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Improved Preparedness Communities in Facing Disasters through Disaster Mitigation on Sapeken Island, Sumenep Regency

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ABSTRACT Disasters can happen anytime and anywhere. Living as an archipelagic community is an advantage as well as a risk for the people of Sapeken Island. Behind the natural beauty and richness of life, the community is far from education related to disaster mitigation, even government data related to mapping regional vulnerabilities and capacities are not optimal. The community-based disaster mitigation education program on Sapeken Island organized by the Disaster Management Masters Program at Airlangga University in collaboration with the Ksatria Airlangga Floating Hospital aims to improve preparedness and increase community capacity in dealing with potential disasters that can occur on Sapeken Island. Based on the results of the pre-test and post-test conducted, the level of community knowledge about disaster mitigation tends to be low and has an average increase of 9% in the post-test knowledge of earthquakes and an average increase of 29% in tsunami knowledge. In addition to disaster mitigation education programs, the community is also invited to determine gathering points and evacuation routes as anticipation and preparedness in the event of an unwanted disaster while waiting for evacuation assistance to arrive. Disaster education programs for archipelagic communities are very important to increase community capacity in addition to developing their tourism potential. So that the community can develop in a balanced way in developing tourism potential in the islands by taking into account the elements of disaster risk that can be prevented or reduced.

INDEX TERMS: disaster, preparedness, mitigation, Island

I. INTRODUCTION

Indonesia as an archipelagic country has many islands with different areas. One thing to watch out for is the Indonesian maritime area with unstable tectonics [6]. The potential for disasters in Indonesia is no exception to be a threat to the people living in the islands. Difficult access to reach small islands makes Indonesia vulnerable to the risk of secondary disasters after the main disaster occurs, which if left unchecked will become a more serious problem [1]. Disaster is a series of events that threaten and disrupt both the lives and livelihoods of the community caused by natural and non-natural factors or human factors that result in human casualties, environmental damage, property losses and psychological impacts [2]. Unfortunately, not much attention has been paid by the government to focus on mitigation and disaster preparedness efforts for people living on the outer islands. Whereas early mitigation management is one of the steps for disaster risk reduction [3].

Sapeken Island is part of the outermost archipelago, as part of the Sumenep Regency area. Geographically, Sapeken Island is located between 7 ° 54 LS-8 ° 13 LS and 112 ° 51 east longitude-113 ° 04 east longitude. The area of Sapeken Island is only about 0.64 Km ^{2}. This island is included in an arid island with a fairly high population density. Almost all of the land in the Sapeken area is in the form of sand, so it cannot be used as rice fields. Trees that can grow in this area are coconut trees, waru trees, shrimp pine trees, and other trees that are only suitable for growing on the coast. Meanwhile, mangrove trees are only on the east side of the island, so Sapeken Island has the potential to experience greater abrasion, in addition to tidal flooding which is a routine phenomenon according to local residents.

Sapeken Island consists of 3 hamlets, namely Dusun Sapeken I with a total of RT 15, Dusun Sapeken II with RT 18, and Hamlet Sapeken III with the number of RT is 10, so the total RT is 43 RT. The population of Sapeken Island is 2,605 people from 868 families for Dusun Sapeken I, 3,501 people from 1,167 families for Dusun Sapeken II and 2,336 people from 779 families for Hamlet Sapeken III, so the total population of Sapeken island is 8,442 souls. Population density reaches 13,219,294 people/km with an average of 3 person in 1 KK [4].

The results of the risk assessment from the Pamekasan Regional Disaster Management Agency (BPBD) and the Meteorology, Climatology and Geophysics Agency (BMKG) have mapped the potential for disasters that threaten the Madura Islands. Some of the threats of disasters that can occur include floods, landslides, earthquakes, and tsunamis. The magnitude of the potential for disasters that can occur in the Madura Islands has resulted in a very large opportunity for the community to become victims, especially for people living in islands that have limited land area and low capacity. This is reinforced based on the narrative of residents living on Sapeken Island, that education about disasters is very rare, even an analysis of the potential for earthquakes and tsunamis has never been carried out, even though during the Lombok earthquake in 2018, residents on Sapeken Island also felt the shaking strong enough.

The limited knowledge of the community in disaster preparedness is one indicator of a low level of capacity. According to Law Number 24 of 2007 concerning Disaster Management, preparedness is a series of actions, preparations, and activities carried out by individuals and community groups with the aim of anticipating or dealing with any disaster threat that has the potential to disrupt human survival through planned organizing efforts. , effective, and efficient (Law Number 24, 2007) . Preparedness is an effort or method of disaster control as an effort to anticipate or reduce the impact of disaster risk by increasing capacity through disaster response knowledge and attitudes [5].

Increasing community capacity through education to build community-based disaster awareness is very important, because with community involvement in analyzing risks, hazards, and vulnerabilities around them, it can raise awareness that affects people's attitudes and behavior [6] [7]. This program is also in line with the priority strategies in the 2020-2024 National Plan (Renas) for Disaster Management, namely community-based disaster risk reduction, increasing the role of Non-Governmental Organizations (NGOs), government organizations, the private sector, and the involvement of universities in the harmonization of the *pentahelix* [8] [12].

II. MATERIALS AND METHODS

The method is in the form of community service which is part of the expedition of the Ksatria Airlangga Floating Hospital with the Masters Program in Disaster Management at the Graduate School of Airlangga University to carry out service activities for people living in the islands. The scope of activities in this community service program is counseling and simulation of disaster preparedness in the archipelago with *pre-test* and *post-test measurements* for the community in the Sapeken Island area. The activity was attended by a number of 17 participants consisting of representatives of village officials, Non-Governmental Organizations (NGOs), Community Organizations (ORMAS), Youth Organizations, Religious Organizations, several community communities related to disasters such as radio broadcasters and disaster response teams, as well as representatives vulnerable groups, namely fishermen and the general public.

Before the material is given, participants are invited to conduct an assessment of potential hazards that may occur based on the geographical location of Sapeken Island for the specifications of the material to be delivered.

Participants were given *pre-test questions* to determine the level of knowledge before getting the material. The material provided includes the types and analysis of disasters that have the potential to occur in the archipelago, earthquake and tsunami disaster preparedness, signs of a disaster, steps that must be taken in the event of a disaster, and safe evacuation methods when a disaster occurs. After receiving the material through counseling, the participants carried out an evacuation simulation during a disaster. Furthermore, an evaluation of the level of understanding was carried out through discussion and question and answer sessions, then at the end of the session participants were asked to return to work on *post-test questions* to measure the level of change in knowledge after receiving education [6].

The additional material provided is a simulation of the use of disaster preparedness bags and First Aid in Emergency (PPGD) to provide basic skills and understanding of participants in the event of a disaster.

One of the outputs of this empowerment program is that the community conducts mapping to determine evacuation gathering points in the event of a disaster based on criteria for safe gathering points. The community also determines evacuation routes for residents to the nearest gathering point from their homes or places of activity when a disaster occurs.

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III. RESULTS AND DISCUSSION

This island community development activity is part of the routine program of the Ksatria Airlangga Floating Hospital to listen to the voices of the islanders along with social services in health services, which on this occasion collaborated with various faculties to develop archipelagic communities in accordance with the disciplines possessed by each Faculty. The Postgraduate School of Airlangga University, represented by the Master of Disaster Management Study Program, chose a community-based disaster mitigation program in the archipelago considering the importance of disaster education for people living in vulnerable areas and far from the center of government.

Increasing community knowledge and capacity in disaster preparedness is one of the expected output indicators of community service activities aimed at building community-based mitigation [11]. The activity begins with the opening and assessment of potential disasters that can occur on Sapeken Island.

Community-based disaster mitigation programs are delivered through three methods, namely: (1) counseling; (2) simulation; and (3) discussion. The counseling method is carried out to convey material related to the earthquake and tsunami, signs, evacuation efforts that must be carried out, disaster risk reduction efforts that can be carried out, and first aid that can be carried out by ordinary people. The simulation method is used for the practice of First Aid in Emergency (PPGD) and evacuation simulations when a disaster occurs. Meanwhile, the discussion method, apart from being conducted for question and answer sessions, was also carried out to assess potential disasters that could occur on Sapeken Island based on geographical conditions other than abrasion and tidal flooding, as well as determining gathering points and evacuation routes as a form of alertness to any disasters that could occur either due to natural and non-natural factors.

Figure 1: Assessment of potential disasters on Sapeken Island

There were two main materials for disaster preparedness delivered, namely those related to earthquakes and tsunamis. Furthermore, additional material includes the introduction of disaster preparedness bags, PPGD, and mapping of the danger zone of Sapeken Island to determine gathering points and evacuation routes in the event of an unwanted disaster.

The series of community empowerment programs are structured through the following stages:

1. Determination of the criteria for participants, which includes representatives of village officials, Non-Governmental Organizations (NGOs), Community Organizations (ORMAS), Youth Organizations, Religious Organizations, several community communities related to disasters such as radio broadcasters and disaster response teams, as well as representatives of vulnerable groups, namely fishermen and the general public.
2. An assessment involving participants regarding the potential for disasters that can occur on Sapeken Island based on natural and non-natural factors.
3. Prioritization of hazards that have a higher risk based on the level of hazards, vulnerability , and capacity . At this stage, it was agreed that two priority disasters would be discussed, namely earthquakes and tsunamis.
4. Implementation of pre-test material to participants to measure the level of understanding of participants prior to counseling.
5. Implementation of education on earthquake and tsunami preparedness materials.
6. Disaster counseling and simulation, use of disaster preparedness bags, and PPGD practices
7. Implementation of post-test to measure the level of understanding of participants after being given the material.
8. Mapping of kelurahan areas based on hazard zones to determine gathering points and evacuation routes for residents to the nearest gathering point from their residence or place of activity.
9. Installation of assembly point markers and evacuation routes to the nearest gathering point.
10. Closing. Monitoring efforts are carried out through communication between the lecturer team and representatives of the village apparatus.

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Based on *the pre-test* and *post-test* that have been conducted on the participants, the following is the distribution diagram of the resulting knowledge level

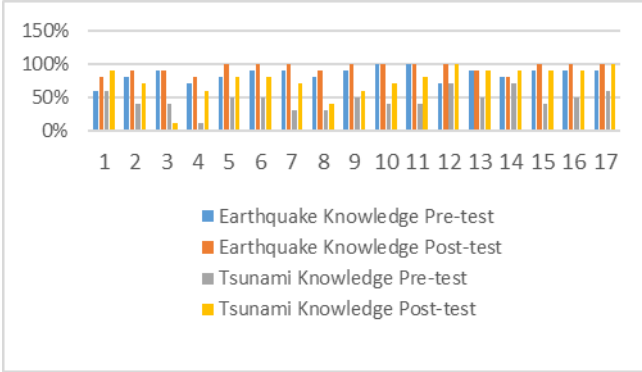

Figure 2: Distribution of increased knowledge of participants

From the diagram above, it can be analyzed that of the 17 participants who took part in the activity, before the material was given, the level of knowledge of the participants tended to be low, especially related to the tsunami. Meanwhile, after being given the material, all participants experienced an increase in knowledge both on the subject of earthquakes and tsunamis.

The average increase in the participants ' pre-test and post-test results is presented in the following diagram:

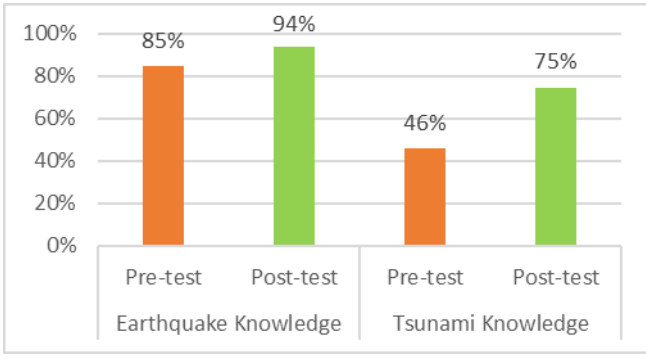

Figure 3: The average results of *pre-test* and *post-test*

From the diagram above, it can be identified that the average increase in knowledge after the delivery of earthquake preparedness materials increased by 9% from 85% to 94%. Meanwhile, the material for tsunami preparedness also experienced a significant increase, although it was still relatively low when compared to earthquake preparedness, which increased by 29% from 46% to 75%.

Community-based disaster preparedness programs are the right solution to reduce the structural vulnerability of communities by increasing the capacity of people living in disaster-prone areas. The community should not just surrender and sit idly by to fate, but should be encouraged to increase their capacity through positive efforts that can reduce vulnerability [8].

Earthquake preparedness materials delivered include recognizing earthquakes, steps that must be taken when an earthquake occurs either inside the house, outside the house, or on a hill/beach, what to do before leaving the house, and how to evacuate to the gathering point. . While the material for tsunami preparedness is a continuation of an earthquake where plate shifts occur in the sea. The material includes recognizing tsunamis, signs and symptoms of a tsunami, when an earthquake is indicated to be followed by a tsunami, evacuation steps that must be taken, criteria for a safe place from a tsunami, and when it is safe to return from a safe place. To make it easier for participants to be introduced to the term 20-20-20 to identify and be safe from tsunamis, that is, if an earthquake occurs for 20 seconds on the coast, then there is 20 minutes to save yourself to a gathering point or safe place with a minimum height of 20 meters higher from the coast, and do not descend until the usual five repetitions of the tsunami waves or follow the direction of the officers if any.

Figure 4: Delivery of disaster mitigation materials

Furthermore, in the additional material for the introduction of disaster preparedness bags and PPGD, personal protective equipment (PPE) was also introduced, especially for fishermen who go to sea daily, additional material on *standard precautions* , including how to use buoys and buoys must always be on the boat or ship. At the same time, samples of complete standby bags and their contents including mini first aid kits, as well as buoys were handed over to community and sub-district representatives to be used as assets on the Desa Siaga Vessel and will be reproduced by the kelurahan to support security on the newly released Desa Siaga Vessel.

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Figure 5: Simulation of First Aid in Emergency

Figure 6: Symbolic handing over of standby and life jackets

One of the supporting efforts in the disaster mitigation program is the determination of gathering points and evacuation routes without waiting for a disaster to occur [10].

One of the outcomes of this community empowerment program is mapping with the community to determine meeting points that meet the criteria and are considered the safest considering the area is only 0.16 km ^{2} . Participants also put up evacuation route markers to the gathering point.

Figure 7: Installation of assembly point markers and evacuation routes

Based on the whole series of community service activities, although it was carried out in a short time, the simulation method used was expected to provide a deeper understanding to the participants. This is because the simulation method applies practice directly to similar situations as possible so that participants must behave and behave according to the specified situation [8]

IV. CONCLUSIONS

Conclusion

Disasters can be classified into preventable and non-preventable disasters. Disasters due to natural factors are a form of hazard that cannot be prevented, for example, earthquakes and tsunamis. Living and living in Indonesia, which is surrounded by tectonic plates, is one of the factors that makes it impossible to avoid the potential for earthquakes and tsunamis.

Sapeken Island as one of the islands with an area of less than 1 km ^{2} with a fairly high population density needs attention in an effort to increase community capacity to build awareness of disasters. Although geographically Sapeken Island is at low risk of the impact of a tsunami, but the area is narrow compared to its population density, tsunami awareness also needs to be built, considering that the impact of the Lombok earthquake in 2018 was also felt quite strongly by residents on Sapeken Island. In addition, based on the results of the *pre - test analysis, it* also shows that public knowledge is still low both regarding the earthquake and tsunami. The level of public knowledge of First Aid in Emergency (PPGD) is also still lacking, this can increase the risk due to disasters because access to greater health services from the Sapeken Health Center is quite far.

The enthusiasm and active participation of participants who take part in community development programs for disaster mitigation by building community-based awareness need to be appreciated and receive

special attention from the government to continue to be improved. With the strong capacity of the community in the islands, even though the threat of disaster comes, the community does not panic and understands what steps must be taken to reduce disaster risk.

Continuous monitoring and evaluation activities are also needed to maintain community capacity regarding awareness of earthquakes and tsunamis as well as the basic principles in PPGD. In addition, evacuation routes and gathering points that have been determined with the community also need follow-up and maintenance so that they can be maintained considering that access to Sapeken Island is not easy.

Contributions and cross-sectoral cooperation to improve disaster mitigation and preparedness through community empowerment in archipelagic areas are very much needed. Not only Sapeken Island, but other islands with a narrow land area and high population density also need to be considered for their capacity. With community involvement, it will build community attitudes and behaviors that lead to disaster alertness and preparedness.

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