Community Perception of The Use of Shelter as Tsunami Mitigation In The Coastal Areas of Padang City

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Abstract. After the 2009 earthquake occurred, found liquefaction at several points of the Padang coast. To respond to this, the government built several shelters in Padang City to minimise the impact of tsunami or earthquakes in the future. However, it was found that there was still a minimum of people to evacuate themselves to the shelter. Based on these conditions, this research intends to conduct on community's perception of Shelters as a tsunami mitigation effort in the coastal areas of Padang City. This research was carried out with direct studies in the field, questionnaire interviews with the community, and those with experience in this field, namely BPBD (Regional Disaster Management Agency) and KOGAMI (Tsunami Alert Community). The objects of this research are four main shelters of Padang City, namely Ulak Karang shelter, Air Tawar shelter, Darussalam Mosque shelter, Nurul Haq mosque shelter. Fifteen respondents for each shelter will be interviewed. Based on the results of the study obtained important things that affect people's perceptions of the existence of Shelters and the use of shelter as an evacuation point.

1. Introduction

Besides tsunami, liquefaction is a disaster that also threatens the coast of Padang [1]. The potential liquefaction on the coast of West Sumatra is at 4-8 m and also will occur after the earthquake. In 2009 West Sumatra earthquake found that water seepage emerged from the fractures around the coast, and the many buildings sloped as an indication of liquefaction. The vulnerability of the West Sumatra region to the potential for earthquake and tsunami threatens 273.755 people who live in the inundation areas [2]. Tsunami disaster can destroy community social structure, not only the loss of humans and material. Based on the devastating impact of tsunami needs disaster resiliency of coastal community [3].

According to Singh [4], it takes about 20 - 30 minutes a tsunami hit the coast of Padang. While residents have to walk 3-5 km to the safe area, it can be said that the time for tsunami evacuation in Padang city is short. Therefore the choice of vertical evacuation is urgent rather than walking along to the safe area. So the development of shelter that minimises the impact of disasters is one of disaster resiliency strategies.

Besides provide a barrier for tsunami waves, the shelter also functions as a socioeconomic building that is formed by cultivating tsunami evacuation culture through symbols on the streets and buildings used in social activities [3]. But there are still many people who not become aware of the existence of the shelter and their functions. Disaster management planning should include community planning and participation because it can contribute to community safety [5]. People rarely use the shelters either when there is a moderate earthquake or during a disaster simulation. From these conditions, this research is intended to get people's perceptions of the use of vertical shelters as tsunami mitigation in the coastal city of Padang.
2. Research Method
The methodology used for this research is a semi-structured interview. A semi-structured interview is an open interview process, but the interviewer must follow the theme and flow of the conversation. The surveys were conducted at four shelters, which are Ulak Karang shelter, Air Tawar shelter, Darussalam Mosque shelter, and Nurul Haq Mosque shelter. The interviewer asked 15 people who live and or have activity near the shelter as a respondent for each shelter. The total respondents are 60 people. The in-depth interview also took to the Regional Disaster Management Agency (BPBD) and the Tsunami Alert Community (Kogami).

The survey was conducted 4 hours a day (14.00-18.00) for two weeks. The questionnaire form related to this research were filled with four sections. The question regards to the aim of the interview are explained in Table 1.

| No | Topic                                           |
|----|------------------------------------------------|
| 1  | Respondent Profile                             |
| 2  | Respondents' Perception of the Existence of Shelter Buildings |
| 3  | Respondents' Perception of the Use of Shelter as Vertical Evacuation Buildings |
| 4  | Management of Shelter Operation                |

3. Result and Discussion
3.1. Respondent Profile
The gender survey results at shelters are 56% female respondents and 44% male respondents. The occupation of respondents in the research location is relatively varied, as seen in the following figure.

![Gender](image1.png) ![Occupation](image2.png)

Figure 1. Respondent Profiles

3.2. Shelter Building Profile
Ulak Karang shelter located 500 meters from the beach. This shelter completely builds in 2015 with a total of 4 floors and a building height of 20.46 m. This shelter can accommodate ± 4000 people. The shelter built by the National Disaster Management Agency (BNPB), and it not been handed over to the local government. Ulak Karang shelter is also rarely used by the community due to inadequate and poorly maintained shelter conditions except on the 1st floor, which is often used by children to play football.

Air Tawar shelter is on Polonia Street, Padang Utara district. Air Tawar Shelter was built in 2012 and consisted of 3 floors, which 35 m height. This shelter can accommodate ± 4000 people. According to the local community, this shelter is often used by wild parties for immoral acts because the shelter is not well maintained. Some of the existing facilities at Air Tawar shelter also not function.
Darussalam Mosque shelter is located in Parupuk-Tabing, Koto Tangah, Padang, and is located ± 1 km from the beach. Five floors of this shelter have an area of 3500 m² with a building height of 25 m. This shelter can accommodate ± 5000 people. Built with complete facilities, but due to lack of maintenance and the act of wild parties, this shelter is often locked.

Nurul Haq Mosque shelter is located in the Jondul Parupuak Tabiang complex. This shelter was inaugurated in 2015, which has spent a total of Rp. 17,564,343,000. This shelter has 22 m height. This shelter can accommodate up to ± 4000 inhabitants around the shelter. Each floor of the shelter is equipped with toilets and clean water facilities. The management of this shelter is quite good because the community also often uses the shelter for community activity.

![Nurul Haq Shelter](image1)
![Darussalam Mosque Shelter](image2)
![Air Tawar Shelter](image3)
![Ulak Karang Shelter](image4)

**Figure 2** All of Shelter Buildings in Padang City

3.3. **Identify the perception of coastal communities on the existence of shelter buildings as tsunami evacuation building**

Only 3% of 59 respondents did not know information about shelters, and the remaining 97% of respondents are aware of the existence of shelters or information about shelters. The community is given counselling by the local government every April 26 so that the community should be more vigilant facing disaster. The public should easy to know where the shelter is. Evacuation signs should indicate the location and direction of the evacuation to the shelter. The adequacy of evacuation signs at the research location confirms this result.

76% of respondents who live on the coast say that the community will use the shelter if there is a warning for a potential tsunami disaster. However, not all of the people choose this, as evidenced by the fact that 24% of other respondents will stay at home or go to a safer area like a higher place, the bypass street, and other alternatives.

According to some respondents who choose to stay at home because they had another place that is higher and closer to their home like a neighbour's house. While some others said, access to the nearest shelter is not easy to reach. This was conveyed by the people who lived a few meters away from the Ulak Karang shelter and Darussalam Mosque shelter. It was challenging to get to the shelter because of the narrow and hampered roads.

Other respondents also said the shelter building was quite low regarding tsunami wave height. So that respondents felt it was still unsafe to escape to the shelter. As for other reasons such as going to a
higher place, for example, go to hills, especially for respondents whose residence is quite far from the beach.

One reason for the lack of public distrust to use shelter buildings is because of the physical condition of the shelter due to the lack of proper management in the operational and maintenance. It can be seen from the completeness or not of the available instruments and facilities at the shelter, for example, lighting, electrical installations, and bathrooms. There is a leak in the room and poor in the cleanliness of the room.

![Figure 3. Inadequate Maintenance of Shelter Building](image)

Also, the observations show the lack of a security system for shelters. The shelter does not have special security guards. In the absence of guarding, people choose to lock in access to the shelter, which aims to reduce thievery and other unwanted action. But it also brings anxiety from the community because if the shelter is often locked will cause unclear response when a disaster occurs.

![Figure 4. Access to Ulak Karang shelters and Darussalam mosque shelter is locked.](image)

Another example that happened at the Ulak Karang shelter is the missing of the lamp and the electrical cable in the room. Improperly use of shelter by local people found in Ulak Karang shelter as an indication of lack of security system. It is dating on the top floor of shelters and the presence of teenagers who sniff glue in one of the shelters' rooms. Lack of security system will make people uncomfortable and unwilling to use the shelter.
Figures 5. Theft of electrical installations at shelters

The operational management of shelter building should involve the participation of the community. The prime component of disaster preparedness is to involve the participation of the community [6]. At Nurul Haq Mosque shelter, government institution has transferred the management of the shelter to the community surrounding. Therefore, the security problem did not exist at the Nurul Haq Mosque shelter.

3.4. Identify the perception of coastal communities of the potential liquefaction in the area of shelter buildings

Based on the questionnaire, 68% of the respondent felt safe for the shelter position, which means that the respondent knew about the threat of liquidation and would continue to use the shelter while disaster happened. Another 32% said it was unsafe, and they see the danger of liquefaction disaster. When the earthquake occurs, the shelter building is expected to have an immediate performance [7]. For instance, no structural damage, the building is still functioned without any rehabilitation, and the area is not followed by liquefaction.

The lack of knowledge about liquefaction and the absence of appeal from the government for threats of the liquefaction make the respondent feel not safe from the liquidation. The position of the Darussalam Mosque shelters that are close to the swamp is one of the most substantial reasons for the respondent. It can be seen in figure 6 below.

According to Minister of Public Works Regulation No. 06/ PRT/M/2009, states that infrastructure development in disaster-prone areas requires the placement of building floors above puddles. The infrastructure should provide barrier walls for inundation, or adjust the distance and orientation of buildings to avoid the tsunami force on the surrounding buildings and buildings.

Figure 6. The Position of Darussalam Mosque Shelter that Close to The Swamp

The lack of information about liquefaction makes community doubt the safety of shelters from liquefaction disasters. The liquefaction map can be the source of information for the public. The government should publish it to the public to make people well informed about the location or areas of the potential liquidation. Developing communication strategies to the community regarding disaster will influence the social and psychological factor upon recommendation escape strategy [8].
Besides this, the government should consider the vulnerability of the building location against liquefaction. FEMA P-646, the guideline for vertical evacuation, reveals that if it is possible, the building should far from the hazard that can cause additional damage to the structure and endanger the safety of the building users like liquefaction. Zulfiar [7] revealed that the vulnerability of building is technically caused by topography or location. If the location of the shelter has a risk of liquefaction, the government should do some practical action to improve the ground structure [9, 10].

4. Conclusion
Padang City has four main shelters that can be used as temporary evacuation sites, but this number is still insufficient for all residents on the coast of Padang. Some people do not know the use of the shelter. This condition is as an indication of the community's lack of knowledge about the danger of a tsunami. The results of the research found that several things influenced the community's perception of the existence of shelters on the coast of Padang. Namely, providing information about shelters as an option in disaster evacuation, evacuation signs located in disaster-prone areas and areas toward shelters, and disaster evacuation maps.

This research also found factors that affect the community's perception of the use of shelters as evacuation places from the tsunami disaster are the location of shelters, the direction to get to shelters, physical shelter conditions, and management in shelter maintenance. And factors of community's reliability of the use of shelters that will not be affected by liquefaction disasters are shelter locations, dissemination from the government, and publication of liquefaction maps. It is hoped that disaster planning and mitigation will be more success by defining this factor.

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