The preparedness of schools in dealing tsunami disaster threat in Pacitan coastal bay, Pacitan regency

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Abstract: Schools are responsible for ensuring the safety of students if a natural disaster occurs during school hours. Besides, schools can implement disaster management towards the natural hazard in the form of effective preparedness so that the school's resilience to disasters has been successfully improved. This study was aimed to determine the level of preparedness of students, teachers, and schools in dealing with the tsunami in Pacitan Bay, Pacitan Regency. The data collection method was done by filling out questionnaires and interviewing respondents participated by 165 students and 39 teachers conducted in 11 schools in the Pacitan regency using a purposive sampling technique. The data analysis method was descriptive qualitative. The results showed that there were differences between schools especially in the matter of preparedness. School preparedness is influenced by knowledge, emergency planning, resource mobilization, early warning systems and school policies and the geographical location of the school. However, the level of school preparedness in Pacitan Bay which plays an important role is school policy. School policies in Pacitan District 36% are included in the low category, so there is a need for an increase in disaster preparedness policies in schools.

1. Introduction
The Eurasia plate collides directly with the Indo-Australian plate in the West where the meeting points are in Indonesia and so is on the East side is a meeting of three plates namely the Philippines, Pacific and Australia plates [1]. In this regard, Indonesia rich in natural resources and an unstable tectonic region in the world, which has the potential of natural disasters such as earthquakes, tsunamis, landslides, and volcanoes. Besides, Indonesia's vulnerability in the matter of subduction’s effect is believed to be increasing with global climate change and the rate of population along with existing plurality [1].

The number of disasters that occurred in the world at the beginning of the 21st century, as many as 168 countries, including Indonesia, realized how important it was to immediately build a global commitment in disaster risk reduction [2]. These efforts were then written down into the Hyogo Framework Action in 2005. Since the tsunami in Aceh and Indonesia's commitment to the Hyogo Framework for Action has made the Indonesian people aware of realizing national commitments in mitigation, namely listed and ratified in Law Number 24 in the year of 2007 concerning Disaster Management. The law explains that everyone has the right to get education, training, recovery, and skills in the implementation of disaster management, both in situations where there are no disasters and is there a potential disaster [1].

Sendai Framework for Disaster Risk Reduction in the year of 2015-2030 (SFDRR) adopted a third conference of the United Nations on World Conference on Disaster Risk Reduction (WCDRR) on 15 March 2015 in Japan, supporting a comprehensive school security framework consisting of three pillars; 1) safe school facilities, 2) effective school disaster management, and 3) disaster risk reduction and
resilience education [4]. Disaster education programs for children contribute to making a great change in mentality and perception so does for behavioral changes towards more proactive prevention of disasters [5].

By reducing the impact of disasters, minimizing spiritual and material losses experienced is the basis of education for every individual in the community. A good education can provide success in facing disasters [6]. The SFDRR integrates education into the objectives of Disaster Risk Reduction (DRR) through school disaster management. Study on school-based disaster management, stated that schools have a responsibility to provide adequate disaster management education, foster awareness of community disaster management, and strengthen community disaster management capabilities. Every school is expected to have safety planning from mitigation, prevention and preparedness, responses and recovery procedures [7].

Schools can have an effective role in reducing the impact of natural disasters on all students and families who are among the most vulnerable [2]. The present study in New Zealand illustrates how school disaster education programs increase knowledge and preparedness among students [8]. In addition to their primary role as providers of education, the school principals also have a responsibility to ensure that students are given a safe learning environment and protection of emergencies when students are in school [9]. This is expected to play a role in supporting the national disaster preparedness program as prioritized in the Hyogo Framework for Action (HFA).

An international study has identified general weaknesses related to school preparedness including emergency planning varies greatly between schools and other regions, so there is a need for school integration in disaster management planning that can cover all students including the most vulnerable [10]. National policies, as well as regulations, can potentially develop regional regulations or governor instructions that allow schools to implement disaster education and safe school activities [10]. The main issues regarding the implementation of DRR education in Indonesian schools relate to policies on DRR education in Indonesia, teacher awareness of and access to DRR education material; teacher capacity for implementing DRR education in schools; partnerships between schools and other stakeholders; lack of a place for teachers to share experiences related to the natural disaster, successes, as well challenges; special personnel and budget; and children's participation in DRR education and actions [11]. As a result of this variation in preparedness, not all schools have the ability to respond effectively to activity emergencies to ensure students' safety.

Based on geographical, Pacitan is closed to the coast support for disaster preparedness [12]. The coastal area of the Pacitan Bay there were seismic gaps due to the tsunami that occurred in the year of 1994 and 2006 [13]. In line with this, school preparedness is becoming important to do since it has effectively impact knowing the natural hazard in Pacitan Bay. Schools become effective institutions in changing people's mindsets and behavior, by providing education on disaster preparedness. It is expected that children apply the knowledge acquired and become participants who can build a disaster-conscious mindset in their environment so that a resilient community can face it. Therefore, the education related to the disaster preparedness can be one of a recommendation of government policy. Concerning that, the researcher is interested in conducting the study under the title "The Preparedness of Schools in Dealing Tsunami Disaster Threat, in Pacitan Coastal Bay, Pacitan Regency".

2. Methods
This is a descriptive qualitative study by using data in the form of words or actions while others are additional data. This study seeks to describe school preparedness in the Pacitan Bay towards tsunamis obtained from the questionnaire as its data instruments and in-depth interviews to obtain more complex results of the study to obtain better study results.

2.1. Research Area
This study used a unit of analysis in the form of an administrative in Pacitan Regency which is located in the Pacitan Bay. Based on Figure 1, tsunami-prone areas include Sidoharjo Village, Sirnobo
Village, Ploso Village, Kembang Village, and Baleharjo Village. Based on Figure 2, the address of schools for study based on its location that is in tsunami-prone areas.

Figure 1. Map of The Tsunami Prone Zone

Figure 2. Map of Area Locations

2.2. Sampling
An education unit in the categories of elementary, middle and high school in Pacitan Regency participated in the study. The samples of this study were schools in tsunami-prone areas including
Baleharjo Village, Ploso Village, Kembang Village, Sidoharjo Village and Sirnobooyo Village with a purposive sampling technique. The participants of this study were school managers, teachers, and students where the participants for school managers were either their principal or vice-principal. The elementary school grade 5, the junior high school grade 8, and the high school grade 11 have participated as their students respondent. The selection is based on considerations: (1) the activity regards the disaster management education does not interfere with learning activities. The upper-class students for grade 6, for grade 9 and so for grade 12 may be preoccupied with several activities related to school exam preparation and national examinations, and (2) if there are future monitoring and evaluation of the level of student preparedness, the participants will be the same. In this regard, this study was conducted in 11 schools which included 6 elementary schools, 2 junior high schools, 2 high schools, and 1 vocational school. With the number of participants as follows:

| No. | School                  | Teacher | Student |
|-----|------------------------|---------|---------|
| 1   | MIN 3 PACITAN          | 3       | 21      |
| 2   | SD ALAM                | 4       | 23      |
| 3   | SDN 2 PLOSO            | 3       | 15      |
| 4   | SDN KEMBANG            | 4       | 15      |
| 5   | SDN 2 SRNNOBOYO        | 2       | 13      |
| 6   | SDN 3 SRNNOBOYO        | 3       | 9       |
| 7   | SMPN 1 PACITAN         | 5       | 15      |
| 8   | SMPN 3 PACITAN         | 4       | 15      |
| 9   | SMA NEGERI I PACITAN   | 5       | 18      |
| 10  | SMAS MUHAMMADIYAH PACITAN | 3   | 13      |
| 11  | SMK BINA KARYA         | 3       | 8       |

Total 39 165

2.3. Data Collection
The data collection technique in this study was by questionnaires and interviews with students, teachers, principals by ticking questions yes or no related to the five preparedness parameters. Questionnaires are systematic to a large number of people about a variable that concerns background, behavior, trust, and attitude [14].

2.4. Data Analysis Technique
Data analysis technique in this study is based on five parameters stated by LIPI - UNESCO/ISDR (2006), namely 1) knowledge, attitude, and practice (KAP) of the earthquake and tsunami phenomena as well disaster risk; 2) Policy Statement (PS); 3) Emergency Response Plans (EP); 4) Warning System (WS) of disaster; and 5) Resource Mobilization Committee (RMC) [15]. The school preparedness index is obtained from the combined number of indexes of each parameter for students, teachers, and schools by:

\[
\text{Student & Teacher Index} = \left( \frac{\text{total score real parameter KAP}}{\text{maximum score parameter KAP}} \times 100\% \right) + \left( \frac{\text{total score real parameter EP}}{\text{maximum score parameter EP}} \times 100\% \right) + \left( \frac{\text{total score real parameter WS}}{\text{maximum score parameter WS}} \times 100\% \right) + \left( \frac{\text{total score real parameter RMC}}{\text{maximum score parameter RMC}} \times 100\% \right)
\]

\[
\text{School Index} = \left( \frac{\text{total score real parameter PS}}{\text{maximum score parameter PS}} \times 100\% \right) + \left( \frac{\text{total score real parameter EP}}{\text{maximum score parameter EP}} \times 100\% \right) + \left( \frac{\text{total score real parameter WS}}{\text{maximum score parameter WS}} \times 100\% \right) + \left( \frac{\text{total score real parameter RMC}}{\text{maximum score parameter RMC}} \times 100\% \right)
\]

3. Result and Discussion
School preparedness scores obtained from school components like students, teachers, and the school itself, by measures preparedness parameter consists of knowledge, emergency planning, warning system, resource mobilization capacity, and school policy. For school to be stated prepared to response
a disaster, it has to have high score on the parameter, that because all aspects of preparedness are interconnected.

**Table 2. Research Data**

| No. | School                  | Student KAP | Student EP | Student WS | Teacher KAP | Teacher EP | Teacher WS | RMC | School KAP | School EP | School WS | School RMC |
|-----|-------------------------|-------------|------------|------------|-------------|------------|------------|-----|------------|------------|-----------|-------------|
| 1   | MIN 3 PACITAN           | 77.3        | 58         | 52         | 8.00        | 79         | 73         | 98  | 35         | 61         | 12        | 54.17       |
| 2   | SD ALAM                 | 76.0        | 79         | 82         | 76.36       | 61         | 80         | 80  | 71         | 40         | 38        | 75          |
| 3   | SDN 2 PLOSO             | 84.6        | 81         | 85         | 72.00       | 84.8       | 88         | 90  | 89         | 90         | 92        | 100         |
| 4   | SDN KEMBANG             | 61.8        | 72         | 57         | 35.56       | 79         | 72         | 53  | 28         | 25         | 38        | 12          |
| 5   | SDN 2 SIRNOBOYO         | 61.9        | 62         | 34         | 24.61       | 88.3       | 88         | 80  | 64.29      | 40         | 61        | 81          |
| 6   | SDN 3 SIRNOBOYO         | 80.2        | 77         | 78         | 60.87       | 84.3       | 86         | 88  | 89.29      | 20         | 77        | 75          |
| 7   | SMPN 1 PACITAN          | 80.1        | 78         | 58         | 40.00       | 88.9       | 69         | 75  | 33.93      | 35         | 77        | 62          |
| 8   | SMPN 3 PACITAN          | 73.6        | 77         | 52         | 48.00       | 69.1       | 63         | 57  | 62.5       | 20         | 38        | 31          |
| 9   | SMA NEGERI I PACITAN    | 81.5        | 75         | 68         | 61.11       | 78.6       | 77         | 68  | 51         | 15         | 61        | 19          |
| 10  | MUHAMMADIYAH PACITAN    | 81.9        | 84         | 26         | 71.11       | 67.8       | 48         | 42  | 43         | 35         | 69        | 19          |
| 11  | SMK BINA KARYA          | 80.0        | 71         | 21         | 72.50       | 74.4       | 69         | 39  | 31         | 0          | 31        | 6           |

**Description:**
- KAP : Knowledge and Attitude
- PS : Policy School
- EP : Emergency Planning
- RMC : Resource Mobilization Capacity
- WS : Warning System

**Figure 3. School Preparedness**

Based on research results that has been done at Pacitan Bay, it can be explain that average results of knowledge about disaster preparedness are 76.5% for students index and 80.7% teachers index, as for emergency planning 74.2% for students index, 76.3% for teachers index, and 60.1% the school index, as for warning system shows 61.5% for students index, 69.8% for teachers index, and 51% the school index, next is resource mobilization capacity that shows 53.4% for students index, 63.9% for teachers index, and 53.4% the school index, and last school policy shows 36%.

This research results, which is conducted to 11 schools, shows that they have different disaster preparedness. As shown in Picture 3, it shows the sum of all 5 components of preparedness parameter from students, teachers, and the school. The results show there are 3 schools which has highest score,
they are SDN Kembang, SMA Muhammadiyah Pacitan, and Sekolah Alam Pacitan. While 3 others schools have the lowest score, they are SMK Bina Karya, SDN 3 Sirnoboyo, and SMPN 3 Pacitan. The other 5 schools have average to high disaster preparedness score.

School which has highscore in disaster preparedness shows that the citizens of the school (in this case students and teachers) has knowledge about disaster preparedness. Knowledge giving will improve disaster preparedness awareness and behaviour to reduce the impact of a disaster [16].

3.1. Effect of Geographical on School Preparedness

Person who lived within distance of <1 km from the coast should have awareness of disaster preparedness [12]. Geographical location is one of the key predictors of the adoption of precautionary measures. Because of that schools that reside in prone area tend to has awareness about precautionary measures to face a disaster. Schools that has highscore on disaster preparedness based on geographical location that is, SMA Muhammadiyah Pacitan has a distance of 2000 meters from Pacitan bay, as for SDN Kembang has a distance of 1000 meters from Pacitan bay, and next Sekolah Alam Pacitan has a distance of 800 meter from Pacitan bay. On the other side, there are schools that has lowest score, compare to the first school mentioned, based on geographical location that is, SMK Bina Karya has a distance of 500 meters from Pacitan bay, it’s included in close category. SDN 3 Sirnoboyo has a distance of 1500 meters from Pacitan bay and near to Grindulu river. Next SMPN 3 Pacitan has a distance of 1000 meters from Pacitan bay. Another schools like SDN 2 Ploso has a distance of 800 meters from Pacitan bay and close to Grindulu river. MIN 3 Pacitan has the closest distance to the Pacitan bay that is less than 500 meters. SDN 2 Sirnoboyo has a distance of 1500 meters from Pacitan bay still on the west side of it there is Grindulu river. SMP Negeri 1 Pacitan has a distance of 2000 meters from Pacitan bay. SMA Negeri 1 Pacitan has a distance of 1000 meters from Pacitan bay.

When affected by a disaster people, community, or even an organization will understanding of the devastation that disasters can create and hence obtained knowledge of what they can do to minimize the risk of harm [17]. Because of that, few of the school policies change accordingly to the event that has happen in Indonesia that resemble their own area, such as tsunami (in this case for area like Pacitan). Few schools which even though not reside in the prone area follow to enforce policies about disaster preparedness in theirs. Schools with a long distance to the coast and still has highscore on disaster preparedness, such as SMA Muhammadiyah Pacitan. That is because SMA Muhammadiyah Pacitan ever been a Disaster Tough Elementary School that being held by Muhammadiyah. Another school with highscore is SDN Kembang, that is because they had have socialization by BPBD because their school’s location is pretty close to the Pacitan bay. While Sekolah Alam Pacitan included in category of highscore on disaster preparedness because they have a different curriculum with another general school. Sekolah alam Pacitan has an Environmental Education subject in which contains lessons that study how to survive in emergency situation if tsunami ever occur. This matter indirectly shows there are disaster education integration in the school subjects. It needs for regional regulations which can be school efforts to include disaster education in the school's annual plan to be implemented [10].

Schools with low score, it because the lack of knowledge about tsunami, given to students and there are not yet lessons to discuss disaster. Just like SMK Bina Karya which dominated by male students and included in school that close to the Pacitan bay. In this school there are no knowledge of disaster that associated with subjects in the school. Because of that, SMK bina Karya has a low disaster preparedness score, eventhough how close the school to the Pacitan bay. Different with SDN 3 Sirnoboyo which included in schools that has moderate distance to the Pacitan bay and has low disaster preparedness score. That is because in the school, their students, teachers and even the school itself, they lack of knowledge. Another factor that is most of the resident around there has a job as a fisherman. SMP Negeri 3 Pacitan included in schools that has low disaster preparedness score and distance of the school location to the Pacitan bay is moderate. That is because lack of knowledge and school policies in integrating disaster knowledge with subjects.

According to the results of UN Conference, March 2015, about comprehensif school safety (CCS) framework that is composed of three pillars 1) safe school facilities; 2) effective school disaster management; and 3) disaster risk reduction and resilience education [18]. Because of that, few schools
start to enforce policies about disaster response school. The educational component could be
accomplished through changes in education policy and practices aligned with disaster management at
national, regional, district and local school site levels [19]. Few schools that has enforce the policies is,
MIN 3 Pacitan. MIN 3 Pacitan is school that has been programmed to become elementary school free
of disaster by regional BNPB in 2016. Location of the MIN 3 Pacitan is the closest to the Pacitan bay is
the one reason this school get selected to do the program. Based on the research results not included in
schools that has high disaster preparedness score, that is because of the school not yet have their own
policies to integrating subjects or extracurricular with disaster preparedness knowledge, even though
they have had program school free of disaster.

Knowledge given to students, teachers, and all of the school citizen, are importenat to give sense of
security and increase the possibility of school citizen to survive through a disaster if ever come. Previous
research shows students who were given disaster preparedness training by the school and were
monitored about their disaster response, all survived the disaster [20].

4. Conclusion

Based on the results of the analysis and discussion that has been described, it can be concluded as
follows: The level of school preparedness is influenced by 5 aspects, that is knowledge, emergency
planning, resource mobilization capacity, warning systems, and school policies. In addition, it is also
influenced by the geographical location of schools in disaster-prone areas such as the coastal region.
However, the level of school preparedness in Pacitan Bay which plays an important role is school policy.
The distance to schools near or far from Pacitan Bay only slightly affects the level of school
preparedness. The most important thing is that there is a school policy, schools can provide
comprehensive knowledge of disaster to the school component and on an ongoing basis. In fact, almost
all schools do not have school policy on disaster knowledge. Thus, the suggestion to improve and
sustainability is that the government plans school policies on disaster education in each school. Schools
holds disaster training a year with the local government. The teacher increases disaster knowledge by
attending workshops. For researchers to review further school preparedness with the collaboration of
the local government.

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