The identifications of the availability of facilities and infrastructure at the temporary evacuation of Padang

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Abstract. The building of Temporary Evacuation Sites (shelter tsunami) has been done in West Sumatra. One of them is the Padang shelter, located in North Ulak Karang Village, Padang. The location has met the requirement of PEMA 646. However, the facilities and infrastructure are still insufficient. Consequently, this study is conducted to inventory, analyze and recommended the facilities and infrastructure so that the mitigation of tsunami disaster will be optimal. The method used is descriptive evaluative, method by doing field observations. The data in the field is tabulated and analysed based on Regulation of Public Works No 19 / PRT/ M / 2001, Indonesian National Standard number 7766: 2012, and 7743: 2011. The results of the study show that the early warning facility (EWS) has functioned well, the logistics room, medical room, public kitchen, and warehouse have not got the equipment yet; clean water and electricity have not functioned. There are 22 evacuation road meeting the wide requirement of environment streets out of 71 existing streets, evacuation signs on 9 streets. To cope with tsunami disaster risk optimally, Padang shelter needs to be equipped with public facilities, additional evacuation maps, evacuation signs, and the improvement of evacuation streets to Padang shelter.

1. Introduction

The West Sumatra Province is one of the most prone earthquakes provinces in Indonesia, because it lies between the Eurasian and Indo-Australian plates [1], Semangko faults in the land and a meeting of the Australian plate and Eurasian plate at the base the ocean, making the city of Padang one of the cities with a high risk of earthquakes and tsunami [2, 3, 4].

In order to reduce tsunami disaster risk and to anticipate the victims in Padang, Disaster Management National Agency (BNPB), built the Temporary Evacuation Site (TES) in Padang started in 2013. One of the vertical evacuation sites built is Padang TES, located in North Ulak Karang Village, North Padang sub-district, Padang City, West Sumatra Province. North Ulak Karang is 1.53 km2 wide of the height of 0-2.5 m above the sea level. In North Ulakkarang e there are 6 Neighborhood units (RW) and 22 Neighborhood sub-units (RT)) with the population of 7,928 people.

Padang TES is located in RW 04 at Wisma Indah Housing Complex on Sumatera street, North Ulak Karang, Padang. The TES distance to the sea side is about ± 699 meters with capacity of 3,898

people. This distance is suitable with the PEMA 646 requirement [5]. The location is shown in Figure 1.

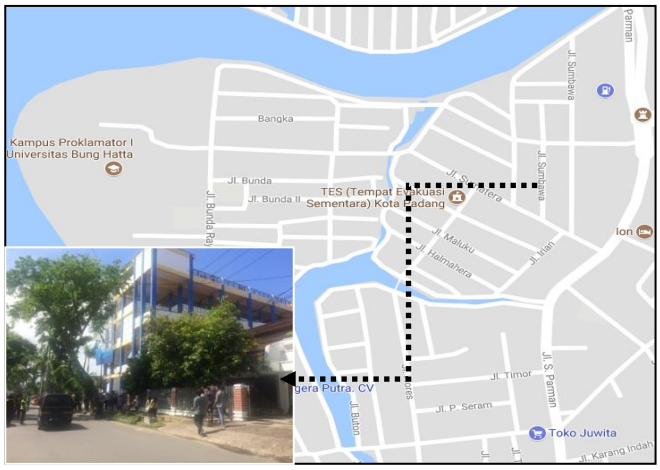

Figure 1. The Map location of TES Padang in North Ulakkarang Village

The main function of the test is to accommodate temporarily the neighboring community from the threat of a tsunami, so beside the suitability of the TES location, care and attention to the facilities and supporting infrastructure like early warning device, public kitchens and medical posts and minimum facilities are necessary [6]. The minimum TES facilities consist of equipment in the location of evacuation like basic medical equipment (first aid kit), sanitation, communication and emergency facilities [7].

The large number of components needed to be considered in building TES require a more detail technical plan. Hopefully, TES can reflect the priority on site, structure, capacity, and sensitivity to the environment as well as the accessibility of the user's base on the mandate of the Law No. 28 year 2002 about Building Construction [8].

The evacuation route in Padang is still limited and many evacuation roads are narrow and broken [9]. Meanwhile, the evacuation roads in North Padang is still inappropriate for evacuation route because in each tsunami evacuation route there are barrier point which are able to cause traffic jam [10]. Based on Regulation of Public Works Minister No. 19 / PRT / M / 2011-year 2011 [11], environmental roads into class III roads and can be used by the vehicles with the width of 2.1 (two point one) meters at the most, the length of maximum 9 (nine) meters, the high of maximum 3.5 meters, and the heaviest loading capacity of 8 (eight) tons. The standard of circumference roads is as shown in Figure 2.

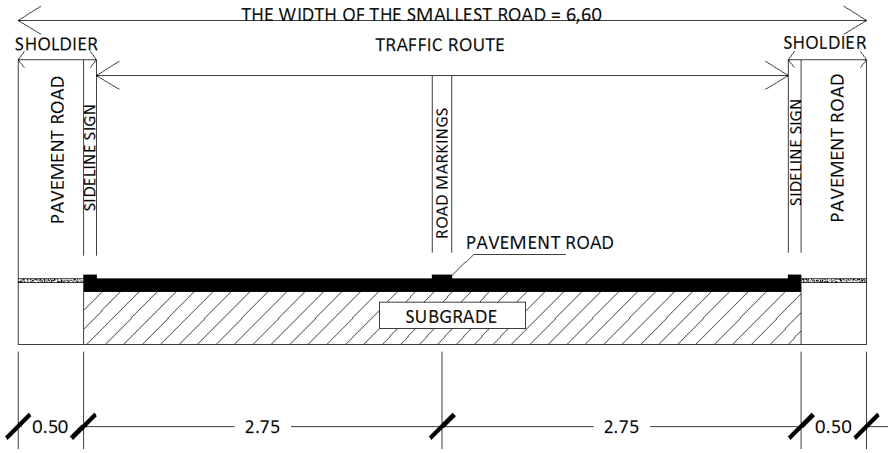

Figure 2. Standard of Circumference Road [11]

Referring to SNI 7766-2012[12], tsunami Evacuation route for the technical requirements of making the evacuation route it is necessary to determine the major route. In the prone tsunami areas, this route is a part of the escape procedures and is included in the evacuation map. Evacuation route is equipped with evacuation signs. Evacuation sign is intended to guide the people to the gathering spot away from disaster-prone areas. The standard of evacuation signs of materials, colors, shapes and sizes, symbols, sign information and the way to install according to the concepts of SNI 7743 - 2011 [13] about Tsunami Evacuation Signs. Accordingly, TES will give the sense of security for the surrounding community. If there is an emergency of tsunami disaster, TES will be ready and function appropriately. In order to function well, TES must be equipped with the appropriate the facilities and infrastructure. Therefore, this study is conducted to inventory, analyze and recommend the availability of facilities and infrastructure at the TES of Padang for the effort of tsunami disaster mitigation.

2. Research Methodology

The research methodology used is descriptive evaluative method. The Primary data are taken by direct field observation. Secondary data are obtained through documents from Disaster Management National Agency (BNPB), Disaster Management Regional Agency (BPBD), and the stake holders. The Analysis is done on the suitability of the location and the availability of facilities and infrastructure at TES of Padang. The analysis of data is done by tabulation. The result of data tabulation is analyzed based on Public the Regulations of Public Works No 19 / PRT / M / 2001 [11] and the Regulations of Indonesian National Standard No 7766: 2012, and No 7743: 2011 [13].

3. Result and Discussion

3.1. The Availability of Facilities and Infrastructures at TES of Padang

The facilities and infrastructure which are available at the Temporary Evacuation Site (TES) of Padang, subdistrict of North Ulak Karang now is as table 1:

Table 1. The Data of Facilities at TES of Padang

No	Kind of Facility	Condition Facility		
		Functional	Non-functional	Position
1.	Sirene/ EWS	√	-	4th floor
2.	Logistik Room		√	3rd floor
3.	Health Room		√	3rd and 4th floor
4.	Public Kitchen		√	3rd and 4th floor
5.	Public Warehouse		√	3rd and 4th floor
6.	Clean water Facility		√	4th floor

The availability of public facilities at TES of Padang is as follow: EWS siren is functional and logistics, medical room, public kitchen, warehouse is still empty without supporting facilities inside them, and the clean water facility is not functional, yet. With this condition, it means that this building does not have complete facilities and infrastructure appropriately based on the minimum standard for a TES. In order to make TES of Padang useful for the people during the tsunami disaster, it is necessary to provide it with the facilities stated in The Tsunami Ready Toolbox for the Indonesian Hotel Industry [7], namely:

1) Basic medical equipment (first aid kit).
2) Water and durable food must be available for 3 days.
3) Communication equipment such as loud speakers (TOA), radio using batteries, VHF Handy Talky and satellite phone.
4) Backup lighting such as flashlight, candle and matches and blankets, toilet tissue, plastic bag for garbage, rubber gloves, insect repellent, crowbars, whistle and cellophone tape

3.2. The Availability of Evacuation Route and Signs Infrastructure

The availability of evacuation route and signs to TES of Padang in the area of North Ulak Karang consist of 71 roads with 1 Provincial Road and 70 circumference Roads with 6 access to bridges and 9 functional evacuation signs for horizontal evacuation. The data of evacuation route and sign infrastructure are as shown in table 2:

Table 2. The Data of circumference Route and Sign Infrastructure

No	Infrastructure	Number	Note
1	Roads	71 roads	1 provincial road and 70 circumference roads
2	Bridges	6 access of bridges	1 construction and 5 conventional bridges
3	Evacuation Sign	9 evacuation signs	broken

3.2.1 The condition of Access Road. Based on the Regulation of Public Works Minister No. 19 / PRT / M / 2011 year 2011 about the technical requirements of roads [11], the width of the roads to be used by the community around the TES are as follow (i) there are 22 road out of 71 access roads which have met the width standard ; 18 roads are in good conditions and 4 roads are broken; (ii) there are 49 roads which have not met the width standard ; 24 roads are in good condition and 25 roads are broken. The details of road conditions are shown in appendix 1.

The main roads and the fastest alternative roads to the evacuation route of TES is Bunda Raya streets, Paus streets and Buton 1 street. However, the condition of the roads is heavily broken with the inundated water due to absence of road drainage and lack of maintenance as well as the files of garbage in some roads.

3.2.2 Evacuation Signs. There are 9 evacuation signs on the access roads. Based on SNI 7743–2011 [13], the conditions of the signs are as follow: (i) two signs are located on Paus Streets with the sign pole in faded condition, (ii) one sign is positioned on Flores streets with the sign note and sign pole in faded condition (iii) two signs are located on Sumatra street with the sign pole in faded condition; (iv) Two signs are located on Sumatra II street with the sign pole in faded condition ; (v) One sign is located on the alternative road Tim-Tim with the sign note and the sign pole in faded condition; (vi) One sign is located on the alternative road of TES of Padang with the sign note and the sign pole in faded condition. All the signs are for horizontal evacuation to direct people away from the seaside. The sign directing to or leading to the vertical evacuation of TES has not been found.

4. Conclusion

Based on the study, it can be concluded that: (i) The Public facilities at TES of Padang are still not appropriate because the only functional facility as the EWS siren, while the logistical and medical room, public kitchens, public warehouses and clean water facility have not been functional, yet. (ii) The Medical, water, communication and lighting equipment have not been available yet. (iii) There are 71 access road with 22 road have met the width requirement, while 49 roads have not met the with requirement yet, (iv) There are Evacuation signs on 9 roads out of 71 existing roads in bad conditions.

5. Recommendation

Improvement on the main access roads namely Bunda Raya Street, the alternative road of the side bank - 1, Buton – 1 street is necessary. Besides, it is urgent to add 26 evacuation signs (17 signs with notes to the TES and 9 sites with notes to the horizontal evacuation. Moreover, risk maps and evacuation maps at the TES area are essential.

Appendix A

Table 3. Condition of roads to TES Padang

No	Road	The Existing width of road (m)	The standard of widthr		The condition of road construction
			M	BM	
1.	Paus Main Street	5 - 6	√	×	Asphalted- Good
2.	Buton - 1 Street	4 - 5	×	√	Asphalted – Heavily damaged
3.	Buton 1 Alley	3 - 4,5	×	√	Asphalted – Lightly damaged
4.	Buton 2 Alley	3 - 4,5	×	√	Asphalted – Lightly damaged
5.	Buton 3 Alley	3 - 4,5	×	√	Asphalted – Lightly damaged
6.	Buton- 2 Street	4 - 5	×	√	concrete - good
7.	Flores Street	4 - 5	×	√	concrete - good
8.	Flores 1 Alley	3 - 4,5	×	√	concrete – moderate damaged
9.	Flores 2 Alley	3 - 4,5	×	√	Asphalted – moderate damaged
10.	P. Seram Street	4 - 5	×	√	concrete - good
11.	Timor Street	4 - 5	×	√	Asphalted- Good
12.	Timor-1 Street	4 - 5	×	√	Asphalted – moderate damaged
13.	Bahari Street	2,5 - 4	×	√	Asphalted – Lightly damaged
14.	S. Parman Street	7 - 12	√	×	Asphalted- Good
15.	Bunda Raya Street	5 - 7,5	√	×	Asphalted – heavily damaged
16.	Kalawi Street	3- 4,5	×	√	Soil
17.	Kalawi-1 Street	3 - 4,5	×	√	Soil
18.	Sejati - 4 Alley	3,0 - 4,5	×	√	Soil
19.	Bunda VI Street	4,0 - 6,0	√	×	Asphalted- Good
20.	Bunda V Street	4,0 - 5,0	×	√	Soil
21.	Bunda IV Street	3,5 - 5,5	√	×	Aspal - Baik
22.	Bunda III B Street	4,0 - 5,5	√	×	Asphalted – Lightly damaged
23.	Bunda III B -1 Street	3,5 - 4,5	×	√	Soil
24.	Bunda III A Street	4,0 - 5,5	×	√	concrete – Lightly damaged
25.	Bunda III A-1 Street	3,0 - 4,5	×	√	concrete – Lightly damaged
26.	Bunda III A-1 Street	4,0 - 5,5	√	×	Asphalted – Lightly damaged
27.	Bunda III Street	4,0 - 6,0	√	×	Asphalted- Good
28.	Bunda III-1 Street	4,0 - 5,5	√	×	Asphalted- Good
29.	Bunda II-1 Street	3,5 - 4,5	×	√	Asphalted- Good
30.	Bunda II Street	4,0 - 5,5	√	×	Asphalted- Good
31.	Bunda I Street	4,0 - 5,5	√	×	Asphalted- Good
32.	Riverside (BR)- 1 Street	4,0 - 5,5	√	×	Asphalted – moderate damaged
33.	Riverside (BR) - 2 Street	3,5 - 4,5	×	√	Asphalted – Lightly damaged
34.	Tim-Tim Street	4,0 - 5,5	√	×	Asphalted- Good
35.	Tim-Tim-1 Street	3,0 - 4,5	×	√	Asphalted- Good
36.	Tim-Tim-2 Street	3,0 - 4,5	×	√	Asphalted- Good
37.	Bridge - 2	3,0 - 4,5	×	√	Asphalted- Good
38.	Bridge -3	3,0 - 4,5	×	√	Asphalted- Good
39.	Sulawesi Street	3,0 - 4,5	×	√	Asphalted – moderate damaged
40.	Belitung -1 Street	4,0 - 10,5	√	×	Asphalted- Good
41.	Bangka Street	4,0 - 5,5	√	×	Asphalted- Good
42.	LPJK - 1 Alley	4,0 - 5,5	√	×	Asphalted- Good
43.	LPJK - 2 Alley	4,0 - 5,5	√	×	Asphalted- Good
44.	Belitung Street	3,0 - 4,5	×	√	Asphalted- Good
45.	Mentawai Main Street	3,0 - 4,5	×	√	Asphalted- Good

46.	Bangka Alley	3,0 - 4,5	×	√	Asphalted- Good
47.	Mentawai-1 Street	3,0 - 4,5	×	√	Asphalted- Good
48.	Sumatera Street	5,0 - 7,5	√	×	Asphalted- Good
49.	Masjid Babusalam Alley	4,0 - 5,5	×	√	Asphalted – Lightly damaged
50.	Sumbawa Street	3,5 - 4,5	×	√	Asphalted – moderate damaged
51.	Bali Street	3,5 - 4,5	×	√	Asphalted – moderate damaged
52.	Sumatera II Street	4,0 - 5,5	√	×	Asphalted- Good
53.	Sumbawa I Street	3,0 - 4,5	×	√	Asphalted- Good
54.	Sumbawa II Street	3,0 - 4,5	×	√	Asphalted – moderate damaged
55.	Bali-1 Street	3,5 - 4,5	×	√	Asphalted- Good
56.	Bali -2 Street	3,5 - 4,5	×	√	Asphalted- Good
57.	Sumbawa -1 Alley	4,0 - 5,5	√	×	concrete – moderate damaged
58.	Sumbawa - 3 Alley	4,0 - 5,5	√	×	Asphalted- Good
59.	Sumbawa - 4 Alley	3,5 - 4,5	×	√	Asphalted – moderate damaged
60.	Irian Street	4,0 - 5,5	√	×	Asphalted- Good
61.	Sulawesi Street	3,5 - 4,5	×	√	concrete - good
62.	Sulawesi - 1 Street	3,5 - 4,5	×	√	concrete - good
63.	Maluku Street	3,5 - 4,5	×	√	concrete - good
64.	Jalan Maluku - 1 Street	3,5 - 4,5	×	√	concrete - good
65.	Halmahera Street	3,5 - 4,5	×	√	concrete - good
66.	Halmahera - 1 Street	3,5 - 4,5	×	√	Asphalted – lightly damaged
67.	Kalimantan Street	3,5 - 4,5	×	√	concrete - good
68.	TES Street	4,0 - 5,5	√	×	concrete - good
69.	Riverside-1 S.Parman Street	3,0 - 4,0	×	√	Asphalted – heavily damaged
70.	Riverside-2 S.Parman Street	3,0 - 4,0	×	√	Asphalted – lightly damaged
71.	Bridge Access Jembatan	2.00	×	√	concrete – moderate damaged

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