

Disaster Risk Management Model In Disaster Prone Area of Simeulue District In Aceh Province

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Abstract

The Simeulue district is categorized as proneness area that often experienced the earthquake and tsunami. The National Disaster Management Authority (BPBD) of Simeulue district recorded there is strong earthquake and tsunami occurred in 1907. Furthermore, the earthquake occurred again in year 2002, 2004, 2005, 2008, 2009, 2010, 2011 and 2012. The research problem is how the disaster risk management model be as the most appropriate approach in disaster-prone areas. The data was collected through interviews, literature studies and field observations. To deepen the results of the research, the authors conducted in-depth interviews with discourse experts. The descriptive method with AHP of analysis is used to explain the results of this study. The disaster risk management that can be developed in the area of Simeulue as disaster-prone areas through, namely; (i) an emergency phase is the logistic (0.210), shelter (0.163) and a common kitchen (0.161); (ii) the rehabilitation and reconstruction phase is the development permanent home (0.316) and home emergency (0.286); (iii) in the mitigation phase is the dissemination of information (0.299) and the construction of evacuation line (0.163); and (iv) the preparedness phase is the evacuation area (0.235) and the construction of the home and school safety (0.165).

Keywords: Management, Risk, Disaster Phase, Traditional Wisdom

Introduction

The experience of disasters over the last twenty years in different parts of the world have increased the awareness of the international community to consider ways of reducing and managing such risks. Up to this date, many international agencies led by the United Nations (UN) defined any strategies and approaches on how to reduce the disasters' risks in various regions. All actions directed towards in an attempt to reduce the impact and pressures of disasters continue to threaten. The disasters perceived more severe impacts, caused by a variety of factors including the increasing in number of population living in hazard prone areas, low levels of preparedness and mitigation efforts at the government level as well as the lack of public awareness in an effort to prepare for a disaster.

One of the earthquakes and tsunami disasters is happened in Aceh and Nias (both are the region in North Sumatera province of Indonesia) in December 2004. It is known that Indonesia still faces many catastrophic events such as tsunamis, floods, landslides, cyclones, volcanic eruption hazard and forest fires. Nevertheless, this country as a United Nations member states have shown a positive attitude and commitment to the issue of disaster risk reduction. The issuance of Law, Government Regulation (PP), Ministry of Home Affairs Regulation in Indonesia are the real reflection of the government concern towards the anticipating of any disasters in the future.

The Disaster Risk Management (PRB) includes four aspects, namely; (i) disaster preparedness to prevent and mitigate disasters: taking steps to reduce the impacts that occurs due to a disaster and ensure everyone is on alert if a disaster occurs; (ii) emergency response refers to what happens during and after a disaster to save lives: reduce suffering and dealing with the direct impact of the disaster; (iii) recovery after a disaster: efforts to restore into normal situation by rebuilding the community through appropriate means and estimate the risk of future disasters; (iv) development of sustainability: long-term efforts of the community is to grow and develop in an appropriate manner without causing other disasters continued or new problems (Act No. 24 of 2007).

A Simeulue district categorized as proneness area that often experienced the earthquake and tsunami. The National Disaster Management Authority (BPBD) of Simeulue district recorded a strong earthquake and tsunami occurred in 1907. Furthermore, on 2nd of November 2002, an earthquake reaching 9.3 on the Richter Scale (SR), then on 26th of December 2004 reached to 9.1 SR and tsunami reached to 30 meters, followed with on the 3rd of March 2005, the earthquake reached to 9.1 SR, on 20th of February 2008, and again happened on 5th of April 2009, on 18th of August 2009 and 19th of December 2009. While, on 16th of January 2011, an earthquake reached to 5.9 SR, on 18th of January 2011 reached to 5.7 SR, on 5th of April 2010 with a strength of 7.2 SR, on 17th of October 2011, an earthquake occurred again with a magnitude of 5.2 SR, on 11th of January 2012 with a strength of 7.1 SR and in April 2012 with a strength of 8.5 SR.

Meanwhile, on 5th of October 2010, a cyclone hit the Western sub-district of Teupah and damaging five homes and on 30th March 2011, the hurricanes is back hit the central sub-district of Simeulue and damaged 3 houses. This concluded that Simeulue district known as an area that is prone to disasters. From the description above, the Simeulue district is included in disaster-prone areas (TDMRC: Tsunami and Disaster Mitigation Research Center, University of Syah Kuala, 2011) and have been socialized in Aceh province. People who are vulnerable to disaster risks, namely; (i) they live in areas of high risk of disasters; (ii) having low economic capability and; (iii) they live in an archipelago (Silbert, 2011). Given these arguments, the authors formulate the following research issues; How is the disaster risk management model that best suits to Simeulue district of disaster-prone areas?

Methodology

The samples were the families living in Simeulue district. The percentage of the sample was calculated based on 95% confidence interval. According to Rahmat (2002) sample size based on the estimation of population's proportion calculated by a simple formula as below:

$$n = \frac{N}{N\alpha^2 + 1}$$

Where: n = total sample

N = population

α = 1 – confidence level

Based on the formula with a population of 21.690 householder, thus the sample obtained is:

$$n = \frac{21.690}{21.690 \cdot 0,05^2 + 1}$$

$$n = \frac{21.690}{21.690 \cdot 0,05^2 + 1}$$

$$n = 392.76 \sim 393 \text{ Householder.}$$

Table 2.1

Research Variables Dan Parameters

No	Variable	Parameter
1.	Emergency Situation	1. Early Warning 2. Search, Evacuation and Treatment 3. Security 4. The common kitchen 5. Shelter 6. Logistic 7. Mapping and Data Collection 8. Networking on Emergency Situations
2.	Rehabilitation and Reconstruction	1. Collection times of disaster victims 2. Data Collection support (development) 3. Construction of the emergency 4. Construction of permanent houses 5. Network (support for rehabilitation/reconstruction)
3.	Mitigation	1. Supervision and standardization 2. Education to the community 3. Development of an early warning 4. Recognizing the danger 5. Understand the ways of salvation 6. Regulation of disaster 7. Evacuation Line 8. The system of information dissemination 9. Planting Trees
4.	Preparedness	1. Local communication systems 2. Evacuation Area 3. Construction of houses and school safety 4. Resilience and local food supply system 5. Local drugs system

The research conducted in Simeulue District which consists of 8 sub-districts, 135 villages.

Table 2.2

Name of Sub-District, Total Villages and Sub-Villages in Simeulue District

Sub-district	Size Area (ha)	Total Villages	Total Sub- Villages
South Teupah	271.53	19	54
East Simeulue	381.73	29	86
West Teupah	193.95	18	52
Central Simeulue	265.28	24	75
Teluk Dalam	138.79	10	26
Salang	222.73	16	44
West Simeulue	415.99	14	50
Alafan	235.12	8	28
Total	2125.12	138	415

Source: Central Bureau of Statistics, Simeuleu District (2011).

The Focus Group Discussion (FGD) is used as data collection method. This method rely on the acquisition of data or information from an informant or respondent interaction based on the discussion in a focus group to solve certain problems. The data is gathered from the respondents of community leaders (head of villages, religious leaders), women and youth group representatives, parents and children. Each representatives participated must provide information in accordance with the questions given. In addition, the in-depth interviews is conducted with the experts discourse. The expert discourse is the people who understand about the disaster on the island of Simeulue both from the aspect of knowledge, experience and implementers, namely; Dr. Dani Hilman (Disaster Specialist-Researcher from LIPI), Kamaruddin (Head of Village of Teupah West), Hasranuddin (Geucik of Sub-Village of Alafan), Ratna Susi (YEU-NGO), Misrizal (BPBD of Simeulue). The disaster risk management model is calculated based on the opinion scores of experts' discourse for each of the phases of the disaster management: mitigation, preparedness, rehabilitation and reconstruction of emergencies.

Meanwhile, the method of analysis is used to interpret the results of the exploration problem descriptively. This study adopt some of the tests which known as the most appropriate model of disaster risk management, that is the AHP analysis. The Analytical Hierarchy Process (AHP) developed by Saaty (1993) and used to solve complex problems or not a frame in which the data and statistical information on the problems have few constraints.

Findings and Discussions

Disaster Risk Management

The Emergency Phase

The coefficient value of logistic is 0.210, shelter with 0.163 and kitchen with 0.161 are become the most important for development of disaster-prone areas in the island of Simeulue. In general, the discourse experts claim that there are three emergency phases need to be built in this region. The logistics refer to the purpose of food, medicine, water and sanitation during

emergencies whereby needed in times of emergency which are usually obtained from outside the island of Simeulue.

In emergency time, all the materials of food, medicine and sanitation are supported by the International Red Cross and others NGOs. In preparation for the fulfillment of logistics, the funding agencies conduct a preliminary study and supports to provide the right target. It is been stated that the donors also facilitate the community by forming several committees such as the shelter committee, health committees, and water and sanitation committees. According to Christopher and Towill (2005) that the logistics plan must be integrated and flexible. There is a good relationship between beneficiaries and providers of goods whereby the implementation of rapid delivering on logistics will help the availability of the items needed. One of the traditional wisdom that could be developed in the provision of logistics when the disaster on the island of Simeulue occurs is the spirit of societies' mutual aid. In the activities of shelter development, the donors do not impose mutual cooperation because it has sufficient financial resources to pay for the public in the form of wage labor intensive (cash for work). The communities expressed their readiness of having the activities of mutual aid to build the shelters. All they need are on the logistics of boards, zinc, nails, cement, iron while the rest is done by the communities themselves.

In addition, the strength of other emergencies is the provision of common kitchen with a coefficient of 0.161. The common kitchen is managed by community together with the utilization of the equipment provided by NGOs and the government. In the provision of meals through common kitchen, people are able to manage by mutual cooperation where actually his habits of managing food in bulk has been done for generations such as the festive custom event. In Simeulue Island, the communities often hold the regular events such as before the birth of the Prophet Muhammad (Peace Be Upon Him), before the month of Ramadan and other holidays.

The Rehabilitation and Reconstruction Phase

In the phase rehabilitation and reconstruction on the post-disaster of the earthquake and tsunami of 26th December 2004, the main priority is the construction of a permanent home which has a coefficient value of 0.316. To build houses is urgently need at that time because after staying at the shelter for three months, the people need to organize their life back and live like before the disaster. The houses meant in the research refer to the standard size of 36 m² with the materials in accordance with the natural conditions in the island of Simeulue. According to discourse experts, the desired houses by the public is consists of walls, tin roofs and cement floors. However, due to the lack of legal timber for house construction, the donors who provide this facility replace it with plywood but in the next stage, the public request is on better materials than plywood.

The concept of public housing that given to the communities has an earthquake-resistant building standards such as; (i) building materials, as much as possible to use raw materials by making use of local content; (ii) the construction material used meets all of the users' requirements on the security and safety of building; (iii) materials of the building must meet the technical provisions that are equivalent to the producers concerned; (vi) building materials made or processed in accordance with the given standard procedures; (v) for a home built with pre-fabricated materials, the system should do well designed and able to

withstand the forces that occur during the installation/implementation (Indonesian National Standard, 2006).

The development of emergency housing with a coefficient of 0.284 is the second priority in the rehabilitation and reconstruction phase, followed with networking (0.166) and data collection (0.163) that need to be built with community participation. This is because the location area of Simeulue Island is far from the center of the Provincial government.

As been explained previously, the discourse expert expressed that the rehabilitation and reconstruction process is rather moving slow compared to other regions of Banda Aceh, Aceh Besar, Meulaboh and Aceh Jaya. It deals with networking and data collection support. Research on the identification of post-disaster recovery is a study that has not been done (Chang, 2010). This study contributes to the understanding of post-disaster recovery, especially in the reconstruction phase of the housing through the identification of factors that affect the process of housing reconstruction. Therefore, there are suggestions used as a top priority in the rehabilitation and reconstruction on the island of Simeulue.

Mitigation Phase

The first activities that reduce the impact of disaster risks conducted by the communities in Simeulue Island is the dissemination of information system which has the highest coefficient of 0.299. This dissemination of information about the earthquake, tsunami and all related characteristics is the most important indicators that have been done in the community. As in the previous explanation that the dissemination of information about the quake and big waves (Smong) are done for generations through common hereditary of rhymes, poetry, bedtime stories and traditional dances. The stories about big waves known by all members of the family; children, teenagers and parents. Having such information of disasters' stories caused every member of the public remain alert in order to survive. These traditional medias are known as medias for people; as an art of folk. Jahi (1988) defines the traditional media as a form of verbal movement, oral and visual known by people, received by them and played or performed for the purpose of entertaining, proclaiming, explaining, teaching and educating.

This is aligned with the proposition by Nurudin (2004) says that traditional media can not be separated from traditional art, which is a form of art excavated from folktales by using traditional media. The traditional media is often referred to as a form of folklore that consists of; a) the prose story of the people (legends, fairy tales); b) expression by folk proverb; c) poem of the people; d) the song of the people; e) popular theater; f) motion cues; g) reminder tool and; h) instrument sounds (kentongan, drum, gong). This traditional media used as a significant social communication device.

The evacuation line with an AHP coefficient value of 0.163 is related to the information systems that are known by the public. This evacuation line also has been known for generations both by indigenous people and migrants of Simeulue Island. The evacuation line provide the markers (signs) so much easier way, especially for the outsiders who come to the island of Simeulue. The escape from the house to evacuation area when the earthquake occur is a common matter. People are aware and able to anticipate on how to get the exit towards the evacuation line. They do not need waiting for a command or ask each other for this

preparedness because it has become a local tradition. At the time of the evacuation they already know what to prepare everything for such important documents and property.

Preparedness Phase

The evacuation area with an AHP's coefficient of 0.235 indicates the crucial indicator of preparedness. According to discourse experts, this infrastructure indicator used in the escape when the tsunami came. The society would already know the intended direction after hearing the tsunami warning, that is Smong will rise. The existing hills that has been available are potentially to be maintained in preparedness. A possible adopted matter of this preparedness indicator is where the hill in disaster-prone areas are not available, then the building was built as a safe area such as the Tsunami Museum in Banda Aceh. In addition to functioned it as a heritage site, that building was used as a safe area when the tsunami came.

The development of houses and schools with an AHP coefficient of 0.165 is an important indicator of preparedness. The houses have been built with the reference to the earthquake resistant concept. The main house is made of wood with simple concept but safe from the earthquake. In the East Simeulue sub-district, Salang sub-district and Teluk Dalam sub-district, its can find a two-story frame house. The earthquakes that regularly occur in these regions does not make the building collapsed. This is because the foundation is solid and impartial.

Not all the schools were built in the area of Simeulue apply the concept of safety for children, but in the category of earthquake resistant. No school buildings collapsed and afflicts children. Indeed, when a large earthquake on 26th of December 2004 occurs in holiday, so the children are not in the schools. However, the responses from the respondents stated that several schools collapsed and swept by large waves. Unlike the earthquake in Padang (2009), the quake struck with a power of 7.6 SR caused the children died from a collapsed building.

Post tsunami of 2004, several new schools built by the NGO of Cordaid in East Simeulue sub-district, West Tegah sub-district, South Tegah and Salang sub-districts have followed the requirements of earthquake-resistant and safe for children. The school has two doors on the back side and the front, lots of windows that open out to facilitate the children to escape when the quake occurred.

According Albani (2011), the type of buildings that are earthquake-resistant building types having characteristics such as lightweight and ductile. The more light the building will receive smaller shock load. While the lightweight and ductile building is the building that has a heavy ductile and brittle. The building with an increasingly heavy and brittle is a building that has become increasingly resistant to earthquakes. These weaknesses in making this house is prone to earthquakes which based on the experience of earthquake whereby the damages on wall of the building cause of rising casualties and losses. The construction of a brick house comply with earthquake resistant construction, quality of materials, method of implementation and qualification of manpower. Purwanto and Gayatri (2007) posited that the development concept *vermakuler* house in Nabire who have the wisdom of traditional architecture is in accordance with the concept of building shelter disaster victims. Additionally, it will be able to minimize the possibility of accidents due to fall of the building. The building is planned with consideration to pay attention to humans as occupants, the

climate and environment. This concept is similar as the state board in Simeulue where it means for preventing the fall of the building when there is an earthquake.

Table 3.1

Coefficient Model of Disaster Risk Management: An Emergency Situation

No	Disaster Risk Management	Coefficient
The Emergency Phase		
1	Logistic	0.210
2	Shelter	0.163
3	The Common Kitchen	0.161
4	Mapping and Data Collection	0.146
5	Networking in Emergency Situation	0.129
6	Security	0.070
7	Search, Evacuation and Treatment	0.067
8	Early Warning with TEWS (tools)	0.055
Rehabilitation and Reconstruction		
1	Construction of permanent houses	0.316
2	Construction of the emergency	0.284
3	Networking	0.166
4	Data Collection support	0.163
5	Collection times of disaster victims	0.071
Mitigation		
1	The system of information dissemination	0.299
2	Evacuation Line	0.163
3	Recognizing the danger	0.149
4	Understand the ways of salvation	0.113
5	Supervision and standardization	0.096
6	Regulation of disaster	0.061
7	Education to the community	0.053
8	Planting Trees	0.036
9	Development of an early warning	0.030
Preparedness		
1	Evacuation Area	0.235
2	Construction of houses and school safety	0.165
3	Resilience and local food supply system	0.163
4	Searching safety location	0.163
5	Local communication systems	0.144
6	Local drugs system	0.130

Source: Analysis of Primary Data (2013)

Conclusion and Recommendation

The disaster risk management model that can be developed in Simeulue as disaster-prone areas are; (i) an emergency phase is the logistic (0.210), shelter (0.163) and a common kitchen (0.161); (ii) in the rehabilitation and reconstruction is construction of permanent houses (0.316) and construction of emergency (0.286); (iii) in the mitigation phase is the

dissemination of information (0.299) and the construction of evacuation route (0.163); and (iv) the preparedness phase is the evacuation area (0.235) and the construction of the home and school safety (0.165).

In these disaster's phases, the traditional wisdom support in the process of disaster response is maintained as in the emergency phase of togetherness with the spirit of mutual cooperation. In the rehabilitation and reconstruction phase is the expertise of the community in making quake-friendly building should be developed and documented. In the mitigation phase, the information dissemination systems and evacuation routes are important to maintain. While, in the preparedness phase is to maintain the natural resources that support disaster risk reduction in Simeulue Island. The road leading to the evacuation area must be able to accommodate the people with special needs.

The indicators of information dissemination system in mitigating variables and indicator of evacuation area in preparedness variable can be replicated to other areas that have similar geographical district. The dissemination of information in the region is through traditional media in the form of rhymes, proverbs, bedtime stories, nandong and other traditional channels. This traditional social media can be maintained where almost all regions in Indonesia have this type of potential. In the preparedness phase, it needs to maintain the natural resources that support disaster risk reduction in Simeulue Island.

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