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Disaster Mitigation and Emergency Response in the School Environment

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Abstract: Natural disasters are a significant threat in vulnerable areas, including Indonesia which frequently experiences floods, earthquakes, and landslides. This study explores disaster mitigation and emergency response management in schools in Sembakung and Lumbis Districts, Nunukan Regency. The objectives are to understand the challenges, human resource (HR) readiness, availability of facilities and infrastructure, community participation, technology utilization, and post-disaster psychosocial support. Qualitative methods were used with in-depth interviews with school principals, teachers, and staff. The findings show limited disaster mitigation and simulation training, minimal disaster-resistant school infrastructure, and low community participation and technology limitations in remote areas. This study recommends a holistic approach to improving disaster preparedness through training, infrastructure strengthening, community participation, technology utilization, and psychosocial support. Collaboration between government, schools, and local communities is needed to create a safe and resilient educational environment in the face of disasters.

Keywords: Community; Disaster mitigation; Emergency response; Infrastructure; Preparedness; Schools

Introduction

Natural disasters are always a threat to the lives of people in disaster-prone areas. This incident can happen anywhere regardless of time, place, or even victims. Indonesia is one of the countries prone to natural disasters. Based on data from the National Disaster Management Agency (BNPB), there were 2,724 natural disasters in Indonesia during the period 1 January-1 September 2023. Floods still dominate, with 852 incidents, followed by extreme weather with 836 incidents. Furthermore, there were 487 forest and land fires (karhutla), 442 landslides, 60 droughts, 24 tidal waves/abrasion, 21 earthquakes, and 2 volcanic eruptions. Meanwhile, not a single tsunami has occurred in Indonesia since the beginning of the year.

Law Number 24 of 2007 Article 6 concerning Disaster Management explains that natural disasters are disasters caused by events or a series of events caused by nature, including earthquakes, tsunamis, volcanic eruptions, floods, droughts, hurricanes, and landslides. The impacts that can be caused by natural disasters can be material or non-material such as loss of life, environmental damage, loss of property, and psychological impacts (Ayub et al., 2020). Mulyasa (2003) stated that the law is also a form of commitment of the Indonesian Government in providing protection to citizens against natural disaster management which includes disaster risk reduction and disaster risk guidance in terms of development, protecting the community from the impact of disasters, guaranteeing the fulfilment of the rights of the community and refugees affected by disasters fairly and in accordance

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with service standards, recovery of conditions from the impact of disasters, allocation of disaster management budget in the adequate state revenue and expenditure budget, allocation of disaster management budget in the form of ready funds, and maintenance of authentic and credible archives/documents from the threat and impact of disasters.

The community is expected to have sufficient capacity to increase preparedness and responsiveness and be aware that they live in a disaster-prone area. Given the dangers that can be caused by natural disasters, disaster mitigation management and emergency response are mandatory things that must be done, especially for areas that are prone to natural disasters (Maryam et al., 2023). In Law No. 24 of 2007 Article 35 letter b and Article 44 letter c concerning the implementation of disaster management, namely disaster mitigation and emergency response. Disaster mitigation is an effort made to reduce the risk of disaster for communities in disaster-prone areas by means such as infrastructure development, education, counseling, and training (Aulia et al., 2023). Meanwhile, emergency response is to reduce the negative impacts that may occur, especially when there is no disaster. Subiyantoro (2010) stated that the driving factors in the program are the many supports provided such as community organizations, community groups, regional apparatus organizations (OPD) to volunteers formed from the village or school. Sulistyorini (2009) stated that this activity must have collaboration from all parties in order to create a responsive, agile, and resilient society in dealing with disasters.

One of the natural disasters that often occurs in Indonesia is flooding. Pribadi et al. (2008) stated that flooding is an event when water inundates an area that is usually not inundated with water for a certain period of time. The occurrence of flooding is greatly influenced by natural factors in the form of above normal rainfall and high sea levels (Maryani, 2017). In addition, human factors also play an important role such as inappropriate land use (settlements on riverbanks, in catchment areas, deforestation), dumping waste into rivers, building settlements in flood plains and so on. Disaster management and mitigation in schools in Indonesia have become an important focus in various studies, especially considering that Indonesia is one of the most disaster-prone countries in the world (Andriani et al., 2024).

One of the main findings of research conducted in Indonesian schools is the importance of integrating disaster education into the school curriculum. Disaster education not only serves to provide theoretical knowledge to students about the types of disasters, but also practical skills in dealing with disasters. Research by Amri et al. (2017) highlighted that disaster mitigation education taught in elementary schools in Indonesia, especially in disaster-prone areas such as Sumatra and Sulawesi, has succeeded in increasing students' preparedness in dealing with disasters such as earthquakes and tsunamis. This study emphasizes the importance of interactive teaching and disaster simulations as part of the learning process. However, LIPI (Indonesian Institute of Sciences) in its study stated that disaster education in many schools has not been fully integrated into the curriculum systematically (Lembaga Ilmu Pengetahuan Indonesia, 2017). This indicates the need to develop more specific educational guidelines and materials that are appropriate to local conditions in each disaster-prone area.

Disaster-resilient school infrastructure is also a major concern in studies conducted in Indonesia. Many school buildings in Indonesia, especially in earthquake-prone areas such as Sumatra, Sulawesi, and Yogyakarta, do not meet earthquake-resistant building standards, increasing the risk of building collapse during a disaster. Research by Heri et al. (2016) after the Yogyakarta earthquake found that many schools did not have buildings specifically designed to withstand natural disasters. According to Arikunto & Yuliani (2009), this caused extensive damage and increased the risk of student fatalities. Diatprasojo (2018) recommends that the Indonesian government conduct a comprehensive assessment of school buildings and prioritize strengthening structures in high-risk areas. In addition, BNPB (2018) emphasized that schools located in red zones should be given special attention in terms of improving the quality of infrastructure, such as adding evacuation routes and providing safe spaces during disasters.

In addition to physical aspects, community support and parental involvement are also considered important in disaster management in Indonesian schools. Research by Maryani et al. (2017) in West Java showed that parental involvement in disaster training and simulations at school significantly increased their knowledge of disaster risks and how to protect their children. Muhaimin (2010) found that active involvement from parents and the local community also helps ensure that evacuation and disaster mitigation plans designed by schools can be supported by the entire community. However, this study also found that in some areas, especially in rural areas with lower levels of education, awareness of the importance of disaster mitigation is still very minimal. Therefore, disaster education should not only focus on students, but also on the wider community (Trayana et al., 2022).

In recent years, technology has begun to play an important role in disaster mitigation in schools in

Indonesia (Syamsidik et al., 2019). The use of smartphone-based applications and early warning systems have been developed to help schools disseminate disaster-related information more quickly and effectively. Rahman et al. (2020) studied the use of mobile application technology to help disseminate disaster warning information in schools in Sulawesi. This application allows schools to provide evacuation instructions and safe route information to students and parents more efficiently. However, this study also shows that access to this advanced technology is still limited in remote areas, where digital infrastructure is not yet fully developed.

Next, no less important is the aspect of post-disaster psychosocial support in Indonesian schools. Many studies emphasize that disasters not only have physical but also psychological impacts, especially on students. Mulyadi et al. (2018) in their research after the earthquake in Lombok found that many students experienced prolonged trauma after the disaster. Schools that provide psychosocial support, such as counseling or mental recovery programs, can help students recover more quickly from the trauma (Syah, 2013). Bafadal (2003) found that this study emphasizes the importance of training for teachers and school staff to understand how to deal with students who experience post-disaster trauma, as well as the importance of providing a safe space in schools for students to talk about their experiences. Overall, research conducted in Indonesia on disaster management in schools shows significant progress, but there are still various challenges that need to be overcome (Rahman, 2020). From disaster education to psychological support and infrastructure improvements, a more holistic approach and stronger support from the government and local communities are needed to build school resilience to disasters (Asmendri, 2012).

Reported from the Tribun Kaltara news page, Nunukan Regency, precisely in Lumbis and Sembakung Districts, is the most frequently affected by flooding. This flood is a flash flood caused by high rainfall in the upper reaches of the Lumbis Pansiangan District, Nunukan Regency, which borders Sabah, Malaysia. The Head of the Nunukan Education Office, Nazaruddin, said, "The schools affected by the flood in Sembakung District are 14 elementary schools, 2 junior high schools, and 1 senior high school. While in Lumbis District there are 10 elementary schools, 1 junior high school, and 1 senior high school. The flood disaster caused road access to be impassable, thus hampering school activities because the flood submerged the school building to a height of 4.30 meters. Sanjaya (2011) found that a number of students and teachers were finally forced to temporarily stop learning activities at school. However, if the flood does not recede, the school community is forced to rent a boat for activities for Rp. 100,000.00/day, the funds for which are not included in the school budget.

Baharuddin (2010) stated that even among them there are some students who are willing to swim to go to school, they wrap school bags containing school uniforms with plastic, then put them on their heads and tie them in such a way, cell phones are wrapped in ice plastic, then swim together from home to the school pick-up boat (Mulyadi, 2018). In addition, this flood disaster also damaged several school facilities and infrastructure such as laboratory rooms, student and teacher chairs and tables, study books, as well as fingerprints and several other electronic devices. This is because these facilities and infrastructure were submerged by the flood, and damaged because they could not be saved on the first day of the flood (Robbin & Coulter, 2007).

The impact of this flash flood disaster on the school environment has the potential to hinder the learning process. According to Sutanto (2020), this is seen from the educational aspect, one example of a flood that has inundated for several days will disrupt the teaching and learning process at school. Students who should be studying during school hours are replaced by cleaning classrooms that are dirty due to flood mud. This is because the implementation of disaster mitigation and emergency response program management at the school is still relatively lacking. The factors that inhibit disaster mitigation and emergency response are the lack of human resources, procurement of facilities and infrastructure and budget limitations at the school.

Method

This type of research is qualitative research. According to Creswell in Sugiyono (2014) qualitative research means the process of exploring and understanding the meaning of individual and group behavior, describing social problems or humanitarian problems. There are two types of data sources in this study, namely primary data sources and secondary data sources. Sugiyono (2014) stated that primary data sources are data sources that directly provide data to data collectors. Data source retrieval in this study uses purposive sampling. With purposive sampling, researchers can selectively select informants based on their roles, experiences, and involvement in disaster mitigation and emergency response programs at SMA Negeri 1 Sembakung and SMA Negeri 1 Lumbis. This technique ensures that the data obtained is relevant and in-depth, in accordance with the research objectives to understand how the program is managed and

implemented (Moleong, 2000). Meanwhile, secondary data sources are sources that do not directly provide data to data collectors. The primary data sources are the principal, teachers and staff. Meanwhile, the secondary data sources are data sources related to the research in the form of documentation of photographs of SMA Negeri 1 Sembakung and SMA Negeri 1 Lumbis, as well as inventory books, maintenance and disposal of facilities and infrastructure. Data analysis with the Miles, Huberman, and Saldana model. According to Miles et al. (2014) analysis consists of three simultaneous activity flows, namely: data condensation, data display, and conclusion drawing, as follows.

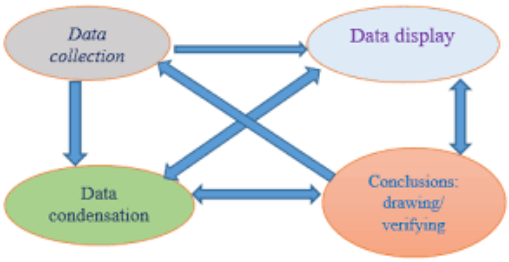

Figure 1. Interactive data analysis model

Result and Discussion

This study explores disaster mitigation and emergency response management in schools in Sembakung and Lumbis Districts, Nunukan Regency. The research findings highlight several challenges in implementing disaster mitigation management in the school environment, ranging from limited human resources (HR), lack of appropriate facilities and infrastructure, to budget constraints. The following are detailed discussions based on these findings.

Human Resources Readiness and Disaster Mitigation Training Programs

Interviews with principals and teachers at SMA Negeri 1 Sembakung and SMA Negeri 1 Lumbis revealed that the lack of structured disaster mitigation and simulation training programs is a significant obstacle. Limited understanding among teachers and students about disaster preparedness contributes to a low level of readiness. This aligns with Amri et al. (2017), who emphasized that simulation-based and interactive disaster education is effective in fostering preparedness. Additionally, Warto et al. (2002) reported that disaster education is often not systematically integrated into school curricula, leading to fragmented preparedness efforts.

Efforts to address these challenges include organizing routine simulation exercises involving all school members, as recommended by Mustari (2014). Schools should also collaborate with local disaster management agencies (BPBD) to ensure that teachers receive proper training and that students are familiar with evacuation procedures. Such initiatives can strengthen a culture of preparedness in schools.

Availability and Quality of Facilities and Infrastructure

Field observations indicated that most schools in Sembakung and Lumbis Districts lack adequate infrastructure to mitigate disaster risks. For instance, many schools have limited evacuation routes and no designated safe zones for floods or earthquakes. Heri et al. (2016) noted that many schools in disaster-prone areas fail to meet building standards for disaster resilience, making them vulnerable to structural damage during disasters.

To address these issues, Adiyoso (2018) stressed the importance of conducting regular risk assessments of school facilities in high-risk areas. Schools must prioritize retrofitting existing buildings to comply with disaster-resistant standards and establish designated safe areas for students and staff during emergencies. The construction of temporary learning spaces that can be quickly assembled post-disaster is another practical recommendation.

Community and Parent Participation

Effective disaster mitigation requires the active involvement of local communities and parents. However, in Sembakung District, low levels of community awareness and participation hinder preparedness efforts. Maryani et al. (2017) found that parental involvement in disaster simulations positively impacts overall community readiness.

Schools should strengthen their partnerships with local communities by hosting regular disaster education workshops and inviting parents to participate in school-based simulations. These activities can foster collective responsibility and enhance resilience. As noted by Usman (2014), involving parents and the broader community can lead to better-prepared households and stronger support networks during disasters.

Technology in Disaster Mitigation

Technological advancements, such as smartphone applications and early warning systems, have proven to be effective tools in disaster mitigation. Rahman (2020) demonstrated that mobile technology significantly improves the dissemination of evacuation instructions. However, the limited digital infrastructure in remote areas like Sembakung and Lumbis Districts restricts access to such innovations.

Long-term solutions include investing in digital infrastructure, such as internet connectivity and mobile

network coverage, as emphasized by Zahara (2019). Local governments should also promote the use of low-tech solutions, such as radio communication and SMS-based alert systems, to bridge the gap in technological access while infrastructure improvements are underway.

Post-Disaster Psychosocial Support

Post-disaster recovery often overlooks the psychosocial needs of students and teachers. According to Mulyadi et al. (2018), trauma from disasters can have long-lasting effects on students' mental health, impacting their academic performance and social interactions. Schools in Sembakung and Lumbis currently lack structured programs to provide psychosocial support after disasters.

The establishment of trauma recovery programs in schools is critical. This includes providing training for teachers on psychological first aid and collaborating with mental health professionals to support affected students. Poerwadarminta (1995) highlighted that early psychosocial intervention can significantly reduce long-term trauma impacts. Furthermore, integrating mental health education into the curriculum can help normalize discussions about emotional well-being and prepare students to cope with future disasters.

Strengthening Disaster Mitigation Policies in Schools

To create a sustainable and resilient school environment, disaster mitigation must be institutionalized through clear policies and guidelines. The Ministry of Education and Culture (Kemendikbud) should work closely with local governments to develop and implement comprehensive disaster risk reduction (DRR) frameworks tailored to regional risks. According to Hyogo Framework for Action (2005-2015), integrating DRR into education policies is a critical step in achieving community resilience.

Schools should also establish disaster preparedness committees comprising teachers, students, parents, and community representatives. These committees can oversee the implementation of disaster mitigation programs and ensure that preparedness efforts are sustained over time. Regular evaluations and updates of these programs are essential to address emerging risks and challenges.

Conclusion

This study concludes that the implementation of disaster mitigation and emergency response in schools in Sembakung and Lumbis Districts, Nunukan Regency, faces major challenges, such as limited human resources, lack of infrastructure, low community participation, and limited access to technology. A holistic approach is needed to overcome these challenges, through improving human resource training, strengthening school infrastructure, community participation, and utilizing technology and psychosocial support. Collaboration between the government, schools, and local communities is key to creating a resilient and safe educational environment.

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Author Contributions

Author contributions include R. and T.R.: collecting data, analyzing data, writing original drafts, methodology and review writing, and so on.

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Conflicts of Interest

The authors declare no conflict of interest.

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