communities, who follow their social plans in the same environment. The aspect of adaptation does not just involve tools and technologies that ensure human survival against natural pressures, but also social plans aimed at exploiting habitats. Forms of competition to exploit natural resources like beach sand, coral, mangroves, and other marine resources are pressures faced by each group. If the Bajo community adhered to their local wisdom system in the face of different environmental conditions, their way of life would be at risk. Therefore, the Bajo community competes in exploiting marine resources to resist the hegemony of external communities to ensure their survival.

The Influence of Government Policies

Infrastructure development in the Bajo community's environment has led to an unsustainable decline in environmental quality. Infrastructure development, such as permanent houses and bridges from cement material, utilizes materials like coral and sea sand found in their surroundings. Indirectly, this infrastructure development has shifted the Bajo community's mindset and displaced the values of local wisdom in environmental practices. Consequently, the demands of development programmed by the government have compelled the Bajo community to adapt to these developmental needs (cf. Kondoh & Miyazaki, 2022; Osawa, 2022). Indirectly, the role of local wisdom, such as myths, taboos, and rituals, has eroded, particularly concerning maintaining environmental stability to prevent disasters. However, the protection and management of the environment are enshrined in Law No. 32 of 2009, where Article 1, Point 30 states that local wisdom refers to noble values applied in the community's way of life, including environmental protection and sustainable management.

Using sand and coral as construction materials for infrastructure have displaced local wisdom values like *pamali*, *maduai ada*, and *pakayuang bangkau kaarama*. The demands of development, as programmed by the government, have forced the Bajo community to adapt to the subsequent physical development. Houses initially built using mangrove wood are now torn down and replaced with permanent structures. Furthermore, gathering these materials has led to environmental damage in the marine ecosystem. Consequently, the local wisdom of the Bajo community in natural disaster mitigation is slowly losing its role in maintaining the stability of the marine environment. Ideally, their local wisdom regarding managing the marine environment should be protected and preserved.

Cultural changes driven by government policies compel the Bajo community to adapt to the marine ecology. This situation is based on the assumption that material resources are determinants in human life and consistently positions culture as an adaptive system to the physical environment (Osawa, 2022; Trejo-Rangel et al., 2023).

Conclusion

In conclusion, disaster education should be enhanced through socialization and the implementation of specialized disaster mitigation learning within various formal education settings such as schools and universities

(Suarmika et al., 2022). Additionally, communities are expected to have a heightened awareness of disasters through tracking news and literature about disasters (Xue et al., 2023). One form of disaster risk management in this research involves empowering local wisdom (Asmal et al., 2023). Naturally, every community possesses local wisdom as an adaptation effort to their natural surroundings. With this local wisdom, communities can lead their lives well and withstand natural upheavals like disasters when they strike their settlements. Local wisdom becomes a local community strategy for peaceful and harmonious coexistence with the natural environment (Trogrlić et al., 2022). This is an integral part of the environmental adaptation process between humans and their surroundings. Furthermore, the researcher recommends further studies into disaster center development strategies in various regions.

Conflict of Interest

The authors declare that there is no conflict of interest.

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