4th International Conference on Civil and Environmental Engineering for Sustainability (IConCEES 2017)

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PREFACE

Alhamdulillah, I am very grateful that this International conference is convened to gather more than one hndred speakers presenting papers pertaining to the field of Civil and Environmental Engineering. This 4th International Conference on Civil and Environmental Engineering for Sustainability (IConCEES 2017) is organized as a platform for scientist, researchers, and engineers to share their knowledge and experiences in creating sustainable and environmental friendly world for the present and the future. We all know that this world is borrowed from the next generation and in other for us to ensure that it is well looked after. We have to maintain the three important pillars of sustainability i.e. Economics, Environment and Society. These three pillars are the catalyst to ensure that the world is live able, continue to exist and at the same time is developed to enhance the socio-culture of mankind.

With the IConCEES theme " Transforming Development Through Green Technology", the conference hopes to interest participant on the wide range of issues and solutions in pursuing sustainability form an engineering perspective. With research works on reducing the usage of natural materials and increasing the use of recycled materials, pollution and negative environmental impacts can be reduced. Thus, it is our duty to ensure that we conduct the necessary steps towards sustainability of the world in whatever discipline and role that we have.

I would like to congratulate and thanked all the 4th IConCEES 2017 committee members for their hard works and diligence. I would like to thank UTHM Commercial Sdn. Bhd. and FKAAS UTHM for their cooperation in managing this conference. It is always hoped that this conference will be organized in the future with a more exciting them to be discussed and shared by all parties.

Thank you

ASSOC. PROF. DR. MOHD ADIB MOHAMMAD RAZI
Executive Chairman of IConCEES 2017.

The 4th International Conference on Civil and Environmental Engineering for Sustainability (IConCEES 2017) is a conference organised by the Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia that was held in Langkawi, Malaysia on the 4th and 5th of December 2017. IConCEES 2017 provide a platform for exchanging ideas between engineers, researchers and scientists from both the academia and the industry on the latest advances in research and innovation, as well as state-of-the-art information in the fields of civil and environmental engineering.

With the theme ***"Transforming Development Through Green Technology",*** the conference hopes to interest participants on the wide range of issues and solutions in pursuing sustainability from an engineering perspective.

The basis for discussion was the material delivered by the following keynote speakers, being internationally recognized academics and leading experts:

Keynote Speaker 1

Development and Construction of Universiti Tun Hussein Onn Malaysia Branch Campus at Pagoh, Malaysia: From Planning to Delivery

The plan to set up a branch campus for Universiti Tun Hussein Onn Malaysia (UTHM) a public technical university was decided in early 2008 when the remaining land are for future development at UTHM main campus in Parit Raja is getting smaller and will not be able to accommodate the needs of further development in line with the increasing enrolment of students. The increase in the enrolment of students will required increased use of space and other physical facilities. This article will explain the process of the development of UTHM branch campus which was in Pagoh, Johor from 2008 until its completion in 2017. The rational of site selection is also explained. The elements of the campus development that applied green technology is also highlighted. The advantages and disadvantages of Public Private Partnership (P3) procurement method which was used successfully to deliver the branch campus is also discussed.

PROF DR AHMAD TARMIZI ABD KARIM

Universiti Tun Hussein Onn Malaysia

Keynote Speaker 2

Japan's High Speed Rail: An Integral Part of Economic Growth

Started in 1964, the Japanese High Speed Rail (HSR) in Shinkansen, Japan was just in time for the Tokyo Olympic Game. The first line (515.4 km length) constructed between Tokyo an Osaka, the two-mega cities in Japan, the network include 2615.7 km of lines with a minimum speed of 320 km/h. With the growth in Japanese economy, the number of HSR passengers was also increased.
Now, Japanese government has plans to build a next generation high speed rail "Maglev" to connect Tokyo and Nagoya by 2027. The main aim of the project is to:

- Influence and increase the Gross National Products, calculated by cost benefit analysis.
- The focus is on spatial economic effects. HSR is not only for urban area but also for rural are that is under development. The balance of each is also important from national wide spatial planning vies.
- HSR's environmental benefits could be calculated by the change in CO_2 level.

The spatial computable general equilibrium (SCGE) analysis can answer numerically above the requirements. Therefore, we apply SCGE model for East Asian HSR projects that contains Japanese Maglev, Korean KTX and Taiwan T-HSR.

Although benefits of Maglev are the largest, benefit-cost ratio (B/C). the investment of Maglev is the smallest due to the huge investment cost. However, all of B/C estimates of the three projects are over one, and therefore, all project has satisfied social efficiency criteria.
The benefits of GDP ratio (B/GDP) in KTX and T-HSR are 6.3 and 7.0 % respectively, which are much higher that Maglev (2.3%). Since the conventional HSR (Shinkansen) has already existed in Japan, marginal effects of the additional HSR investment should be small. That is why the B/GDP in KTX an T-HSR are relatively larger.

Regarding CO2 emissions from the transport sector, all three HSR project can reduce the emission successfully. The reduction in amount of CO2 and the reduction rate of CO2 in T0HSR are the highest among the three projects. This is because of the (exogenously given assumption) shift of modal split share from air and car to HSR, 100 and 52.7% respectively, is much higher that other countries.

On the other hand, improvement of inter-regional transport conditions by HSR develops the overall economic activity, and then CO2 emissions from the industrial sector will increase. From this result, we can point out following two environmental issues;

1) CO2 emission form HSR is good performance than air transport. However, in case of Maglev, the result of CO2 is dominated by electrical power generation. This result, calculated before Fukushima (last Japanese Great earthquake in 2011), sets unclear power generator. If we set this scenario, the result of CO2 emission might be more serious. Therefore, the scenario of what kind of electric sources is very important in these kinds of analysis.
2) HSR project decreases CO2 emission in transport sector. However, HSR make an economic growth at the same time. These indirect effects of HSR make additional CO2

emission. Form our results, the amount could not be ignored. Therefore, we need comprehensive policy to reduce all CO2 emission in the entire society.

Table 1 the Effect and change of CO2 emissions of high speed railway investment

		Maglev	(Reference)	
			KTX	T-HSR
Benefit		US$ 120.6 billion	US$ 41.8 billion	US$ 19.1 billion
		11.2 trillion ¥	46.7 trillion won	668.9 billion NT$
Cost		US$ 97.1 billion	US$ 19.7 billion	12.9 billion US$
		9.0 trillion ¥	22.0 trillion won	450.0 billion NT$
B/C		1.2	2.1	1.5
Benefit/GDP ratio		2.3%	6.2%	7.0%
CO_2 emission	Transport change of amount change of ratio change of price	−100,621 t-CO_2/year	−525 t-CO_2/year	−1,694,555 t-CO_2/year
		−0.9%	−3.4%	−30.4%
		−3.1 million	−0.01 million	−17.4 million US$/year
		US$/year	US$/year	−610.0 million
		−284.0 million ¥/year	−7.2 million won/year	NT$/year
	Industrial change of amount change of ratio change of price	137,065 t-CO_2/year	66,969 t-CO_2/year	152,387 t-CO_2/year
		0.1%	0.3%	0.1%
		4.2 million US$/year	0.821 million	1.57 million US$/year
		387 million ¥/year	US$/year	55 million NT$/year
			913 million won/year	

PROF DR ATSUSHI KOIKE

Kobe University, Japan

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Visitors' awareness of the tsunami evacuation plan in Pasar Raya Padang, Indonesia

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Abstract. This paper presents an investigation into the visitors' awareness of the tsunami evacuation plan at Pasar Raya Padang, a traditional market at the central business district of Padang City, Indonesia. This study has been motivated by the fact that Pasar Raya Padang is the largest traditional market in West Sumatera and visited by many visitors from various origins. Pasar Raya Padang is chosen because it is located at a tsunami prone area, but local government managed to keep businesses in the area running and attract visitors. The awareness of the people in the market would be crucial to increase the possibility to safe their life during an evacuation. As much as 500 respondents were interviewed during daytime in the market. The study found that most of the visitors are not aware of the tsunami evacuation plan in the area. Local government is suggested to develop standard procedure for the evacuation, to place more sign and make it more visible for most of the visitors and do evacuation simulations periodically.

1. Introduction

Pasar Raya is the largest traditional market in West Sumatera, Indonesia. The contribution of the market in economic development to Padang is significant. As a central business area, Pasar Raya is visited by thousands of people everyday. They come from various places not only around the city but also people from outside of the city. This raises concerns about their safety in the event of a possible tsunami earthquake, as they might not familiar with the surrounding environment.

The central business area is located at the elevation less than 10 m, whilst experts predicted that a 15 m tsunami inundation could be triggered by an earthquake in Padang [1-3]. Kemal et al. [4] and [3] predicted that people in this area might not be able to reach the safety zone by doing horizontal evacuation before the tsunami waves reach the coastline. One of the possible strategy to safe them is to evacuate them to a nearest shelter.

The question is, do the visitors of the Pasar Raya aware of the threat and know what to do and where to go when a possible tsunami earthquake hit? The questions become more importance as on the latest strong earthquake on 5th August 2017, people seems to be unaware of the threat. Only a few people flee to a safe zone after the earthquake. Can we conclude that people have forgotten the tsunami threat to the city?. This research aims to answer the questions. Based on the finding, a recommendation to the local government could be proposed.

2. Literature Review

2.1. Feature of Padang City

Padang is the capital city of West Sumatera Province, Indonesia. Astronomically, Padang is located between 0°44' and 01° 08' South Latitude and 100°05' and 100°34' East Longitude [5]. Pasar Raya is located at the central business area of Padang. From the coast, the terrain of Padang has 3-4 km of flat land within zero to five-meter elevation above sea level and then rising toward hills further inland [1]. The altitude of Pasar Raya itself is just about 7-9 meters above sea level. The population of the city in 2014 was 889.646 people [5] which about a half of them were living close to the coast. These number is potentially to increase in day time as the visitors of Pasar Raya come from all region of Padang or from outside of Padang. The map of Padang is shown in figure 1.

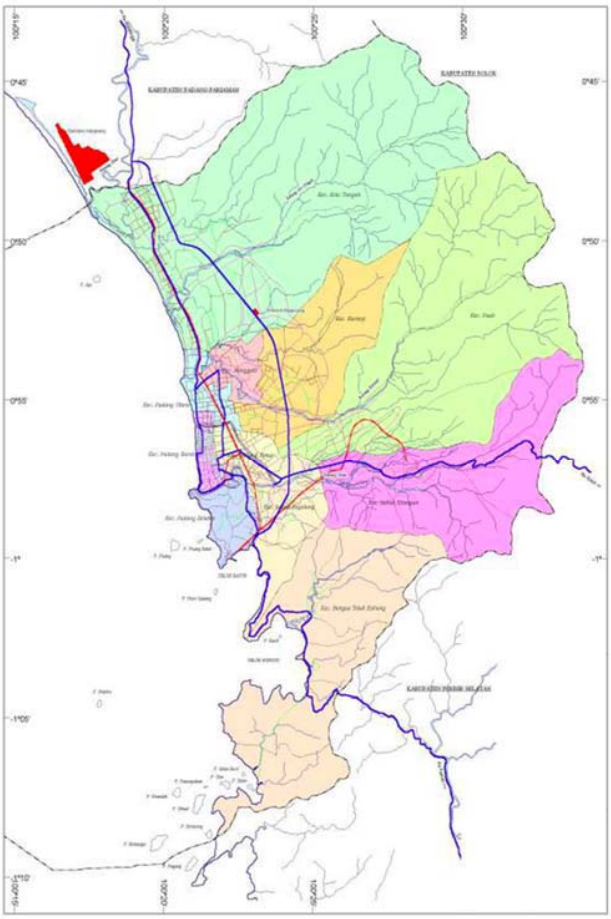


Figure 1. Map of Padang City [5]

2.2. Padang Tsunami Preparedness

The preparedness of Padang for the tsunami hazard has been starting since 2004 after the Aceh's tsunami. Some multi-story buildings were set as temporary evacuation site. However, on the September 30, 2016, many of the multi-story buildings were collapsed due to a powerful earthquake [6]. No tsunami was recorded at the time, but the thousands of life were lost and thousands were injured. Learning from this events, all of the survived multi-story buildings were assessed to ensure

that the buildings are strong enough to the most anticipated earthquake. Retrofitting and re-locating of some buildings were conducted. New building was designed using the new standard for the earthquake resistant building.

Some shelters or temporary evacuation sites were set again from a retrofitted building or a new building. Yosritzal et al. [3] and Kemal et al. [4] estimated that number of shelters in 2015 was 24 and this number is not enough to handle the demand. It was predicted that the demand for the shelters more than twice of the existing shelters, depending on the location and the capacity of the shelters. In terms of the functionality of the shelters even worse. Access to the shelters were not available at anytime, even when an earthquake hit the city, the gate to the shelter was still closed.

A shelter is under construction at the center of Pasar Raya. At normal day it will be functioned as a place for the sellers to sell their merchandise. The building has not been one hundred percent ready as a market building but it can be used as a shelter when needed. In some occasions, city major and other organisations encouraged people in Pasar Raya to evacuate to the shelter when a powerful earthquake hit.

3. Methodology

Data for this study was collected by interviewing Pasar Raya visitors using a questionnaire. The questions include the personal characteristics of respondents as well as their knowledge and awareness of the tsunami and evacuation plan. Prior to the data collection, a pilot study has been administered. The pilot study aims to test the questionnaire and to estimate the time needed to get one data. This information is importance in order to obtain a more reliable data. In order to ensure the quality of the data collected, a training for the surveyor was conducted prior to the data collection.

Detail location of the survey is shown in figure 2. The new shelter is constructing at the old market building that suffered from serious damage after the 30 September 2009 earthquake.

(a.) (b.)

Figure 2. The map of location. (a.) Location of the survey (the building with blue roof is the shelter. (b.) Situation of the market, at the background, the shelter can be seen. At the time of this picture was taken, it was not finished yet. (Source: maps.google.com).

The full survey was conducted from 22 to 29 of October 2017. The data was then analysed using descriptive statistic methods. The respondents were randomly chosen among those who were not busy at the time and were willing to involve in the interview and completing the questionnaire. The interview took place around the Pasar Raya traditional market. As the sample size is 501, it is considered to be large enough to represent the Pasar Raya visitors, then the respondent characteristics here can be assumed to be the same with the characteristics of the visitors.

4. Result and Discussion

4.1. Characteristics of the Visitors

The characteristics of visitors were expected to influence the awareness of the visitors. For example, it is expected that young visitors will have a higher awareness as they obtain information about tsunami

and evacuation through social-media. Therefore, the characteristics of respondents will be described first before the awareness data being analysed.

In terms of gender, about two third of the Pasar Raya visitors are Females and one third are males as shown in figure 3 and figure 4. This profile is much different from the distribution of population by gender where number of males is almost equal to number of female in Padang [5]. Learning from the culture in West Sumatera, this profile is not shocking because females more likely to go shopping to the traditional market than males. In terms of age, the visitors were mostly at the age interval of 16 to 30 years old (64%).

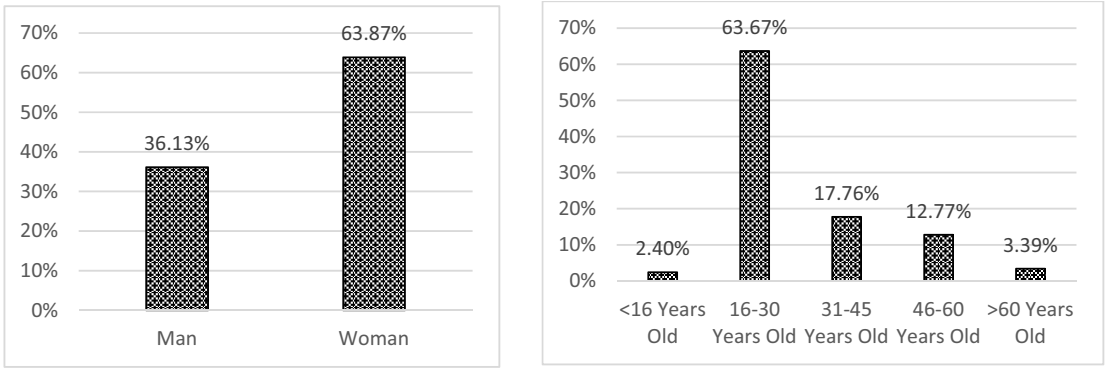


Figure 3. The distribution of Visitors in terms of gender and age interval. (a.) Distribution by gender. (b.) Distribution by age interval.

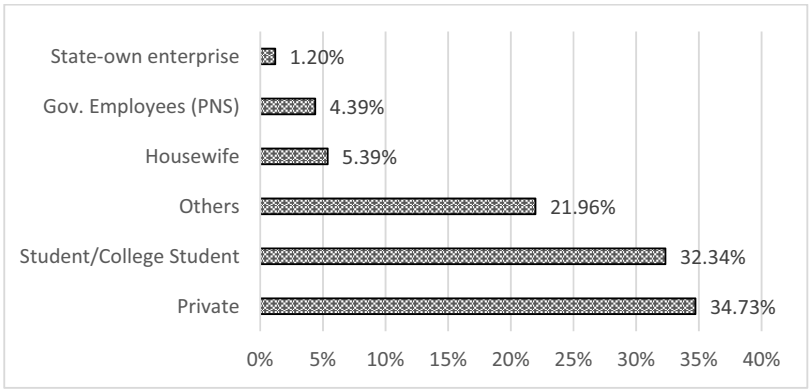
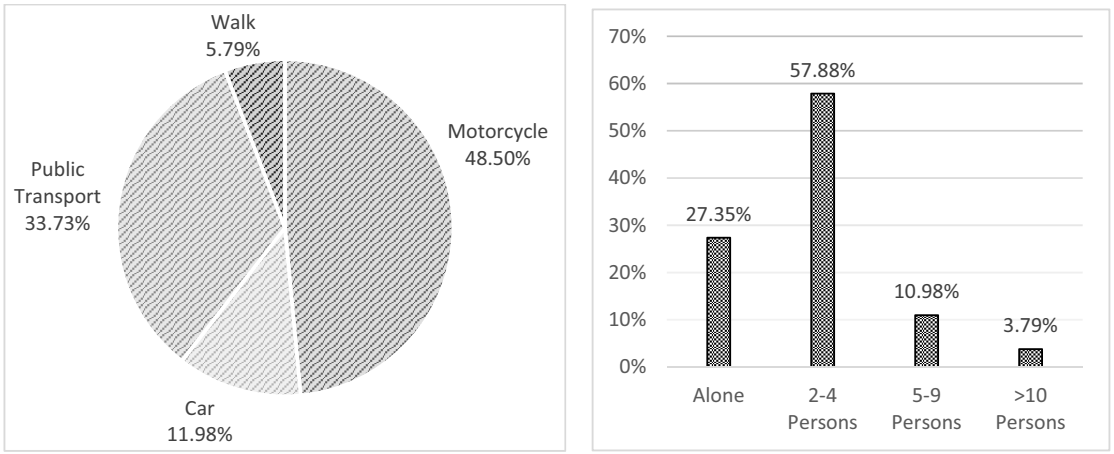


Figure 4. Distribution of visitors by employment status

Based on employment status, visitors were mostly private enterprise and students. Private enterprise here could be the seller of those who work at a private company. Less representation of the government and state-own enterprise employees may be because of the survey was taken place in daytime so that most of them were still in their office. Detail is shown in figure 5.



(a.) (b.)

Figure 5. Distribution of visitors by mode used from their origin and how many person of them in a group.

It is very interesting to find that 49% of the visitors were using their motorcycle for going to Pasar Raya, and 34% using public transport. More than half of them were travelled to Pasar Raya in a group of 2 to 4 persons. Please see the Figure 5 for detail information.

Awareness of the visitors about the earthquake that potentially to trigger a tsunami was assessed using some questions. The answer of them will be explained one by one in the following sub-section.

4.2. Perseption on the Available Time for Evacuation

Yosritzal et al. [7] estimated that the effective available evacuation time was 17.1 minutes. This time was estimated with assumption that the starting time for evacuation was 20 minutes after the earthquake. When visitors were asked how long they think they will have time to evacuate if the epicentre of the earthquake located at megathrust, the various answers were obtained as shown in figure 6.

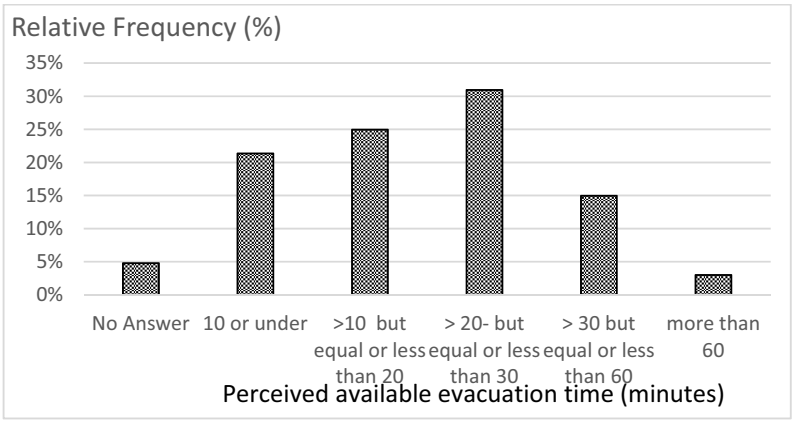


Figure 6. Response to the question: how long do you think you have time to evacuate if the epicentre of the earthquake is located at the megathrust?

Majority thought that they will have time up to 30 minutes but surprisingly, there were a significant number of visitors though that they will have time more than 30 minutes. Yosritzal et al. [3] estimated

that the propagation time of tsunami wave is about 37 minutes. Based on the experience, very few people evacuated immediately after the earthquake. It was estimated that evacuation was started 20 minutes after the earthquake. Therefore, the effective available evacuation time is 17 minutes. The significant number of people who thought that they will have more than the effective evacuation time, is very risky. If the [3] estimation is proven, the possibility of having casualties will increase.

4.3. Awareness on the Evacuation Plan

Awareness on the evacuation plan was assessed by several questions recalling their memory on the evacuation sites or shelters and evacuation signs around the Pasar Raya. The responses were recorded as "yes" or "no" and shown in table 1 and table 2.

Table 1. Awareness on the evacuation plan

No.	Question	Yes (%)	No (%)
1	Do you know any shelters around here?	28.3	71.7
2	Do you know the evacuation route to the nearest shelter?	25.7	74.3
3	Do you see any sign pointed to a shelter location?	18.2	81.8
4	Do you see any horizontal evacuation route sign?	29.5	70.5
5	Is there any access to shelter location or horizontal evacuation route?	49.3	50.7

Table 2. Distribution of response to the question "Do you know any shelters around here?" by respondents' characteristics.

Respondents' Characteristics	Response (%)		Respondents' Characteristics	Response (%)	
	Yes	No		Yes	No
Gender			Employment status		
Male	0.409	0.591	Government	0.364	0.636
Female	0.213	0.788	State own enterprise	0.167	0.833
Age			Private	0.339	0.661
<16 y.o.	0.167	0.833	House wife	0.259	0.741
16-30 y.o.	0.219	0.781	Student	0.148	0.852
31-45 y.o.	0.371	0.629	Others	0.391	0.609
46-60 y.o.	0.484	0.516	Group member		
>60 y.o.	0.353	0.647	Alone	0.380	0.620
Mode use			2-4 persons	0.252	0.748
Motorcycle	0.387	0.613	5-9 persons	0.236	0.764
Car	0.200	0.800	>10 persons	0.211	0.789
Public Transport	0.195	0.805			
Walk	0.211	0.789			

Table 1 shows that most of the visitors were not aware on whether a shelter is available around the location or not and whether any sign for evacuation is placed around the Pasar Raya. Just about one fourth of the visitors recognised that a shelter is located at Pasar Raya which is the new building. This people may be those who visits the Pasar Raya everyday as a seller or they are living close to the Pasar Raya. However, about a half of respondents were aware that the access to shelter location or to horizontal evacuation site is available. This response showed an anomaly in their thinking as they said earlier that they do not know any shelters or evacuation sign either for horizontal or vertical

evacuation. This finding may be influenced by their previous knowledge that, some of the radial roads heading to a hilly land have been declared as tsunami evacuation roads by the government.

A cross tabulation was conducted to investigate whether respondent's characteristics influence their awareness. The findings suggested that there were little differences in their awareness among different characteristics. For example: responses to the question: "Do you know any shelters around here?" as shown in table 2 indicate that the proportion of "Yes" is nearly similar which is about 0.284 in average. The largest "Yes" proportion was shown by people in age range of 46-60 years old (0.484) followed by Male (0.409). These proportions are almost equal to all other questions.

The findings disproved our hypothesis that younger visitors who are perceived to be more familiar with internet and social media will have a higher knowledge and awareness about the tsunami threat. Nowadays, social media is perceived to be the most important media to educate people and to share importance information.

4.4. What to Do if a Possible Tsunami Earthquake Happened

The next question being asked to the respondents is what will they do if they feel a powerful earthquake hit their area. The answers are shown in figure 7. The response to this question is also worrying because most of respondents will flee to a hilly area by vehicle which is not recommended by government and experts [6,8]. The second frequent response is go to hilly area on foot which is also not recommended as they might not be able to reach the safety zone before the tsunami wave arrive [4]. This finding supports the interpretation that most of the people are not aware of the threat and what to do.

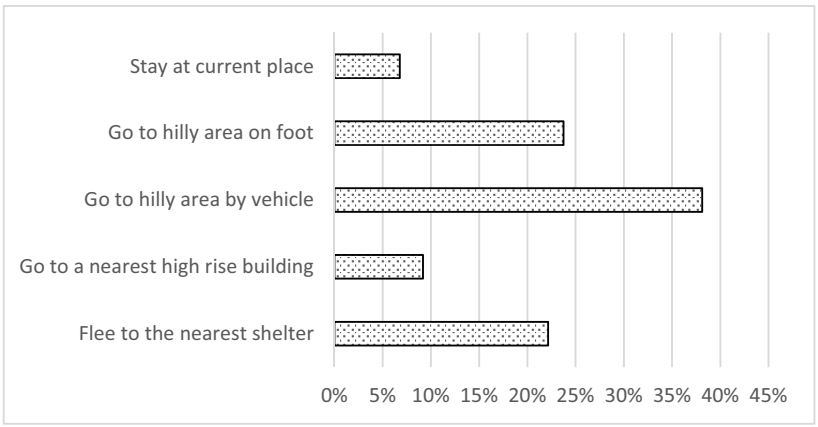


Figure 7. What to do if possible tsunami earthquake hit

4.5. Discussion

A preliminary results of a comprehensive study on the awareness of the visitors of Pasar Raya on the tsunami hazards have been presented. It is very clear that the awareness of the visitors are very worrying. They do not know whether there is any shelter around the location or not. According to [3,4] the people in this area were more likely to fail to reach the safety zone when they do horizontal evacuation to a hilly land, especially when they start to evacuate 20 minutes after the earthquake. Based on the characteristics of the visitors, most of them were in the productive age range (16-30 years old) and working in a private company or a student. This generation is a technology dependence generation. They obtain information from their gadget and do something based on the social media response on their enquiry. In the case of a powerful earthquake, usually such technology will stop operating either because of the electricity cut or because of the damage in provider's infrastructure.

Furthermore, the government and experts' suggestion to evacuate on foot and not by vehicle seems to be abandoned as most of respondents said they will evacuate by vehicle to a hilly land.

Therefore, we suggest the local government to make the evacuation signs are visible at any places around the Pasar Raya. Standard operating procedure for the evacuation of Pasar Raya visitors should be carefully developed and simulated. Socialisation of the tsunami hazard for the location should be continuously done.

5. Conclusion

This paper presents the result of an investigation on the awareness of visitors of Pasar Raya Padang on the tsunami evacuation plan at their location. The study found that about one fourth visitors only who are aware of the evacuation plan around the Pasar Raya. Therefore, local government should educate the visitors and provide more sign to make it more visible and periodically do simulation.

Further works will be investigating: the knowledge of the Pasar Raya visitors about earthquake and tsunami; and the attitude and behaviour of the visitors during evacuation.

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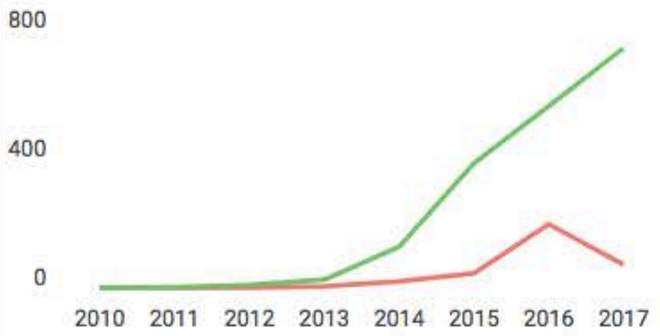

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