The role of education and geography on disaster preparedness

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Abstract. The preparedness of disaster is important to be socialized as Indonesia is one the most disaster-prone are. One way to improve this preparedness is through education. The purpose of this study is to analyse the school curriculum relating to the disaster preparedness and to find out the way disaster material delivered by the teacher. The method used was descriptive qualitative. The data gained through documentation, literature review, and interview. The result shows that disaster material was not optimally discussed in the school curriculum. The teachers’ understanding of the material were also considered as low. They also did not use various learning media to give the understanding to the student of the importance of disaster preparedness.

1. Introduction
News of disaster always becomes the popular topic discussed in the newspaper, radio or television. It sometime raises the question of why it occurs and how great the impact are. In respond to this question, the relation between space and time needs to be understood. Space basically deals with location, natural setting and its population. It becomes the place that can dig out the cause of disaster as well as its impact to the other areas. Space along with earth and its population is a system that is unseparated. Geography is the study of earth, a bridge that connects natural science and social science. It considers earth and human as a whole system, geography studies relation between society and the natural environment. It gives comprehensive and integrative comprehension of natural and human dynamics, including adaptation and anticipation [1].

Indonesia is one of the most disaster-prone countries in the world [2]. This is because six factors include 1) Indonesia is crossed by three tectonic plates are potential areas for earthquake, 2) Indonesia has ± 127 active volcanoes, and high-slope areas (such foothills) that are prone to landslide, 3) Indonesia is an archipelago with the second longest coastline in the world and potential for tsunami, 4) It has tropical climate that triggers flood, extreme flood, drought, land and forest fire, and abrasion, 5) Most of Indonesian’ population lives near the river, lake, and cost, they also live in foothills, 6) The preparedness of Indonesian’ people to disaster are very low [3-6]. There are four aspects as the cause of disaster in Indonesia. Those are geologically, geographically, sociologically, and pedagogically [7]. Geologically, Indonesia is located between Asia, Pacific, and Australia plates. Geographically, as island and maritime country, Indonesia people are spread unevenly. Many of them stayed in mountain and water area, such as river and coastal area. Sociologically, Indonesia has multi-ethnics and cultures. Then, pedagogically, many of Indonesia people are categorized as low education and low economics people.

The National Disaster Management Agency (BNPB) predicts that there will be more than 2,500 disaster in 2019, especially in Indonesia. This number decreased from 2,862 disasters in 2018 [12]. Every month, there are ± 500 earthquakes of 127 volcanoes, one is on warning level, four are on alert level, and sixteenth are on standby level. Based on U.S Geological Survey (USGS), 80% earthquake occurred along the Pacific ring of fire. This ring of fire has a long fracture zone from Chile, Japan, to
Southeast Asia including Indonesia. As a consequence, earthquake frequently hit Indonesia. This disaster have caused various damages and losses. Therefore, it must be anticipated, avoided, and controlled. Based on the above condition, education of disaster needs to be given to the Indonesian people. The aim is to increase their understanding of disaster risk as well as improve their preparedness. School as a formal institution has a key role in forming this understanding, comparing the project based training given by various institutions. The role of geography subject, in this case, cannot be ignored. It has been called "the world discipline". Geography is divided into two main branches-human geography and physical geography [8]. A natural disaster may be defined as the effect of natural hazards which leads to human, environmental or financial losses. This paper aims to examine the government policies in disaster education, the extent to which disaster material presents in the school curriculum, and how geography teachers teach disaster material at primary and secondary school.

2. Methods
The method used in this paper was descriptive qualitative. Data were collected through literature studies, documentation and interviews with primary and secondary geographic teachers. Literature study is conducted to discover the rules and policies of disaster in Indonesia. It also aimed to investigate the contribution of geography on disaster. Meanwhile, documentation was used to find out the materials of disaster in in school curricula. Various researches related to this paper were also collected to see the school and government response if schools disaster and emergency preparedness were built. Concerning the interview, 15 primary and secondary geographic teacher were chosen as the interviewees. They had to give their opinion about disaster learning. The result of the interview was then clarified by the data taken from disaster mitigation learning at schools. The result was then analyzed descriptively.

3. Results and Discussion
3.1 Disaster education policies in Indonesia
As a disaster-prone country, Indonesia forms the Law on Management Disaster No 24 of 2007, this law regulates not only disaster recovery, but also prevention, mitigation, and community preparedness [9]. In line with this, the government also make the Regulation Number 21 Year 2008 of Disaster Management. Article 3 on this regulation notes that the implementation of disaster management covers pre-disaster, emergency response, and post-disaster. The regulation also explains that disaster management plan is carried out by a non-governmental government, BNPB. Article 6 (4) notes that the preparation of a disaster management plan is coordinated by BNPB for the national level and Regional Disaster Management Agency (BPBD) for regional level. Regarding this, Minister of Domestic Affairs Regulation No. 33/2006 concerning General Guidelines for Disaster Mitigation regulates more specifically the role of the Disaster Management Agency in order to avoid the overlapping duties.

BNPB has a vision of "Resilience of the nation in dealing with disasters. Actually, the awareness of disaster prone has been realized by the Indonesian people since 1945, but limited to the handling of victims of the independence war. On August 20, 1945 Indonesia had a Family Assistance Agency for War Victims (BPKKP). In 1966, the Government formed Central Natural Disaster Management Advisory Agency (BP2BAP) through Presidential Decree Number 256 of 1966. The person who is responsible for this institution was the Minister of Social Affairs. BP2BAP is more focused on emergency response and disaster victim assistance, has not involved yet to overcome, cope with and improve disaster preparedness. In 1967, the Cabinet Presidium issued Decree Number 14 / U / KEP / I / 1967 which aimed to form a National Disaster Management Coordination Team (TKP2BA). In 1979, a National Coordinating Board for Natural Disaster Management (Bakornas PBA) was formed, chaired by Ministry of Economic Affair and People’s Welfare (Menkokesra) through Presidential Decree Number 28 of 1979. As an operational interpretation of the Presidential Decree, the Ministry of Home Affairs with instruction No. 27 of 1979 formed the Coordinating Unit for the Implementation of Natural Disaster Management (Satkorlak PBA) in each province. This is because disasters are not only caused by natural factors, but also non-natural and social factors. The example of non-natural disasters are such as transportation accidents, technological failures, and social conflicts.
In 1990, the National Coordinating Board for Natural Disaster Management became the National Coordinating Board for Disaster Management (Bakornas PB). Through Presidential Decree No. 43 of 1990, the scope of Bakornas PB duties was expanded and not only focused on natural disasters but also non-natural and social. This is reaffirmed by Presidential Decree No. 106/1999. Disaster management requires coordinated cross-sectoral, cross-sectoral and cross-disciplinary management. In 2000, Indonesia experienced an economic crisis that caused other crises such as displacement. PB National Bakornas was later developed into the National Coordinating Board for Disaster Management and Refugee Handling (Bakornas PBP). The policy was contained in Presidential Decree Number 3 of 2001 which was later updated with Presidential Decree Number 111 of 2001. In 2005, the tragedy of the earthquake and tsunami in Aceh encouraged the Government of Indonesia to seriously deal with disasters by issuing Presidential Regulation No. 83 of 2005 concerning National Disaster Management Agency (Bakornas PB). This body has a coordinating function that is supported by a daily implementer as an element of disaster management. Accordingly, the paradigm approach to disaster risk reduction is a major concern. Since now BNPB has issued SOPs in handling disasters such as:

a. Regulation of the Head of BNPB No.7 of 2008 concerning Procedures Guidelines for Providing Assistance to Fulfil Basic Needs.
b. Regulation of the Head of BNPB No.9 of 2008 concerning the Permanent Procedure of the National Disaster Management Rapid Response Team.
c. Head of BNPB Regulation No.13 of 2008 concerning Guidelines for Logistics Management and Disaster Management Tools.
d. Head of BNPB Regulation No.12 of 2010 concerning Mechanisms for Providing Emergency Repair Assistance.
e. Head of BNPB Regulation No.13 of 2010 concerning Guidelines for Searching, Relief and Evacuation.
f. Head of BNPB Regulation No.14 of 2010 concerning Guidelines for the Establishment of Disaster Emergency Response Command Post.
g. Head of BNPB Regulation No.24 of 2010 concerning Guidelines for Preparation of Disaster Emergency Operation Plans.

In the Government Regulation of the Republic of Indonesia Number 21 Year 2008 regarding the Implementation of Disaster Management, Article 4 states that disaster management covers the pre-disaster stage (situation of no disaster and potential for disaster), emergency response and post-disaster. In Article 5, it is stated that in case disaster does not occur, the activities that should be done are:

a. Disaster management planning;
b. Disaster risk reduction;
c. Prevention;
d. Integration in development planning;
e. Requirements for disaster risk analysis;
f. Implementation and enforcement of spatial plans;
g. Education and training; and
h. Technical standards for disaster management.

Informally, BNPB has disseminated disaster information through the journal "Disaster Management Dialogue" and books about disaster data in Indonesia from 2009 to 2017. In addition, there are also the catalogue of village that are prone to disaster such as drought, tsunami, flood and landslide disaster books; and books Disaster pocket in 2019. These journals and books can provide information of disaster, but its readability by the community including teachers and students has not been investigated yet. Formally, Circular of Minister of National Education Number 70a / MPN / SE / 2010 underlies disaster education in schools. The content of this circular are:

a. Implementation of disaster management needs to be done in schools through the implementation of disaster risk reduction.
b. The implementation of disaster risk management in schools is carried out through structural and non-structural measures to disaster preparedness and safety in schools through:
• Empowering the institutional role and ability of the school community
• Integrating disaster risk reduction into formal education unit curricula, both intra and extracurricular
• Building partnerships and networks between various parties to support the implementation of disaster risk reduction in schools
c. Implementation of disaster risk reduction in schools is guided by the attachment in this circular. The presence of this circular was then followed by the technical guidelines in the form of education disaster management; technical guidelines for rehabilitation of school buildings due to natural disasters and riots (by the Directorate General of Basic Education, Ministry of National Education); guidelines for implementing schools / madrasas safe from disasters (through the Head of BNPB Regulation No. 4 of 2012) [10]. The Head of BNPB signs the issuance of the Head of Regulation (Perka) BNPB No. 4 of 2012 concerning Guidelines for the Implementation of Schools / Madrasas Safe from Disasters on 30 April 2012. The Perka was launched by the Minister of Education and Culture at the National Education Day commemoration event on May 2, 2012. The issuance of this PERKA was a follow-up action from the Hyogo Framework for Action (HFA) 2005-2015. HFA is a commitment from 168 countries in the world to create community and state resilience from disasters through the implementation of DRR in five priority action areas. As a sequel, during the 2015 DRR World Conference in Sendai Japan, the 2015-2030 Sendai Framework for Disaster Risk Reduction was produced.

Indonesian Institute of Science (LIPI) compiled "Policy Manuscript for Implementing Disaster Preparedness Schools in Indonesia" explains that since the circular of the Minister of Education Circular No. 70a / SE / MPN / 2010, there is no significant response, especially in schools that are geographically located in disaster prone zones and urges immediate efforts to reduce disaster risk, even in schools that are not in disaster prone areas [11]. The reason of not realizing the instruction in the circular are: (1) it does not have a legal power; (2) the circular was not followed by a special budget allocation policy for disaster risk in schools issued at the national level (h. 12); (3) lack of cooperation between schools and BNPB or other parties related to disaster; (4) weak support of government agencies at the local level for the implementation of SPABs that have been initiated; and (5) the limitations of principals and teachers in understanding disasters including mitigation.

3.2 Disaster material at schools
School communities can be the agents of change to deliver the knowledge related to disasters and its anticipatory actions [11]. This is based on the idea that schools are a place to transfer and reform the knowledge, attitudes and skills, which are a means for all students to survive and manage every problem faced now and then. The success in developing education will make significant contribution to the achievement of national development goals. In this context, the development of education covers a very broad range of dimensions which include social, cultural, economic and political dimensions [13]. Teachers, students and education personnel are intellectual figures who can be a source of knowledge for the wider community. However, disaster education is obstructed because of three main things: the lack ability of the teacher in teaching disaster materials, the lack of the availability of teaching materials related to disaster education, and the weakness of existing policies related to disaster safe schools.

It was also realized Director of Community Empowerment of the National Disaster Management Agency (BNPB) in the "Disaster Potential Map and Implementation of Disaster Mitigation" event held in Jakarta February 2, 2019. The mapping result done by BNPB and the Ministry of Education revealed that 70% of schools in Indonesia are located in disaster-prone areas. Most of these schools are in the area of West Java, followed by North Sumatra, Central Java, West Sumatra, East Java and South Sulawesi. In these schools, children spend more than six hours daily. Therefore, disaster education for cultural mitigation, especially related to the types of disasters in the area, is considered as an important thing to do. Regarding this, President Jokowi states in his speech at the end of 2018 that "As a country that was prone to natural disasters, ring of fire, we had to respond and be responsible for dealing with natural disasters. Better, consistent, and earlier education have to get into the content of our education system,"
The existence of disaster material in the curriculum becomes a very important part to develop disaster literacy for the younger generation. Besides, preparedness can be done earlier, systematically and directly. Based on the 2013 Curriculum that was revised in 2016, the material of disaster was only given in the first grade. The content is about the natural disaster, such as dry season, rain season, and natural disaster. As the learning process in elementary school is thematic, the material of disaster can be inserted in the mathematic, sport, or socio-cultural subjects. At the second grade, there is no disaster material. Instead, it can be combined in healthy living material. The same condition also occurs in the third, fourth, fifth, and sixth grade. For the last three grades, the learning process has been based on scientific discipline. Thus, disaster material can be given not only in social science subject, but also natural science subject. The material here can be inserted in Basic Competence 3, point 3.3.

For the junior high school curriculum, disaster material is out of discussion. It can actually be included in basic competence of 7th grade, especially in understanding the concepts of space (location, distribution, potential, and climate, shape of the earth, geology, flora and fauna) and the interaction between spaces in Indonesia and its influence on human life in economic, social, cultural and educational aspects. For classes VII and IX, disaster material is impossible to be included as the material discusses ASEAN countries, except it discusses the extreme disasters in ASEAN countries and the world. Unfortunately the teacher felt unconfident to teach this material as they are lack of understanding. This implies that disaster materials are suggested to not only given to the students, but also teachers. The teachers here can get the materials in the magazine, newspaper, and television.

At senior high school, disaster material have been included in the social studies with the time allocation 100 minutes or 2 meetings.

3.3 Schools disaster preparedness and disaster learning

Preparedness is an effort made to anticipate disasters through appropriate and efficient measure. Disaster preparedness includes forecasting and making decision on preventive actions before the emergence of a threat [14]. Disaster preparedness aims to minimize losses. One of the important actions is through education and simulation. Some reasons of why material disaster needs to be implemented at schools:
1) efficiency, the results will be more optimal, 2) effectiveness, it can support the efforts to overcome natural disasters, 3) sustainability. Improving preparedness in school can be done through:
a. Integrate disaster material in subjects
b. Insert School local content
c. Do cross curriculum for simulation
d. Give a training for teachers, students and education staff
e. Install disaster alert signs

The important thing in carrying out preparedness at school is the commitment of the school community and also the government as a coach to carry out the activities consistently. The examples are: disaster preparedness schools at SDN 57 Bengkulu in 2008 and SMAN 6 Bengkulu. It is formed by COMPRESS-LIPI. It was then continued in 2009 at Maumere. The results revealed that there was no indication of program's sustainability. This is due to the absence of school policies that reinforce the importance of preparedness education. Even the school does not yet have a decree (SK) regarding the organization of the disaster management or alert group at the beginning of the program's initiation. The absence of various policies at the school level is inseparable from the unclear government policies at the local level. Dependence on the national education service was very strong recorded in the SSB evaluation study in Bengkulu. Schools have not taken the initiative to issue the policies due to the unavailability of guidelines or references in making school preparedness policies (Triyono, et al, 2012).

Nangroe Aceh Darussalam Province, as the province that experienced the greatest tsunami disaster in 2004, developed the disaster preparedness school in 2009. Three schools were recommended by the Banda Aceh Education Departement to be the pioneering of disaster preparedness school, namely SD Negeri 2, SMP Negeri 1, SMA Negeri 1 Banda Aceh. Excellent schools have also been submerged by the tsunami. Disaster preparedness schools showed that the school community did not ensure the continuation of disaster education as a school responsibility because it was part of the UNSYIAH,
TDMRC, LIPI and UNESCO projects [15]. The Tsunami and Disaster Mitigation Research Center (TDMRC) of the Syiah Kuala University in collaboration with LIPI intensively socializes the development of disaster preparedness schools. From 2009 to 2013 there were 20 schools received socialization. These schools are required to carry out disaster preparedness programs for the entire school community in a sustainable manner. SSB does not continuously implement disaster risk reduction programs [16]. The preparedness of school communities in reducing disaster risk was still at the level of knowing rescue actions, but they did not yet have the skills of preparedness actions [17].

Furthermore, comparing SMAN 1 (SSB) and SMAN 6 (non-SSB) in Banda Aceh City showed that there were no significant differences between the preparedness levels of disaster preparedness schools and non-disaster preparedness schools in dealing with disasters [18]. This indicates that the efforts of disaster preparedness schools are not running optimally, disaster material in the subjects of geography, biology, physics, and religion was more effective compared to other subjects. Simulation by using disaster evacuation information media such as evacuation maps, evacuation directions, and point boards gathered in carrying out disaster simulations was also good to be implemented. Outsiders were involved in the simulation. It was due to the lack of school experts and the large amount of funding needed on its implementation. Factors that influence the implementation of disaster preparedness school guidance consisted of internal and external factors. Internal factors included school commitment and budget allocation, while external factors were government support and partnerships with related parties.

Table 1. Curriculum scheme based on disaster preparedness.

| Elementary level (SD) | Junior high school (SMP) | Senior high school (SMA) |
|-----------------------|-------------------------|--------------------------|
| 1st grade : Natural Phenomenon: Flood | 7th grade : Disaster in Indonesia (types and the distribution pattern) | 10th grade : Disasters and how to mitigate it (identification, cause-effect, and preparedness) |
| 2nd grade : Healty Living: Flood mitigation | 8th grade : The impact of disasters | |
| 3rd grade : Earth: Earthquake and how to mitigate it | 9th grade : Disaster preparedness | |
| 4th grade : Caring : Fire forest and how to mitigate it. | | |
| 5th grade : Ecosystem: Drought and how to mitigate it | | |
| 6th grade : My earth: Volcanoes Explosion and how to mitigate it | | |

Influence of learning environment to the students’ disaster understanding in which those leaned outdoor was better than those who learned in the classroom. Regarding the media, audio visual through film was considered effective. This result indicated bad result of disaster education at disaster preparedness school. The results of interviews with elementary teachers shows that there was no special treatment to disaster material. In other words, it was taught like the other materials. There were no demonstration, media, or simulations. This condition also occurred in junior high school. The teacher at this level has mono-disciplinary education background. Thus, when non-geographic teacher had to insert disaster material in their subject, they were confused of how to teach it. The teachers, here, only got the understanding from non-text books and news from mass media. They did not have enough comprehension so that they could not deliver the material well. Like the above condition, high school teachers’ understanding of disaster was only gained from textbook. They did not have enough knowledge about it. In the process teaching and learning, they generally taught in line with the learning stages stated in the curriculum. Fortunately, they used film as a media. This very helpful in giving the description of disaster to the students. Regarding this findings, teachers basically can use discussion, demonstration, and simulation as the other media. Thus, the students’ understanding can be maximally improved. In response to the above finding, several obstacles in in disaster education. Those obstacle are: 1) Many teachers do not confident to teach this material as they are lack of knowledge; 2) they have limited material of disaster; 3) They have limited learning media; 4) the policies to implement disaster
preparedness school is very weak [19]. Geography, however, is a bridge between natural and social science. It has a great contribution to the understanding of disaster. Examines disasters (hazards) and its impact on the population by using tools such as maps, demographic data and GIS [20,21]. Geography, here, has a role in evacuation planning and disaster preparedness. Thus, the following materials are suggested to be inserted in the teaching and learning process at elementary, junior, and senior high schools (Table 1). Through scientific approach, the teacher can start the leaning by these following stages:

a. Identification of disasters that possibly occurs in the area. At this stage, the teacher can ask the students to discuss their understanding of disaster, such as the types and situation or symptoms. Pictures or film can be used as the media in this stages. Besides, collaborative working probably can improve students’ understanding of the materials.

b. Gathering information from various sources to check the students’ discussion in the previous stages.

c. Communicate the finding on the previous stages both orally and written.

d. Make a conclusion of the discussion results.

The material of disaster in geography, however, offers several advantages for the students, such:

a. Provide an understanding of disaster, especially natural disaster.

b. Provide an understanding of disaster characteristics.

c. Give an ability to make disaster map like:

- Map of disaster threat: giving information of disaster types and frequency. The data is gained from administrative map and various literature such as researches. The example: landslides is caused by a combination of high rainfall, slope, soil type and land use. Areas prone to earthquakes, volcanic eruptions and so on.

- Map of disaster analysis. The data is gained from the location of disaster and residents (house location, demographic condition, etc). Through this map, the risk of disaster can be predicted.

- Map of capacity assessment and potential resources. Potential resources here is the preparedness of the society to respond to disaster.

- Evacuation map. It gives the information of the evacuation routes including the scenario that should be taken and the equipment that should be brought.

d. Increase communities’ preparedness to disaster.

Meanwhile, the education of disaster and mitigation can be sustainably carried out through the following ways 1) insert disaster mitigation material in the curriculum of all education levels, 2) geography should be chosen as the subject to discuss disaster material, 3) develop teaching material consisted local wisdom as one of way in mitigating disaster, 4) use a technology as integral part in teaching and learning as it can give a clear visualization, 5) make an evaluation map that can be easily read and see by the school members, 6) develop disaster preparedness consistently, 7) collaboration between local government and BMG or BNPB needs to be done, 8) conduct simulation to overcome and anticipate disaster, and 9) school is one of the agent that is responsible for socializing disaster prone areas to the community in order to improve their preparedness.

4. Conclusion

The dynamics between earth and human definitely occur, often create danger that is potential to be disaster. Geography is a study that learn the interaction between nature and human. It gives important contribution to disaster management and mitigation. Human are required to be more wised in responding to disaster through knowledge and preparedness. Formal education is an effective ways to transfer those two things. Government and school policies to develop disaster preparedness school need to be seriously realized which supported by teachers’ understanding of disaster and the use of interactive media.

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