

## Local Wisdom-Based Disaster Mitigation Education and Environmental Conservation in Bintalahe Village of Bone Bolango Municipality

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### ABSTRACT

Bintalahe Village is a coastal area of Tomini Bay, Bone Bolango Regency. This area is prone to landslides and part of the area is on the coast. Therefore, it is necessary to socialize and educate the community in disaster mitigation and environmental conservation based on local wisdom so that the surrounding community can be aware of the disasters that arise. The main objective of this activity is to socialize and educate disaster mitigation and environmental conservation based on local wisdom in the coastal communities of Tomini Bay in Bintalahe Village. The method of activity implementation is carried out through stages, namely: 1). Survey and Coordination 2). Socialization 3). Education on disaster mitigation and environmental conservation based on local wisdom to the community, 4) Simulation when facing disasters to students of SDN 3 Kabila Bone, 5) Monitoring and evaluation. Based on the results of community service in socialization and education activities, it shows that the participants, namely the Bintalahe village community, are very enthusiastic and understand about potential disasters and how to deal with them. This is reflected in the dialog and question and answer activities during the activity stages. The education delivered in person was very interesting and important because it increased the knowledge and skills needed to deal with natural disasters including knowledge of emergency response actions, evacuation plans, and survival skills. Encouraging them to change to more sustainable behaviors to reduce plastic waste, wise use of natural resources, and other practices that support environmental conservation. Local wisdom-based disaster mitigation has the potential to improve community preparedness and response to disasters by utilizing local knowledge and culture. Disaster simulation is a very important and useful activity for students of SDN 3 Kabila Bone because students are trained to react quickly and not panic when a disaster occurs, which can save their lives and others. Local wisdom-based disaster mitigation has improved the community's understanding of risks and provided a sense of ownership of mitigation actions.

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## INTRODUCTION

Coastal area is a vulnerable to various natural disasters such as earthquake, tsunami, typhon, flood, volcanic eruption, and landslides, due to its geographical and geological conditions. Therefore, increasing community awareness for early mitigation to reduce the impact of those disasters. The coastal areas are often prone to many natural disasters. Hence, it needs effective socializations on steps to mitigate those natural disasters.

Bintalahe is a village who has complex topography of high land, low land, and coastal areas. Meanwhile, Gorontalo, in general has diverse morphological and geological conditions, abundant potential natural resources ( Eraku *et al.*, 2017; Permana, 2018; Permana *et al.*, 2019a, Permana *et al.*, 2019b; Eraku and Permana, 2020a; Permana *et al.*, 2020). Bintalahe village administratively is part of Kabila Bone sub-district and it lays between Molutabu village and Oluhuta village of Kabila Bone sub-district. This area is a landslide prone location and some of its area located in the coastal area. Therefore, local wisdom-based disaster mitigation and environmental education. Landslides in South-East Asia, especially with its tropical climate, is mainly due to steep slopes, high rainfall, and its lack of soil stability (Shahabi *et al* 2015). In addition, people's practices to open new farming lands by clearing the slopes of its vegetation and illegal logging practices also contribute to the incidents of natural disasters (Eraku *et al.*, 2020b)

Landslides in slopes happened due to the instability of the soil that causes land movements. Some parts of the slope moved due to the gravitational pull that triggers the landslides, following the slides, the land regains its stability (Akhirianto, *et al* 2016).

On the other hand, a region's development will increase the demand for residential areas and other economic spaces. However, land's availability does not follow this trend. Therefore, less unfortunate people were forced to settle down in areas with high risks, such as, hills and slopes. Thus, increases their vulnerability toward disasters such as landslides (Khasyir, *et al* 2015). Such natural disasters or man-made disasters may have caused casualty, live casualty and destruction of public facilities, infrastructures, and disruption of source of livelihood (Permana *et al.*, 2014, Eraku *et al.*, 2019a, Eraku *et al.*, 2019b)

This also applies to the community of Bintalahe village, where landslides and flood are common disasters. The flood and landslides are often happened due to the wavy topography and the slopes that are composed from weathered rocks (Eraku *et al.*, 2023a). Thus, there is a need for socialization and education of disaster mitigation by taking into account their local practices and local knowledge, which have been practiced for generations in that place. This was to spread the understanding on steps to prevent disaster among the community, thus, they can be more prepared against the possible disaster that might happen in their area. One of the most important aspect in this approach is introduction and acknowledgement of existing knowledge and practices on disaster prevention and mitigation. This not a mere acknowledgement of the local's value, rather it reflects deep understanding on the local environment (Eraku *et al.*, 2023b). Employing local knowledge in planning and implementation steps of disaster mitigation is not only increasing the effectiveness of the action, but also strengthen the community awareness on their responsibility towards their personal safety and ensuring the sustainability of their resources and environment.

Local wisdom refers to the cultural and social heritage that consists of knowledge, norms, rules, and skills that have been passed through generations in certain areas, in order to fulfill their needs to exist as a community (Baruadi *et al.*, 2024). Local wisdom is understood as local knowledge or local genius that exists within a community (Lim *et al.*, 2023]. Local wisdom plays a critical role in the process of environmental adaptation. Community accumulates and develops understanding, cultural values, develop practices and produce tools based on their abstraction in managing their surrounding environment (Baruadi *et al.*, 2023). In Gorontalo's culture, there is a local tradition that insists on helping each other to clean the environment and to replant the forests as a community. This tradition encompasses several aspects namely: 1) *Heeluma*; working

together to clean their surrounding environment and to replant trees in their areas, 2) *Huulunga*; cooperation among group members to repair the infrastructures that directly effect the community such as, bridge repairment, drainage channel cleaning, and reforestation, 3) *Huuyula*; cooperation among large community group to implement a project together, such as building water canal or water reservoir for farming and environmental conservation 4) *Ti'ayo*; cooperation among some community members to complete a task for private interest (Eraku *et al.*, 2019). These local wisdoms of Gorontalo community can be implemented in the context of disaster mitigation. Implementation of local wisdom-based disaster mitigation. This approach involves close collaboration among local community members, local government institutions, non-government organizations, and expert in disaster prevention and mitigation. This process incorporates local knowledge and acknowledges scientific knowledge and new technology to support the prevention and mitigation efforts. Therefore, raising community awareness on traditional knowledge related to environmental management and disaster mitigation is important. Understanding natural signs such as changes in the temperature, changes in the sea waves, and other natural signs that indicate the potential hazardous situation. This community service program is aimed at raising the community awareness of the potential hazardous incidents that may happened in the coastal area of Tomini bay. This activity includes understanding the factors that causes disasters and ways to reduce risks and impacts of the disasters. To achieve these objectives, a community service program entitled, "Disaster Mitigation Education and local-wisdom based environmental conservation in Bintalahe Village Tomini Bay coastal area in Bone Bolango Regency".

## METHODS

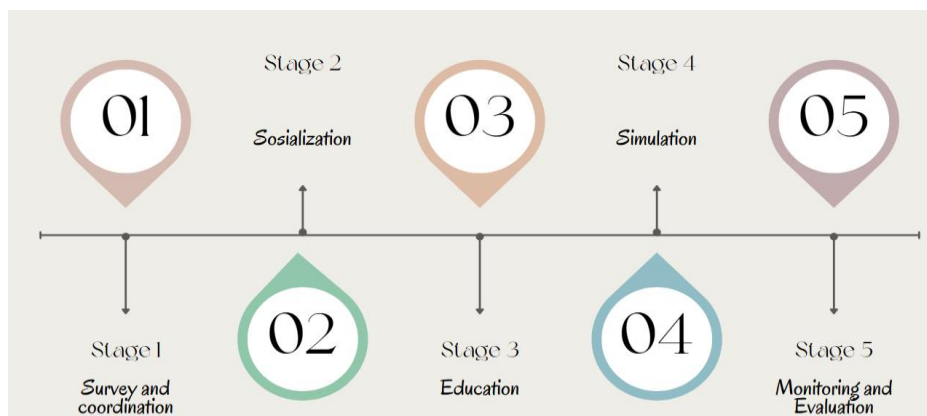


FIGURE 1. stages of community service program methods

1.

The method of activity implementation was carried out as follows:

1. Survey and coordination

Survey was conducted in Bintalahe village to record the position of residential areas that are easily affected by landslides. Coordination with the Bintalahe village government was carried out to record the number of residents around landslide-prone locations.

2. Socialization and education

Socialization to the community, especially to housewives in Bintalahe village in residential areas that are prone to landslides. The socialization material provided included an introduction to disasters, disaster mitigation efforts, and what the community should do before a disaster occurs, during a disaster and after a disaster. Disaster mitigation and environmental conservation education based on local wisdom is mainly aimed at farmers and fishermen in landslide-prone neighborhoods.

The education provided is in the form of education about natural signs when a disaster will occur, pre- and post-disaster disaster mitigation efforts.

3. Simulation

Simulations when facing disasters are given to students of SDN 3 Kabila Bone. This aims to introduce directly

4. Monitoring and Evaluation

After these stages are completed, monitoring and evaluation are carried out to review the implemented program and the need for further programs

## RESULT

Coordination and survey results involving the Bintalahe village government showed that of the total population of 860 people, 50 people need to be given socialization and education consisting of 20 housewives who are wives of fishermen, 10 youth organizations, 10 people are fishermen whose settlements are prone to landslides and fishermen's children who are students of SDN 3 Kabila Bone.

The socialization and education activities began with the delivery of the material "Landslide Disaster Mitigation Education and Environmental Conservation. Education on landslide disaster mitigation and environmental conservation is very important to protect the community and the environment from the negative impacts of disasters and ensure environmental sustainability.



(a)



(b)

**FIGURE 2.** (a) landslide mitigation and environmental conservation information session, (b) local wisdom-based disaster mitigation session

Disaster mitigation education for participants to understand the causes and triggering factors of landslides such as high rainfall, steep slopes, deforestation, improper construction, and other human activities. Recognize the early signs of landslides such as soil cracks, changes in slope shape, and movement of small objects. The speaker also said that people need to understand the causes and triggering factors of landslides such as high rainfall, steep slopes, deforestation, improper construction, and other human activities. Recognize early signs of landslides such as soil cracks, slope deformation, and movement of small objects. Promote soil conservation practices such as reforestation, use of cover crops, and erosion control. Education on soil engineering such as terracing, slope damping, and retaining walls to reduce pressure on slopes and prevent landslides as well as communities avoiding development in landslide-prone areas and adopting landslide-resistant technologies in development.

Disaster mitigation education based on local wisdom of Gorontalo community is conducted especially to fishermen whose settlements are prone to landslides. Local wisdom-based disaster mitigation is an

approach to reducing disaster impacts by utilizing existing knowledge and practices in local cultures and communities. This approach recognizes that communities living in disaster-prone areas have rich knowledge about their environment and traditional ways of dealing with disaster threats. This educational material emphasizes integrating local wisdom into disaster mitigation strategies, so as to create solutions that are more sustainable and appropriate to local conditions. Local wisdom or traditions of the Gorontalo people include mutual help and assistance in Gorontalo culture such as *heeluma*, *hulunga*, *huyula* and *ti'ayo*.

Local wisdom-based disaster mitigation education explains several examples of local wisdom-based disaster mitigation practices of Gorontalo people, namely: knowledge of the environment. Local communities often have a deep understanding of their surrounding environment, including natural behavior and weather patterns. This knowledge can be used to anticipate natural disasters such as floods, landslides or droughts. Local communities can also practice sustainable management of natural resources, such as forests and rivers, which can help reduce the impact of disasters such as floods and landslides. Traditional architecture needs to be developed as traditional buildings are often built with environmental and disaster factors in mind. The use of local materials and earthquake- or flood-resistant designs can help reduce disaster damage. Then there is the locally-based early warning system. Local communities can develop early warning systems based on natural signs or certain animal behaviors that indicate a potential disaster. Furthermore, the utilization of religious traditions can play a role in reducing the impact of disasters. For example, some religious practices can teach environmental ethics that encourage balance with nature. Local wisdom can be one of the non-structural mitigations carried out in disaster risk reduction efforts. The utilization of local wisdom in disaster mitigation is also more sustainable because it is hereditary, thus providing security in the long term (Putri, 2022).

Education on strengthening community preparedness in facing disaster threats. In this session, a natural disaster management model was developed that includes the stages before a disaster occurs, when a disaster occurs, and after a disaster occurs. The presentation of this material emphasizes community organization, where local communities can form disaster response groups that are trained to deal with emergency situations and provide first aid before official assistance arrives. Local communities can develop education and training programs on how to act in the face of a disaster. This can involve evacuation simulations, first aid training, and so on.

The stages of disaster simulation activities prepared a model of handling natural disasters before the disaster, during the disaster and after the disaster. This activity was attended by children of SDN 3 Kabila Bone.



**FIGURE 3.** (a) familiarization of disaster mitigation topic to students of SDN 3 Kabila Bone, (b) Personal safety during tsunami event

Students about natural disasters are in science subjects and are only limited to the knowledge of what natural disasters are. Therefore, this socialization provides science literacy to children. Psychological conditions such as anxiety and fear can affect children's readiness to face natural disasters (Eraku et al., 2023c). Then a simulation of how to save themselves when a disaster occurs was carried out. The simulation conducted by children in the Bintalahe Beach area is shown in Figure 2.

In this simulation, children and the community were very enthusiastic in participating in this activity. This can be seen from the number of participants whose children and the community of Bintalahe village exceeded the original target. Children and youth groups were very enthusiastic in discussing the efforts made in natural disaster management before the disaster occurred, natural disaster management during the disaster occurred, natural disaster management after the disaster occurred.

The monitoring and evaluation stage has assessed the importance of continuing education programmatically so that the community is always prepared to face disasters.

## DISCUSSION

This community service activity showed that the villagers of Bintalahe village were very positive about this activity. The education and simulation approaches that consists of steps to prepare for disaster, actions taken during disaster, and local knowledge-based disaster mitigation, mitigation of landslide, and environmental preservation are considered critical in protecting the community and its environment from the negative impact of disasters. This was reflected from the dialogue during and after the session. The topics presented have attracted the attention of the community as it increases their knowledge and skills on what needs to be done during emergency response, evacuation, and survival skills. This activity encouraged them to shift their practices into more sustainable practices such as reducing plastic waste, wise utilization of natural resources, and other practices that support environmental conservation. Strengthening the local knowledge that has been proven to be effective during natural disaster, including revitalizing traditional practices that can assist in disaster mitigation. Traditional knowledge serves as guideline of community interaction, it is also critical for the preservation of nature and its resources (Wibowo dkk., 2012). The community preserves their customs and local knowledge, which can help reduce the risk and uphold values that are inline with environmental balance. This process of value transfer was ingrained since they were children as they copy the behavior of the older generations (Ningrum, 2012).

Self-evacuation simulation during the disaster was also important to note. Several factors can affect children's vulnerability toward a disaster, such as their dependability on adults. Children tend to rely on adults for their self-protection and the fulfilment of their basic needs. During emergency situation, when adults cannot provide sufficient protection, children would become more vulnerable. Children may not fully comprehend emergency and how to deal with that emergency. This lack of understanding could lead to bad decision making in prevention and appropriate evacuation (Eraku *et al.*, 2023b). Therefore, disaster drill is a critical activity and useful for children of SDN 3 Kabila Bone as they were trained to react quickly and to not panic during the disaster, which can save their lives and others. Implementing disaster mitigation through education and training in schools is part of the government's effort to reduce impact of disaster among the community (Samion, 2021).

The output indicator in this community service is that the community understand their local knowledge and local myth which can be utilized as guideline of action during disaster and how to treat the environment with respect. This persuades the community to preserve their environment and develop resilient community network in the event of disaster. This network involves collaboration among community members, development of community-based early warning system, and establish local emergency response teams.

encourage. Therefore, local wisdom-based disaster mitigation can provide comprehensive understanding of the context and actively involves community in disaster preparedness planning and mitigation.

The benefit of this activity is that it employs local knowledge, culture, and experience, hence, fits the needs and condition of the Bintalahe village that is prone to landslide disaster. This activity can increase community participation in disaster mitigation efforts. Local knowledge, which has been passed down for generations can ensure the sustainability of the disaster mitigation practices. It encourages active community participation in planning, implementation, and monitoring the impact of natural disaster and increases their responsibility and understanding on the risks of disaster. Further activity should incorporate disaster mitigation into school curricula, and information sessions to increase community's knowledge awareness on disaster.

## CONCLUSION

The community service activity was highly anticipated by the community in Bintalahe village. This was seen from the interactive dialogue at the end of the program. The participants revealed that the activity was interesting and important for them as it enriches their knowledge and understanding on disaster prevention and mitigation, during the emergency response, evacuation plan, and survival skills. The community service activity encourages the community to shift their current lifestyle into a more sustainable lifestyle by reducing the use of plastic and its use, wise utilization of natural resources, and other practices to support environmental conservation. Local wisdom-based disaster mitigation approach provides sustainable solution and enables the community to adapt toward the change in their physical and social environments. This approach allows the community to continuously renew their knowledge against new challenges. Local wisdom-based disaster mitigation increases the community preparedness and responses during the disaster by employing their local knowledge and culture. This approach also increases community active participation in planning, decision-making, and implementation of mitigation steps. Meanwhile, disaster simulation is an important activity for the students at SDN 3 Kabila Bone as students were trained to react fast and not to panic during the disaster as these can save their lives and others.

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