Analysis of preparedness in dealing with volcanic eruption disaster, study case: SMPN 2 Ngemplak Sleman regency

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Abstract. In the region of Indonesia, several volcanoes are still active and can erupt at any time. Knowledge of volcanic eruptions is very important for residents around the volcano because it will be related to the preparedness of residents at the time of volcanic eruptions. If the knowledge and preparedness of the citizens are good, it will prevent so many victims. This study aimed to analyze students' levels of disaster preparedness in the face of catastrophic volcanic eruptions. The research used is a quantitative descriptive method with a research sample of 32 students of class VII SMPN 2 Ngemplak taken by cluster random sampling. The data collection techniques used are interviews, and questionnaires. Based on the results of the study, it can be concluded that the student preparedness index for each indicator of preparedness in the dealing of a catastrophic volcanic eruption is (1) knowledge and attitude 72.40 categorized ready, (2) emergency planning 59.38 categorized almost ready (3) early warning system 61.72 categorized almost ready and (4) resource mobilization is in the index 64.06 with almost ready category. So that the average index value of the four parameters of disaster preparedness of volcanic eruptions is 64.72 with the category almost ready. This research can be used as a basis for the development of teaching materials to help reduce the risk of volcanic eruptions.

1. Introduction

Indonesia is geographically located at three earth plate encounters: the Eurasian Plate, Indo-Australian Plate, and Pacific plate. So geographically many mountains are scattered throughout the region [1]. Volcanoes pose a significant catastrophic threat to Indonesia among other natural hazards, as Indonesia lies in a ring of fire. [12]. The existence of volcanoes scattered in Indonesia causes volcanic activity around the volcano area. Areas geographically close to the source of volcanic activity are at risk of volcanic eruptions [13]. Based on data from the National Disaster Management Agency, from the period 2011-2019 volcanoes erupted the most in 2018. Volcanoes that experienced eruptions include Anak Krakatau volcano, Sinabung volcano, Mount Merapi, and others [2]. Merapi is Indonesia's most active volcano, the 2010 eruption ranked third in the world from 2005 in terms of the impact caused and it is claimed that there were at least 386 deaths and more than 300,000 people evacuated [2,3].
Mount of Merapi is one of the volcanoes in Indonesia that is still active and can erupt at any time. Administratively Mount Merapi is located in 4 districts, namely Magelang Regency, Boyolali Regency, Klaten Regency, and Sleman Regency [4]. The increase in activity of Mount Merapi occurred in 2018, the status of level I (normal) rose to level II (alert) causing a radius of 3 km to be emptied, but there were no fatalities. Some areas affected by volcanic ash are Cangkringan, Pakem, and Ngemplak districts. [5].

The collapse of the lava dome on Mount Merapi caused the eruption of Mount Merapi dominated by pyroclastic flows. [6]. Volcanic eruptions can give rise to hot clouds, rock throws, heavy ash rains, lava flows and toxic gases, and cold lava [7]. People who are close to Mount Merapi are very vulnerable, so it is necessary to develop their awareness and preparedness when danger occurs. Disaster preparedness is an action to overcome disasters so that people can reduce risks and anticipate disasters through appropriate and effective knowledge and actions [8].

Preparedness is a series of actions or activities to reduce and anticipate the risks that occur due to disasters through proper implementation and measures [9]. Preparedness is very important and must be built in every community group, one of which is school. Schools are a platform to empower children and young people to understand the signs of disaster and the steps that must be taken as a form of disaster prevention to reduce the risk [10]. Education increases risk and risk reduction measures have relationships that can encourage students to think about the importance of preventive and preparedness measures to bridge the gap between knowing and acting according to their knowledge [11].

The school is one of the most important in terms of disaster education to its students. Knowledge of natural disasters and volcanic eruptions is important for students to know to have a disaster preparedness attitude that encourages schools to provide knowledge and understanding to students. Disaster education was one of the things that were true in the pre-disaster phase [16]. Children are one of the most vulnerable groups during and after disasters [21]. Disasters can damage children's physical and mental health. A school is a place where almost all children gather to learn, which can be a suitable place to prepare them for disasters with counseling or other activities in school [22]. The knowledge needed by students can be provided through classroom learning, one of which uses e-modules as teaching materials to help teachers deliver the material. Based on these problems, this study aims to analyze the level of disaster preparedness of SMPN 2 Ngemplak students to then be able to take action if it is known that the preparedness of students is low.

2. Methods

Ngemplak District is a disaster-prone area potentially affected by lava or lava floods and exposed to the expansion of hot clouds, then if there is a large eruption this area has the potential to be hit by falling material such as ash rain [15]. Thus, the disaster preparedness of volcanic eruptions is used to be able to help reduce the risks posed. The study used quantitative descriptive methods. The study was conducted at SMPN 2 Ngemplak with a research sample of class VII students who were taken cluster random sampling, the study used 32 respondents. The data collection techniques used are interviews and questionnaires. Data collection uses questions distributed to respondents that contain indicators of disaster preparedness, namely Knowledge and Attitude (KA), Emergency Response Plan (ERP), Early Warning System (EWS), and Resource Mobilization (RM).

The data analysis technique used is a percentage. The scores obtained were categorized based on aspects assessed to determine students' disaster preparedness levels in the face of overall mountain eruptions and analyzed using the average scores obtained using disaster preparedness index scores. Then a quantitative descriptive analysis of the four indikatorsof disaster preparedness is carried out. The questionnaire criteria were given "Yes" and "No", with scores of 1 for Yes and 0 for No. After calculations are then classified the level of preparedness of students based on the index values that have been adapted [14].

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\text{Percentage of value} = \left( \frac{\text{Total Score}}{\text{Highest Score}} \right) \times 100\% \tag{1}
\]
The classification of preparedness rates can be written as follows [14]

| Index Value | Category      |
|-------------|---------------|
| 80-100      | Very ready    |
| 65-79       | Ready         |
| 55-64       | Almost ready  |
| 40-54       | Less Ready    |
| <40         | Not Ready     |

### 3. Result and Discussion

Data from research obtained on the level of disaster preparedness of volcanic eruptions can be developed for further research on the disaster preparedness of volcanic eruptions. Catastrophic volcanic eruptions can occur at any time, but the signs can be known. Natural disasters volcanic eruptions have many impacts, including loss of life and loss of property. Natural disasters cannot be prevented but can be reduced in impact. One way to reduce the impact caused by volcanic eruption disasters is to know and understand disaster preparedness.

Based on this problem, this study aims to analyze the level of disaster preparedness of SMPN 2 Ngemplak students to then be able to take action if it is known that the preparedness of students is low. Based on the data obtained from respondents, he conducted an analysis. From the results of the analysis obtained the preparedness level of SMPN 2 students rejected the level of preparedness obtained from the results of the questionnaire showed that students in the category of Almost ready with an index score of 64.37 in the face of catastrophic volcanic eruptions. distribution of the four indicators of disaster preparedness can be seen in figure 2

![Figure 1. Distribution of index scores from each student's preparedness parameters in the face of catastrophic volcanic eruption](image)
Based on figure 2 about the level of disaster preparedness students against volcanic eruptions obtained the results of the four indicators observed in the form of knowledge and attitude of students towards disaster category Ready with a score of 72.40. In the second indicator, the emergency response plan obtained a value of 59.38 with the category almost ready. The third indicator of the disaster warning system obtained the Almost ready category with a value of 61.72. The last indicator is fourth, the mobilization of student resources obtained a category almost ready with a score of 64.06.

3.1. Knowledge and attitude
The results of the study preparedness analysis of knowledge and attitude indicators obtained the Ready category with a value of 72.40. Students already know the characteristics of the region that is prone to volcanic eruptions and the potential dangers. Students gain knowledge about the dangers of volcanic eruptions from schools, television, and information from social media. If students know the dangers posed by volcanic eruptions can plan the actions that must be done and can prepare to avoid eruptions. [17]. Knowledge about the dangers of volcanic eruptions can be obtained by students in schools, schools can convey information about actions and knowledge about the dangers of volcanic eruptions. Teachers can guide students to find information about volcanic eruptions on social media or other media.

3.2. Emergency Response Plan
Student preparedness analysis of emergency response plan indicators obtained the almost ready category with a score of 59.38. Some students already know the evacuation routes and shelter protections. However, some still do not know the evacuation route so it needs to be increased again. Schools have a role to play in providing information on where to get together when volcanic eruptions occur to reduce the greater risk. In the school, there are also medicines for first aid available in the school's Health unit. But students have never received training in simulated disaster response to volcanic eruptions. Research conducted [18] simulations can improve the ability to demonstrate disaster mitigation education efforts in elementary school students inserted into 4th grade IPS learning so that students can know pre-disaster conditions, disasters, and post-occurrence of natural disasters, especially volcanic eruption disasters.

3.3. Early Warning System
The results of the early warning indicator system analysis obtained a value of 61.72 with the category almost ready. Schools have early warning tools to convey information in the event of a disaster such as electric bells, bells, HT, and megaphones. However, some students do not know the early warning system owned by the school because they have not received technical guidance from the school's early warning system. An early warning system is needed so that the community can be better prepared for this disaster and can minimize the number of fatalities and property losses [19]. In addition to the early warning system, the mass media also acts as an early warning of disasters, mass media provide information about threatening dangers, with this warning the public can prevent damage and loss, be aware of the dangers that can occur at any time; Linking a news or media content can serve to increase mobilization and reduce threats to social stability to reduce public panic. Some students seek information about disasters through mass media such as television, and so on.

3.4. Resource Mobilization
The results of the analysis of resource mobilization indicators obtained a value of 64.06 with the category almost ready. Disaster mitigation materials are in class VII IPA lessons, but learning about disaster mitigation of volcanic eruptions has not been overemphasized. Disaster education integrated into learning is expected to form the character of students who are ready for disasters [20].

This data descriptive the level of student preparedness in the face of the disaster of volcanic eruptions, especially in SMPN 2 Ngemplak have obtained an average of the level of preparedness
almost ready. If students already have a ready attitude then when before, disasters occur, and after volcanic eruption disasters students already know what to do based on appropriate knowledge to reduce the risk. However, it is necessary to improve the disaster preparedness of learners in terms of the emergency response plans, by holding disaster response simulation training or educators can give more emphasis to IPA subjects, especially disaster mitigation materials by the characteristics of the local area. This research is expected to be a reference material for schools and local governments in disaster resilience planning.

4. Conclusion

From the description obtained the results of research that describes the condition of the level of preparedness for volcanic activity disasters obtained an index value of 64.37 classified as almost ready. The results were obtained from an analysis of 4 indicators of disaster preparedness, namely knowledge and attitude with the highest score of 72.4 (ready), emergency response plan with a score of 59.38 (almost ready), mobilization of resources with a score of 64.06 (almost ready), an early warning system with a score of 61.72 (almost ready). This research is a preliminary study for the development of the E-Module on Disaster Mitigation which is expected to improve disaster preparedness for students.

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