Knowledge, Awareness, and Resilience of Earthquake and Tsunami Disaster Risk Reduction in Coastal Area

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Abstract. Indonesia is an earthquake and tsunami prone area, included Sumatera Island. Bandar Lampung is also vulnerable to earthquake and tsunami, especially Kangkung fishing village in Lampung Bay. Disaster risk reduction is very important to be implemented in the cases of earthquake and tsunami, which can save more life and build resilience in facing the hazard. This research aimed to study how the knowledge, awareness, and resilience of people in Kangkung fishing village can strengthen the earthquake and tsunami disaster risk reduction. This research conducted by quantitative methods. Survey and interview of 53 respondents were conducted as well as data collecting approached by purposive sampling. The results found that there is little knowledge and awareness of people in Kangkung fishing village of the hazard of earthquake and tsunami. Therefore, this research proposed a model of “Community-Based Resilience Strategy” Model of earthquake and tsunami disaster risk reduction. It is a comprehensive and sustainable model of how people take a part in disaster risk reduction by intensive participatory. Conclusion of this research emphasized that disaster risk reduction is a big matter in marginalized society such as people in Kangkung fishing village. The “Community-Based Resilience Strategy” Model of earthquake and tsunami disaster risk reduction that may increase the knowledge and awareness to become more resilience.

1. Introduction
Indonesia is a prone area to earthquake and tsunami along its coastal line (Figure 1). In the late decades, earthquake and tsunami have devastated Indonesia which becomes worse year to year. It is still in our memory that the latest big earthquake and tsunami hit Palu and Donggala in 2018 that took many life and destroyed infrastructure.
Figure 1. Map of Tsunami Zoning in Indonesia  
(National Agency of Disaster Mitigation, 2017; [1])

Figure 2. Map of Lampung Province  
(Urban Regional Planning of Lampung Provincial Government)

Since Semangko Fault that exists along the western part of Sumatera Island generates earthquake, the southern part of the island, included Lampung Province (Figure 2) should also be aware to the potential big earthquake and tsunami that may happened in the future. Instead of investigating the areas surrounding the Semangko Fault, it is also interesting to study the southern part of Sumatera Island, for example Bandar Lampung city. Bandar Lampung city is special because it is prone to
multi-disasters event. This city is influenced by volcanic activity of Anak Krakatau Mountain as well as the hazard of tectonic activity that causes earthquake and tsunami. It should also no doubt that the coastal city like Bandar Lampung has fishing villages along its coastal line that are vulnerable to those disasters. As specific population, Kangkung fishing village in sub-district of Bumi Waras in Bandar Lampung city, is also vulnerable to earthquake and tsunami.

It is reported by [2] that natural disaster in Asia-Pacific regions have taken life about 2 (two) million people since 1970 (it is about 59% of global mortality) where earthquake takes place about 46% of the number. The misery caused by those disasters has inspired the action of disaster risk reduction as promoted by Third United Nations (UN) World Conference on Disaster Risk Reduction in 2015 which adopted the Sendai Framework for Disaster Risk Reduction 2015-2030 signed by 187 member states [2,3]. In the Sendai Framework, the States reiterated their commitment (Preamble, No.2) “to address disaster risk reduction and the building of resilience to disasters with a renewed sense of urgency within the context of sustainable development and poverty eradication, and to integrate, as appropriate, both disaster risk reduction and the building of resilience into policies, plans, programs and budgets at all levels and to consider both within relevant frameworks” [3].

In wider context as stated by [4], “Disaster Risk Reduction” (DRR) may defined as a systematic approach to identify, assess and reduce the risk of disaster. Hence, the purpose of disaster risk reduction is to minimize vulnerabilities and disaster risks in a society that to avoid (prevent) or to limit (mitigate and prepare for) the adverse impacts of natural hazards, as well as to facilitate the sustainable development. Disaster risk reduction is very important to be implemented in the cases of earthquake and tsunami, which can save more life and build resilience in facing the hazard. Many efforts can be done to promote and to implement disaster risk reduction such as giving knowledge of disaster, building strategy of resilience to the disaster [5–12], developing technology, including materials innovations and even novel inventions [13-15,22–29] that can prevent (or resist) human and its ‘treasures’ from disaster, preparing safe and environmental friendly low cost settlement [30–37], inventing novel techniques and methods [10,18-19, 21,38–40], etc.

In marginalized society like in fishing villages, disaster risk reduction may not become their first priority. However, a suitable approach can be conducted to educate people about earthquake and tsunami disaster risk reduction. Therefore, this research wants to study how the knowledge, awareness, and resilience of people in Kangkung fishing village can strengthen the earthquake and tsunami disaster risk reduction.

2. Methods

![Figure 3. Fishing village and fishing boats in Kangkung village, Lampung Bay, Bandar Lampung City](image)

This research was conducted in Kangkung fishing village (Figure 3), an area in Lampung Bay, Bandar Lampung city, Lampung Province by qualitative method and purposive-descriptive approach.
Purposive sampling applied in this research by interviewing 53 respondents in a survey. This community was chosen because they are marginalized society even though they live in capital city of Lampung Province. There was comprehensive analysis how the knowledge, awareness, and resilience of people in Kangkung fishing village can strengthen the earthquake and tsunami disaster risk reduction.

3. Results and Discussion

![Figure 4. Interview to respondents in Kangkung fishing village](image)

3.1. Adaptation and Resilience to Disaster
Kangkung fishing village that is vulnerable to earthquake and tsunami is found in adaptation process. After adaptation, people in Kangkung fishing village will go to the next step, it is resilience that make them fit to the conditions. By high level of vigilance, people in Kangkung fishing village may overcome the hazard of disasters at any time. As a matter of fact, it is not easy for the people in Kangkung fishing village to adapt to the climate change and potential disaster. However, there was no disaster event in Bandar Lampung in the late months (after the eruption of Anak Krakatau Mountain) instead of the incidental extreme climate that also happened in other places in Indonesia. Anyhow, some people still remember the last events of big earthquake in Bandar Lampung several years ago, but for now, the ‘small’ earthquake means nothing to them.

3.2. Early Disaster Warning System
Early warning system of disaster, especially earthquake and tsunami is a very important aspect in disaster risk reduction. As reported by respondent, they notice early warning system in Bandar Lampung as direct announcement (by outdoor big speaker) at the event of disaster. Actually, when the people should be aware prior to the event of disaster, the evacuation route must be prepared and informed by government. According to in-depth interviews, most respondents have full awareness to save themselves and their families during the evacuation, but they need the government to facilitate the process. Nevertheless, the people of Kangkung fishing village don’t recognize the evacuation signs and route. Hence, it is the time for government to prepare and apply the infrastructures and facilities of disaster risk reduction.

3.3. Community Awareness
Most of respondents in Kangkung fishing village said that they don’t know if they live in earthquake and tsunami prone area. There is 32.1% of respondents completely unaware and do not understand about the geographic of the city as well as the hazard of earthquake and tsunami. Little number of respondents of 26.4% who aware and know the risk of living in the earthquake and tsunami prone area...
are educated, unlike the most people in Kangkung fishing village who only have elementary school education. Hence, it can be understood that there were little awareness of the hazard of those disasters. This situation is getting worse that there were no workshops or training or just briefing to the society about earthquake and tsunami hazard and disaster risk reduction. Despite the high vulnerability to earthquake and tsunami, people persist and take the situation easy in their daily life. Most respondents (60.4%) said that they are already settled to live there as their motherland (28.3%).

3.4. Disaster Knowledge and Communication
Due to the vulnerability living in earthquake and tsunami prone area, it is important to know the readiness of the people to do self-evacuation during the disaster events. Almost half of the respondents aware of the self-evacuation (43.4%), which means they can protect themselves and be alert to the hazard of disaster. They already know where to go and where the nearest evacuation points in the event of a disaster (it is Governor office). However, the lack of knowledge about disaster hotline numbers is quite a problem in the evacuation process. A total of 90.6% of the respondents did not know and did not memorize the emergency number to be contacted in the event of a disaster. As a matter of fact, most people in Bandar Lampung as well as in Kangkung fishing village get familiar to information and communication technology. In this modern world, the people in Kangkung fishing village also connected to internet and communication devices. It could be a good opportunity for government to make good early warning system where people can get information earlier, even alert of the disaster, by using information and communication technology, instead of ‘old-fashioned’ announcement by public speaker.

3.5. Evacuation Infrastructures
A city that is earthquake and tsunami prone area should have been prepared for the hazard. Unfortunately, Kangkung fishing village has limited infrastructures of disaster risk reduction, especially the ones that supported evacuation. Some respondents reported that there are no agencies or organizations that deal with natural disasters in the fishing village, as well as no public education about the disasters, and even there is no preparation of emergency supplies. It must not be good when people don’t have knowledge of disaster although they live in the earthquake and tsunami prone area. In context of evacuation, general information about evacuation point is Governor's Office.

3.6. Community-Based Resilience Strategy Model

![Diagram](image)

**Figure 5.** Community-Based Resilience Strategy Model of earthquake and tsunami disaster risk reduction
Are the knowledge, awareness, and resilience of people in Kangkung fishing village can strengthen the earthquake and tsunami disaster risk reduction? This question could be answered by a model of “Community-Based Resilience Strategy” Model of earthquake and tsunami disaster risk reduction. It is a comprehensive and sustainable model of how people take a part in disaster risk reduction by intensive participatory. It can be explained that nature presents earthquake and tsunami as the events of disaster. Hence, people have vulnerability as well as ability to cope with and then they get impacts of it. Those vulnerability and impacts then are mapped and identified to perform capacity exposure. This exposure will draw scenario, and finally being implemented. Public participatory is definitely demonstrated in capacity exposure and scenario. Giving people knowledge of disaster risk reduction, resources must be developed and government assistance has to become program and action. Therefore, awareness of disaster risk reduction will be built, and finally this model is going to achieve disaster resilience. People in Kangkung fishing village can strengthen the earthquake and tsunami disaster risk reduction by increase their knowledge, awareness, and resilience.

4. Conclusions
Disaster risk reduction is crucial aspect in marginalized society such as people in Kangkung fishing village. The lack of knowledge, awareness, and resilience earthquake and tsunami disaster risk reduction will increase their vulnerability in coping with the hazard. It is “Community-Based Resilience Strategy” Model of earthquake and tsunami disaster risk reduction that may increase the knowledge and awareness to become more resilience.

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