Preparedness of vocational high schools in the face of earthquake disasters in Lembang fault area, Indonesia

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Abstract. In the effort to reduce the risk of earthquake hazards in the Lembang Fault area, it is necessary to understand the level of preparedness in dealing with earthquake, especially for those who are in disaster prone areas. This study aims to find out the perception of high schools on the dangers of earthquake, as well as the preparation conducted by the schools such as campaign and simulation for preparedness if an earthquake happened, prepare a gathering point, prepare technological devices to provide earthquake disaster warnings to students, including preparation of school building resilience in facing earthquake happening in the Lembang Fault area. The result of this research indicates that the responses obtained from the interview conducted at SMK 45 Lembang and Pembangunan Negeri Agriculture Vocational High School Lembang identified that most of them know and aware that their own school is located within the Lembang Fault line and of the danger of earthquakes in the future. However, the schools have not done much preparation, including no earthquake hazard detection technology, there are also obstacles in the construction of earthquake resistant school standards that become one of the points of the lack of preparedness in dealing with earthquake disaster.

1. Introduction
Much of what we know about earthquake hazard adjustment comes from studies in geographic areas that have been prone to earthquakes for decades (e.g. California, Japan, New Zealand) [1]. Earthquakes have proven to be one of the most frightening and costly natural hazards, which represent a real and serious threat to infrastructure, population, economy, and social structure [2]. Cities located in earthquake prone areas are very vulnerable to disasters given that buildings are not designed to withstand earthquakes, people are not prepared, for example on what actions must be taken, before, during and after an earthquake, this is especially true in developing countries [3]. Earthquakes have a large impact on mortality in low and middle income countries [4]. Earthquakes can cause damage not only to residential buildings but also infrastructure elements such as roads, telecommunications, hospitals and schools [5]. We cannot predict earthquakes to prepare and reduce the danger that will occur [6]. The same goes in Indonesia, precisely in the Lembang area. Lately the Lembang area is being heavily reported about the existence of Lembang Fault which is likely to cause an earthquake in the future. The Lembang Fault is a fault in the earth that crosses from east to west in the north of the Bandung basin, for up to 29 kilometers. With a length of 29 km, this shows that the Lembang Fault could produce an earthquake of 6.5-7.0 Mw with a repetition time of 170-670 years [7]. The Lembang Fault shows clear geomorphic evidence of current activity and has long been considered active [7].
The occurrence of an earthquake cannot be prevented, but the impact of this disaster can be minimized by prior preparations to reduce the disaster [8]. Humans will never be able to conquer nature and can only live in it with a better relationship [9]. Disaster preparedness is a continuous process before a disaster occurs [10]. Individual preparedness plays an important role in reducing deaths and morbidity caused by disasters and there are many things that individuals and communities can do to prevent or reduce the consequences of disasters [11,12]. The underlying assumption in disaster management is that preparing populations for disasters by providing accurate and ongoing information and knowledge to potential populations at risk will reduce the likelihood of injury and death and improve the cost of damage to property and infrastructure when a disaster does occur [13]. Buildings located in seismic zones are prone to life-long earthquakes and their nonstructural elements can experience varying degrees of damage, which requires repairs or replacements to maintain the strength of the building to be more robust [14]. As a result, more attention has been paid to strategies to design facilities that are safe and resistant to earthquake damage [15]. Lembang Fault information must be conveyed to the public through education about what to do when an earthquake occurs. In an effort to reduce the risk of earthquake hazards in the Lembang Fault area it is necessary to understand the level of preparedness and perception of high schools in dealing with earthquake disasters, especially those in disaster prone areas. School is the first place to look for knowledge. Knowledge is a major factor and is the key to preparedness. Education can be regarded as a process that brings changes in people's behavior [16]. Education about earthquake disaster can increase public awareness, but the impact will not last long [17]. Likewise, education can increase knowledge about disaster risk and how to respond to these risks [18]. School is a place where vulnerable segments of society are located; therefore, it is very important that children and adolescents are protected as much as possible from the effects of earthquakes [19]. School development plans must be in accordance with circumstances that are directly related to the region and area where the school is in earthquake-prone areas. In 2006-2007, the United Nations International Strategy for Disaster Reduction (UNISDR) conducted a global campaign entitled Disaster Risk Reduction Beginning in Schools, with the support and contributions of all UNISDR system partners [20]. The previous studies revealed the preparedness in households in the Lembang Fault area, but no one has examined the earthquake preparedness in the school environment. This study aims to determine the perception of high schools about the danger of earthquake, as well as what preparations have been made by the school such as campaign to students at school, simulations for preparedness in the event of an earthquake, preparing a place for a gathering point in the event of an earthquake, preparation regarding technological devices to provide earthquake disaster warnings to students, including preparation of school buildings resilience in facing earthquakes in the Lembang Fault area. Because, the school building not only accommodates children throughout the day but also functions as an emergency shelter in a disaster and provides a storage place for books and technical equipment [21]. Community responses to hazards partly reflect their views on the risks associated with those hazards, although other variables are also important [22].

2. Research method

This study uses a grounded theory approach with Theoretical Sampling. The data collection is qualitative, because this method is suitable for the perspective of symbolic interactionism and grounded theory approach [23]. As is known, based on its purpose, qualitative research does not aim to make generalizations through numbers [24]. This study uses structured interviews that begin with basic questions about knowledge of earthquakes and Lembang Faults to questions about the preparation and anticipation of earthquakes in the Lembang Fault area, which are expected to achieve the research objectives. Each question in the interview will be a benchmark in the results obtained [25]. The study was conducted at SMK 45 Lembang and Pembangunan Negeri Agriculture Vocational High School Lembang. These schools were chosen because they are located within the Lembang Fault line and precisely on the slopes of mountains and cliffs, thus these schools are highly likely to experience earthquake in the future.
The data in this study were obtained from the results of a survey and in-depth interviews with teachers in SMK 45 Lembang and Pembangunan Negeri Agriculture Vocational High School Lembang. The researcher interviewed two teachers, namely one female biology teacher and one male productive teacher in SMK 45 Lembang and one deputy headmaster in Agriculture Vocational High School Lembang as research object sample in order to get more specific and in-depth data results. Each teacher was interviewed with at least 12 questions regarding the knowledge on Lembang Fault, the impact of Lembang Fault on earthquake, preparation of emergency equipment in the event of an earthquake, including school buildings that had been prepared or not prepared to reduce damage by being designed as earthquake resistant buildings. The questions emphasized in this research are "In this school has there been any campaign on Lembang Fault and earthquake preparedness?", "Has there been a simulation in this school for earthquake preparation?" and "Has this school prepared gathering point or evacuation routes as an anticipation for the occurrence of earthquakes?".

Data were obtained in the form of record archives and notes at the time of the interview. Evaluation of data collection tools was done by analyzing the content of qualitative analysis method [24]. The results of the analysis were obtained in the form of a description. As is known, based on its purpose, qualitative research does not aim to make generalizations through numbers [24]. The analysis was carried out based on the responses of one teacher at SMK 45 Lembang and two teachers at Pembangunan Negeri Agriculture Vocational High School Lembang. This data collection takes place from May 2019 to June 2019.

3. Result and discussion

3.1. SMK 45 Lembang

From the results of interviews conducted at SMK 45 Lembang, it can be concluded that this school is already aware of the location of the school which is located within the Lembang Fault line and also aware of the danger of earthquakes in the future. To anticipate this, SMK 45 Lembang has made preparations to deal with this earthquake disaster, one of which is by holding campaign to students to introduce the dangers of earthquake. In addition to conducting campaign for earthquake preparedness, the school is currently constructing new buildings with construction standards to withstand earthquakes. As for evacuation routes or gathering points in the event of an earthquake, the school has provided a large field near the parking area and the main gate as in Figure 1. The evacuation site in the picture has not been tidied up because near the field for evacuation construction is underway to construct school buildings with earthquake resistant standards.

![Figure 1. Field area as a gathering point in SMK 45 Lembang.](image)

Implementation of simulations on students has never been done and the installation of signs for warning of danger has not been done. The same goes to the technological devices to detect earthquake warnings.
to students which have never been installed and implemented at this school. Earthquake hazard detection technology is very important because we as humans cannot predict in detail the occurrence of earthquakes. The main reason why we cannot predict earthquakes is because we cannot monitor the stress and strain conditions of rocks a few kilometers below the surface where the focal point is [10].

3.2. Pembangunan Negeri Agriculture Vocational High School Lembang

From the results of interviews conducted at the Pembangunan Negeri Agriculture Vocational High School Lembang, it can be concluded that in this school there has been an awareness of the existence of the school within the Lembang Fault line and the impact of this Lembang Fault, namely the occurrence of earthquakes. However, from the school there is no action to prepare in the event of an earthquake in the future. The campaign, simulation and installation of signs for hazard warning to students has never been done. As the evacuation routes or gathering points when an earthquake occurs, the school provides a field in front of the school area as shown in Figure 2. The field used as a gathering point is a large area close to a parking lot and oftentimes being used as a parking lot by several teachers there, and there is also a basketball court which serves as a meeting point close to the parking area.

![Figure 2. Field area as a gathering point in Pembangunan Negeri Agriculture Vocational High School Lembang.](image)

The school buildings here also have not been designed as earthquake resistant school buildings. Thus, these schools are highly vulnerable to the existing earthquake hazards and vulnerable to potential future earthquakes, which can cause severe infrastructure damage and the death of students and teachers [26]. Earthquake hazard warning technology has never been implemented in this school. One of the teachers stated their willingness to integrate earthquake responsiveness in the design of earthquake-resistant buildings, which relate with government financial aid and the complicated submission process of the construction, therefore, there had to be support from the government itself. Thus, one of the teachers quoted "Disaster responsiveness is being promoted by BMKG and various fields, maybe the government should also concentrate on us, concerned with development of buildings in accordance with earthquake resistant standards". Likewise they also asked for support for the involvement of students in the campaign and simulation to the government and relevant parties and the government for conducting disaster awareness campaign and simulation.

This study has several limitations, since this study is qualitative, it does not measure the representation of the model in the wider population, also in the selection of people interviewed, there may be some who are excessive in expressing perceptions and interest in an earthquake and preparedness [27]. Although qualitative analysis does provide confirmation of the validity of the model, this analysis also identifies ways in which it can be revised. For example, qualitative analysis shows that including measures or salience and mistrust as predictors can provide benefits [28]. The government and related
parties can assist in counseling or campaign to every vocational school in the Lembang Fault line. Future research should focus on the process of capacity building through the act of relaying information to better prepare for disasters [29].

4. Conclusion
This study found that most schools were aware of the dangers of earthquakes and knew the location of the schools are within the Lembang Fault line, but there were obstacles in the construction of schools in accordance with earthquake resistant standards which becomes one of the points of the lack of preparedness in dealing with earthquake disaster in the Lembang Fault area. Private Vocational High Schools were a bit more prepared in dealing with earthquake disasters, and campaign has also been carried out several times in the private school SMK 45 Lembang. As for public Vocational High Schools such as in the Pembangunan Negeri Agriculture Vocational High School Lembang, most have not been prepared for earthquake disaster management due to many obstacles regarding counseling or campaign as well as construction of earthquake resistant school buildings that are related to the government and related education agencies. The technology in warning about the danger of earthquake disaster in these two schools has never been implemented. If an earthquake occurs, the ability of people to cope, adapt and recover quickly and effectively will be greatly influenced by the extent to which they have developed the resources and competences needed to carry out for preparedness before an earthquake occurs [30].

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