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Assessing Residents' Flood Preparedness through Adaption of Protective Behaviour in Melaka, Malaysia

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Abstract Flood is a natural disaster experienced by Malaysians including residents in Melaka. Floods cause huge damage and loss, and can affect the health of the flood victims. However, flood prone residents' awareness and preparation towards floods are still lacking. Despite many efforts done by different organizations to reduce the flood risk, flood hazard remains the main problem in Melaka. Several studies had been conducted to investigate the level of flood preparedness in some regions in Malaysia, but the level of flood preparedness amongst residents in Melaka is still unknown. Therefore, this research is conducted to assess the Melaka residents' flood preparedness using the Adoption of Protective Behaviour (APB) scale. The nine measurements APM scale is utilized and another three measurement items are created and added into the scale which makes it twelve measurement items. The mean for the twelve measurement items ranges between 2.85 to 4.03 while the likelihood percentage ranges between 31.67% and 74.17%. The twelve measurement items are significantly correlated with flood preparedness of the residents in Melaka. The result shows that flood preparedness among the residents in Melaka is still low. Most respondents are not well prepared in facing the flood. As the study was conducted on the states of Melaka only, it is recommended that future study should be carried out in all states in Malaysia especially in the east coast of Malaysia where large scale flooding occurs every year. The findings in this research can assist the authorities and the government to plan on creating public awareness and education for flood disasters. This helps the residents in Melaka to increase their knowledge on flood risk and establish an emergency plan for their families. The study also shows that residents in flood prone area put inadequate efforts in preparing for a flood event.

Keywords Flood, Flood Preparedness, Flood Risk, Adoption of Protective Behaviour, Melaka

1. Introduction

Malaysia is a country with fewer types of natural disasters compared to many other countries. However, flooding which is one of the natural disasters that occurs frequently in Malaysia causes huge loss and damage to the affected communities. Flooding in Malaysia leads to different kinds of damages that may affect human health physically and mentally. According to Stanke et al. [1], the impacts of flooding to human include financial problems, trauma and domestic violence which can happen due to stress after a flood. This shows that floods can bring a series of problems indirectly towards human mental health. According to the World Health Organization, floods will

also increase the spread or transmission of water-borne diseases such as fever and Hepatitis A. Other than that, flooding is also causing damage such as tree falls, damage to agriculture, properties and has an indirect effect to the economy.

The Melaka state government has taken numerous efforts including drainage improvement and flood mitigation projects to prevent or reduce the risk and damage of the flood. The Melaka state government had used major allocations to provide financial assistance and to house flood evacuees in relief centres [2]. Melaka has also invested in Melaka River Embankment Projects in 2010, continuously doing maintenance for the river, establishing some stores to keep food and necessities for flood victims and also installing early warning systems [3]. However, the flood mitigation projects in Melaka are insufficient to protect Melaka from a flood. Therefore, this research attempts to establish the residents' perception of flood risk and their preparedness [4].

Although Malaysia and Melaka governments have invested and prepared many projects to reduce the risk of flood, residents in the flood-prone area still need to make some efforts to minimize the damage that may be caused by flood to them. Residents in a flood-prone area must take precautionary actions. They need to be prepared earlier with sufficient emergency supplies and make sure all the family members have the knowledge about what they should do when a flood occurs to minimize the risk and damage of a flood [5]. Research has shown that temporary resistant measures such as flood boards can minimize the average flood damage cost by between 50 and 100% [6]. Participation of flood residents in the flood risk management process is a significant factor in achieving the target of evolving flood risk management strategies [6]. However, Malaysians are lack awareness of the seriousness of the floods [7]. Therefore, to minimize the cost impact of the damage caused by flooding, residents in flood-prone areas must be encouraged to take steps to install their flood protection measures and alerts.

The purpose of this research is to investigate the residents' level of flood preparedness to find out how well the residents in Melaka prepare to face the flood and what can be suggested to increase the residents' awareness about the flood risks and undertake the right preparation before a flood occurs. The residents' flood preparedness will be measured using *the* Adoption of Protective Behaviours (APB). The key contribution of this work is the solution it could provide to relevant authorities to take action to educate the residents on the importance of preparing for a flood hazard instead of just waiting for the actions from the authorities. This research is conducted on residents of flood-prone areas in Melaka, Malaysia.

If the residents can have more knowledge on the importance and the steps needed for flood preparedness, the residents will be able to gain the benefits and save potential victims' life from the flood. In Malaysia, there are not many studies being carried out to determine the level of community flood preparedness. A study on community preparedness towards flooding in Segamat, Johor shows that households and communities have high levels of preparedness and less reliance on the authorities responsible [15]. Therefore, this study aims at examining the level of flood preparedness in Melaka, Malaysia in order to reduce the vulnerability of disaster risk.

2. Literature Review

2.1. Flood Preparedness

Disaster preparedness is described as "a readiness state" for responding to a disaster or a crisis. Disaster preparedness serves as one of the main components of the continuum of disaster management relating to initiatives carried out not only to save lives but also to mitigate property harm and reduce the impact of a crisis incident, including long-term business disruptions [8]. Therefore, it can be said that flood preparedness is actions done to face the flood to reduce or minimize the risk and damage caused by the flood.

Preparedness for disaster is extremely important as this can reduce the risk and reduce the burden of the rescuers to rescue the victims [9]. Hence, early preparation before the flood happens is necessary for safety and minimizing losses. There are three elements included as the actions for preparedness which are prepared, planned and kept up-to-date [10]. Ashenefe et al.[11] assert that flood preparedness can also include training, facilitating, improving and estimating in order to protect, avoid, recuperate and reduce the damage that may be caused by the flood. On the other hand, Terpstra [12] shows that flood preparedness does not only involve the government or authorities but also the residents or citizens are to participate in to make sure that the preparedness can be done to reduce the flood risk effectively. This suggests that residents' flood preparedness is the key to success in mitigating flood damage [11]. In view of this, some studies were carried out to examine residents' flood preparedness. A study of disaster preparedness and perception of flood risk in an alpine valley in Italy shows that most of the respondents are reasonably well trained to deal with a future flood catastrophe [13]. According to Monde et al. [13], Namibians have a higher rate of flood preparedness compared to Zambians. However, the residents of Denbia, Ethiopia have a low level of preparedness for flood protection [11].

Kamarulzaman [14] demonstrates that the residents' flood preparedness in Kelantan, Malaysia is based on their experience only. Therefore, a lot of the strategies or preparation plans are not suitable or unable to protect them from the flood effectively. The flood preparedness in Malaysia is highly dependent on the government which makes the flood preparedness among the residents in Malaysia is less enthusiastic [10]. According to a study by

Ashenefe et al. [11], the flood preparedness among the residents is affected by their age, household income, flood knowledge and duration of the previous flood while gender and homeownership were found to be not correlated with the flood preparedness between the residents.

2.2. Adoption of Protective Behaviours (APB)

The residents will apply the protective behaviors when they think they are at risk and have adequate skills and knowledge needed to do so [16]. However, Dohle et al. [17] argue that the APB needs cooperation from the society to make the action or measures effective. The higher the APB, the lower the risk [18].

Previous research for example Mulilis et al. [19] evaluate disaster preparedness items using a series of questions from APB to ascertain the form and number of defensive behaviors practiced by individuals to deal with a potential flood disaster. This research adapts the APB nine items measurement of flood preparedness from [8]. The APB nine items are as stated in the below table. Respondents would then be asked to show whether they have embraced each of the behaviours presented or not.

2.3. Research Framework

Figure 1 shows the research framework for this research is adapted from the APB. The APB nine items were developed by Mulilis et al [19] to find out the disaster preparedness of residents in flood area. However, in this research, instead of nine items, twelve items were developed for this research to study in depth on the flood preparedness of the respondents. The research framework of this research is shown as below:

Adoption of protective behaviors: items [8]

1. Keep a working flashlight and a battery operated radio in a convenient location
2. Keep a readily available list of emergency phone numbers
3. Teach (and/or arranged with) relatives what to do in case of emergency
4. Attend a first-aid course
5. Purchase any kind of insurance against natural disasters
6. Ask someone (local government, Civil Defense, etc.) information about what to do in case of emergency
7. Store important objects in a safe place
8. Store emergency food and water supplies
9. Make some changes to home

3. Methodology

3.1. Study Area

In Malaysia, the approximate flooding area is 29,800 KM2, impacting more than 4.8 million people and causing considerable property damage [20]. Melaka, which is a state in Malaysia as shown in Figure 2, faces a perpetual flooding problem. In Melaka, it is estimated that the average affected population is 18,000 and flood prone area is 80.9 square kilometers [4]. This article had also added that the average damage caused by flood to Melaka state is about RM2.3 million per year. It is found that the top five areas in Melaka that are identified as the most affected flood areas are Alor Gajah, Durian Tunggal, Sungai Putat, Batu Berendam and Melaka Baru. According to Murali [21], the flood occurs in high flood risk affected areas including Durian Tunggal and Sungai Putat while other areas in Melaka such as Ayer Keroh Height, Taman Muzafar Shah, Taman Malim Jaya, Taman Bukit Melaka and many other areas in Melaka are also areas that are affected by flash flood. Therefore, this research will include respondents from all areas in Melaka as the flood affected areas are not only the top five affected areas but many other areas as well. The maps below show the location of Melaka in Malaysia and the top 5 most affected flood areas in Melaka.

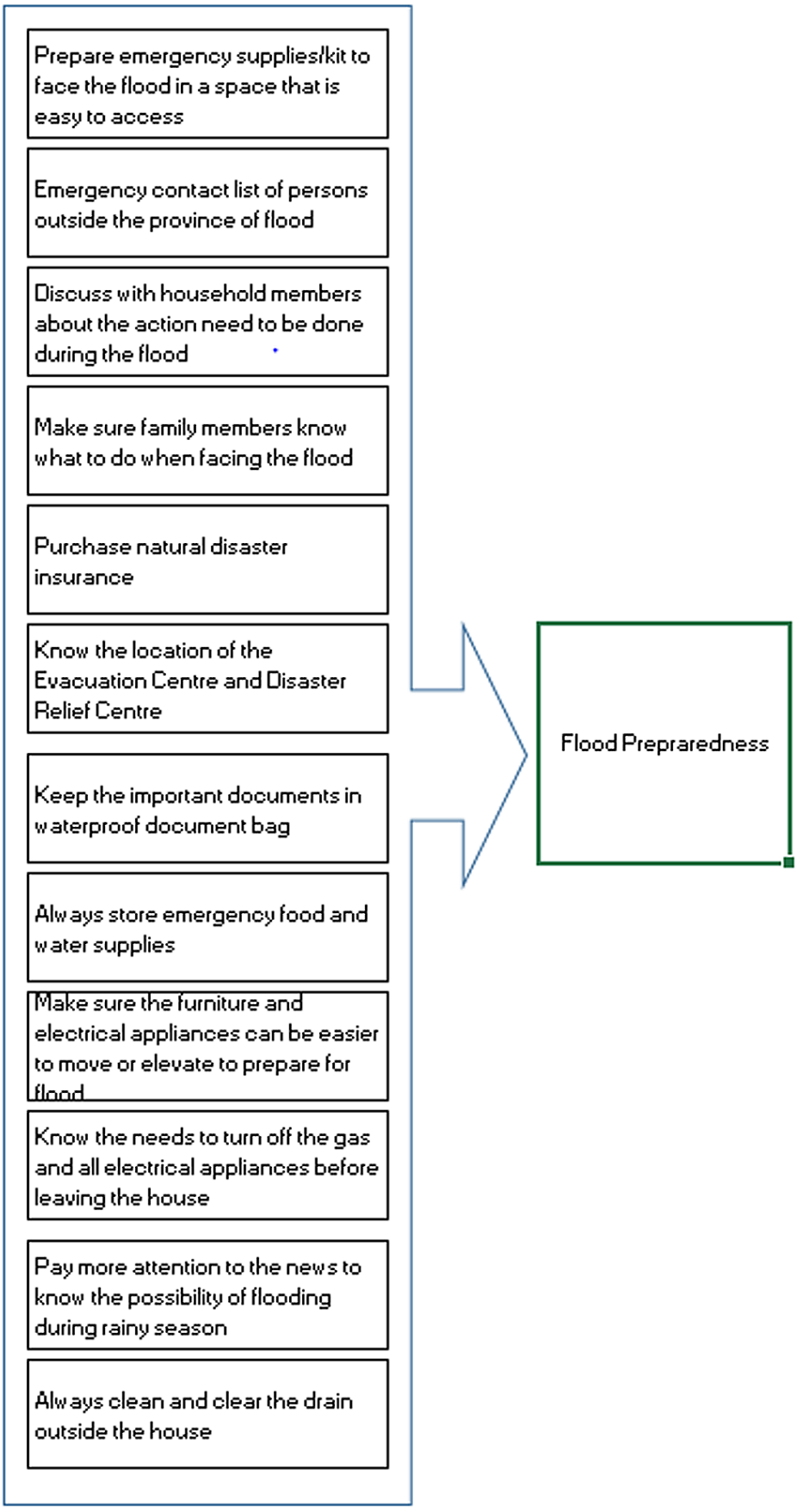

Figure 1. Research Framework adopted from Mulilis et al.

Figure 2. Map Showing the Top 5 most affected areas in Melaka

3.2. Data Source

This research is using quantitative methods instead of qualitative methods. This is because the data collection method for this research is distributing the questionnaires randomly to the respondents who are from or living at Melaka. The data for this research is adopted by distributing a set of questionnaires in the second quarter of 2021. Questionnaire is used in this research because it is fast, effective and requires lower cost to collect the data. It is also easier to reach the respondents as the questionnaire is distributed online which is easy to access by anyone who has an electronic device with internet connection.

The first section of the questionnaire which is Section A includes the questions about the demographic background of the respondents. The demographic data collected included gender, age, race, household income, number of household members, area of region and also type of houses of respondents living at Melaka. The targeted response needed for this research is at least 100 responses. Each set of questionnaires takes about 20 minutes to answer. The questionnaire is distributed using Google Form. Since this research is using a simple random sampling method, the questionnaire is distributed randomly to people in Melaka without considering their gender, age and race.

The second section which is Section B contains 12 questions on the respondents' preparedness towards a flood. Likert scales are used in the questionnaire by allowing the respondents to select the range from 1 to 5 which are

'strongly disagree', 'disagree', 'neutral', 'agree' and 'strongly agree'. The questionnaires were prepared in both English and Malay language and were distributed using social media platforms such as Facebook, Twitter, WhatsApp, Telegram and e-mail. Data were analysed to find out the average and standard deviation.

3.3. Data Analysis

Prior to the official distribution of questionnaires to collect the data, a pilot test was conducted by collecting responses from 30 respondents to examine the validity of each question. Subsequently, the questionnaire was distributed randomly to respondents in Melaka. The data was then exported to IBM SPSS Statistics version 26 for analysis.

Descriptive analysis was carried out to analyse both data from Section A and B which are demographic data and Adoption of the Protective Behaviour of respondents. By using descriptive analysis, the frequency, percentage, mean and standard deviation of the data can be obtained. Descriptive analysis was used in this research as it can analyse the Adoption of the Protective Behaviour accurately. The percentage and number of respondents who agree or disagree with the statement of protective behaviour can be analysed in details. The likelihood percentage of each measurement item was calculated using the total number of respondents who agree with the statement.

Correlation analysis was also utilized to ascertain which types of demographic data are going to affect the Adoption of Protective Behaviour. The results or the descriptive analysis, likelihood of the variables and correlation analysis are presented in the next section.

4. Results and Discussion

4.1. Demographic Profile

Melaka population is about 579,000 and 18,000 of them is estimated to be affected by flood. Therefore, the sample size of this research is calculated according to Cochran formula, which is 376. However, only about a quarter of 376 is projected to be 18 years old and above and thus can be the respondents of this study. As such, the respondents of this research should be at least 94.

120 responses were collected in this research. The response rate is 100% as 120 responses were collected without any blank answer. Table 1 shows the demographic data of this research.

65.8% of the respondents are female while 34.2% of the respondents are male. Majority of the respondents which are 70% of them, are between the age of 18-30 while 20% of the respondents are between 31-40 years old. In case of race, 48.3% of the respondents are Chinese, 40.8% are Malay, 8.3% are Indian and another 2.5% of the respondents are of other races. Most of the respondents' households contain 3-4 members and RM4001-RM6000 is the household income of 27.5% of the respondents. In the case of area of region, more than half of the respondents which is also 56.7% of them are staying in areas other than Sungai Putat, Durian Tunggal, Melaka Baru, Batu Berendam and Alor Gajah. Most of the respondents which is 39.2% of them, are staying at single-storey landed houses in Melaka.

4.2. Adoption of Protective Behaviours of Respondents

Table 2 shows the mean, standard deviation, maximum and minimum point of each measurement item that was included in the questionnaire. The questionnaire comprised of 12 items measurement of flood preparedness to examine the flood preparedness of residents in Melaka. As Likert scale is used in the questionnaire, respondents can rate between 1-5 range in which 1 is 'strongly disagree', 2 is 'disagree', 3 is 'neutral or uncertain', 4 is 'agree' while 5 is 'strongly agree' to show whether they are agreeing or they had prepared for the particular measurement items. Therefore, it indicates that the higher the number of means, the more the respondents are agreeing or well prepared with the particular measurement items or statements. All of the measurement items obtain a maximum point of five and minimum point of one.

Table 1. Demographic Data

Variable	Description	Number	Percentage (%)
Gender	Male	41	34.2
	Female	79	65.8
Age Group	Below 18	3	2.5
	18-30	84	70.0
	31-40	24	20.0
	41-50	8	6.7
	51-60	1	0.8
	61 and above	0	0
Race	Malay	49	40.8
	Chinese	58	48.3
	Indian	10	8.3
	Other	3	2.5
Household Member	1-2	10	8.3
	3-4	64	53.3
	5-6	35	29.2
	7-8	10	8.3
	9 and above	1	0.8
Area of Region	Less than RM 2,000	15	12.5
	RM 2,001- RM 4,000	32	26.7
	RM 4,001- RM 6,000	33	27.5
	RM 6,001- RM 8,000	23	19.2
	RM 8,001 and above	17	14.2
	Alor Gajah	5	4.2
	Batu Berendam	12	10.0
	Durian Tunggal	12	10.0
	Melaka Baru	18	15.0
	Sungai Putat	5	4.2
	Other	68	56.7
Type of Houses	Wooden House	4	3.3
	Flat/ Apartment	12	10.0
	Lot Houses/ Bungalow	19	15.8
	Single-Storey Landed House	47	39.2
	Double-Storey Landed House	35	29.2
	Shop Lot	3	2.5
	Other	0	0

Table 2. Results for Adoption of Protective Behaviours

Adoption of Protective Behaviours	Mean	Standard Deviation	Min	Max
Prepare emergency supplies/kit to face the flood in a space that is easy to access	3.6333	1.06852	1	5
Emergency contact list of persons outside the province of flood	3.8167	1.06102	1	5
Discuss with household members about the action need to be done during the flood	3.2583	1.25354	1	5
Make sure family members know what to do when facing the flood	3.3583	1.24209	1	5
Purchase natural disaster insurance	2.8500	1.35752	1	5
Know the location of the Evacuation Centre and Disaster Relief Centre	2.8833	1.24471	1	5
Keep the important documents in waterproof document bag	3.9167	1.00070	1	5
Always store emergency food and water supplies	3.8833	0.97173	1	5
Make sure the furniture and electrical appliances can be easier to move or elevate to prepare for flood	3.7500	1.05520	1	5
Know the needs to turn off the gas and all electrical appliances before leaving the house	4.0250	0.87411	1	5
Pay more attention to the news to know the possibility of flooding during rainy season	3.9750	0.95673	1	5
Always clean and clear the drain outside the house	3.6083	1.25889	1	5

[Likert scale is used to obtain the data whereas 1: Strongly Disagree; 2: Disagree; 3: Neutral/Uncertain; 4: Agree; 5: Strongly Agree]

The highest mean between 12 statements is 4.0250 which is the mean of respondents who answered about whether they agree that they know they need to turn off the gas and electrical appliances before leaving the house during the flood. This is the measurement item with the highest level of agreement among the respondents. The result also shows that most of the residents in Melaka know that they need to turn off the gas and electrical appliances before they evacuate their houses when a flood happens. The second highest mean is 'Pay more attention to the news to know the possibility of flooding during rainy season' where the mean is 3.9750. The result shows that many of the respondents will pay more attention to the news to find out the possibility of flooding in their area especially during the rainy season. Therefore, the respondents had shown that there is a greater consensus that they know that they have to turn off the gas and electrical appliances before they leave the house during the flood to reduce the flood risk and also pay more attention to the news to know the possibility of flooding in their housing area.

On the other hand, the lowest mean which is 2.8500 or the lowest level of agreement among the respondents in all twelve measurement items is buying natural disaster insurance. It can be interpreted as the respondents had come to a consensus that they do not buy natural disaster insurance for themselves and their family members. The average is even lower than the uncertain point as neutral or uncertain point is 3. The result indicates that the majority of the residents in Melaka have less intention in buying natural disaster insurance to reduce the flood risk or decrease the financial loss due to flooding. The measurement items with the statement that states whether the respondents know the location of the evacuation centre and disaster relief centre is the second lowest mean which is only 2.8833. The result also shows that this is a measurement item with the lowest level of agreement among the respondents as the mean is also lower than the uncertain point of 3. Most of the respondents of this research admitted that they still do not know the location of the evacuation centre and the disaster relief centre.

The other 8 measurement items are all with mean between 3-3.99 which is the point that shows the respondents do not really agree or disagree about the statement. The measurement items that gained the mean in the range of 3-3.99 are the statements that the respondents cannot come to a consensus as some of them may agree, disagree or neither agree nor disagree. For example, 10% of the respondents had answered 1 which is strongly disagree, 19% of the respondents had chosen 2 which is disagree; 25% had chosen uncertainty which is 3; 26% had answered 4 which is agree; and another 19% had picked 5 which is strongly agree for the measurement item about whether the respondents discuss with household members about the action need to be done during the flood. The difference between the probability of disagreeing, uncertain, and agreeing for the measurement items that gained 3-3.99 is not substantial.

4.3. Likelihood of the Adoption of Protective Behaviours

According to Etz [22], likelihood is corresponding to probability. Holland [23] adds that likelihood is not a defined number that totally confirms that the results are going to be the same as estimated in the hypothesis. It is just an estimation about how likely it may be going to act like the hypothesis. Likelihood was examined in this research in order to find out how likely are the residents in Melaka in preparing to face the flood. The higher the percentage of likelihood, the more likely the respondents are prepared in the particular measurement items of flood preparedness. The likelihood of the Adoption of Protective Behaviour was calculated according to the total number of respondents that had chosen 'agree' and 'strongly agree'. The calculation is done according to the maximum binomial likelihood formula which is $p=x/n$ where p is the likelihood; x is number of agree and strongly disagree' and n is the total number of responses for the particular measurement item. The likelihood analysis for this study is shown in Figure 3 and Figure 4.

Table 3. Likelihood of each measurement item

Adoption of Protective Behaviours	Number of Agree + Strongly Agree Responds	Likelihood Percentage
Prepare emergency supplies/kit to face the flood in a space that is easy to access	71	59.17%
Emergency contact list of persons outside the province of flood	76	63.33%
Discuss with household members about the action need to be done during the flood	55	45.83%
Make sure family members know what to do when facing the flood	60	50%
Purchase natural disaster insurance	38	31.67%
Know the location of the Evacuation Centre and Disaster Relief Centre	39	32.5%
Keep the important documents in waterproof document bag	79	65.83%
Always store emergency food and water supplies	78	65%
Make sure the furniture and electrical appliances can be easier to move or elevate to prepare for flood	71	59.17%
Know the needs to turn off the gas and all electrical appliances before leaving the house	89	74.17%
Pay more attention to the news to know the possibility of flooding during rainy season	89	74.17%
Always clean and clear the drain outside the house	72	60%

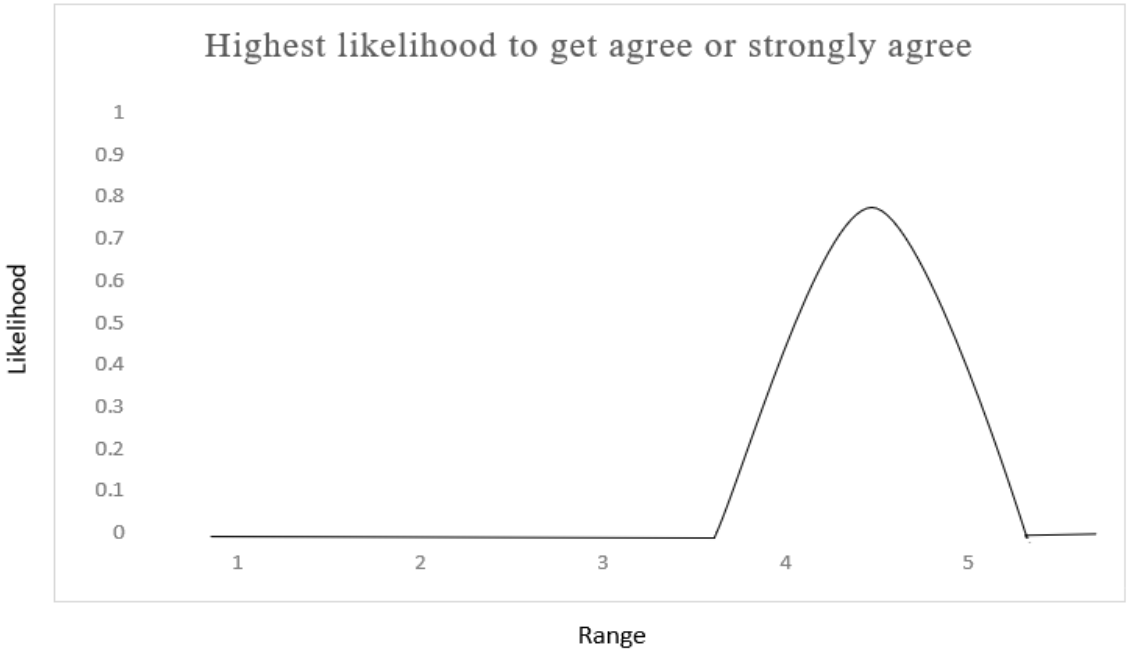

Figure 3. Highest Likelihood to agree or strongly agree

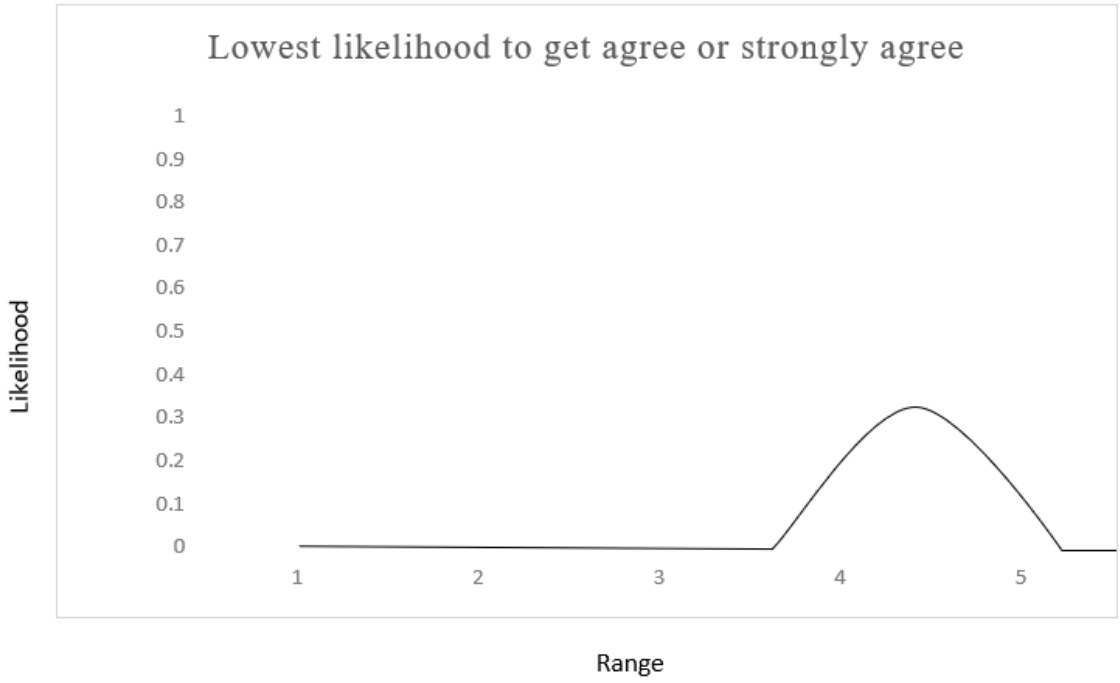

Figure 4. Lowest likelihood to agree or strongly agree

It can be seen from the table 3 above that the respondents are most likely in both knowing the needs to turn off the gas and all electrical appliances before leaving the house and also most likely is paying more attention to the news to know the possibility of flooding during the rainy season as both of these measurement items are the highest in likelihood percentage which is 74.17%. On the other hand, the least likely among all the measurement items is purchasing natural disaster insurance which only has a likelihood of 31.67%. Such a level of likelihood suggests that many of the respondents do not purchase natural disaster insurance.

Overall, there are three measurement items of the Adoption of Protective Behaviour that have likelihoods that are lower than 50%. The three measurement items are ‘discuss with household members about the action needed to be done during the flood’, ‘purchase natural disaster insurance’ and ‘know the location of the Evacuation Centre and Disaster Relief Centre’. Less than half of the respondents had agreed on these three measurement items.

Another nine measurement items of the Adoption of Protective Behaviour have a likelihood percentage of more than 50% which signifies that more than half of the 120 respondents had agreed with these nine measurement items instead of uncertainty and disagreement. The likelihood of these measurement items is high as it can be estimated as more than half of the residents are going to agree with these measurement items as well.

4.4. Correlation Analysis

Table 4 shows the results of correlation analysis. According to Glen [24], the correlation between classifying variables and quantitative variables can be analysed through correlation analysis. The correlation was analysed between the Adoption of Protective Behaviour and demographic data which include gender, age, race, household member, household income, area of region and type of houses. The variables such as gender, age, household member and type of houses have no significant relationships with Adoption of Protective Behaviour. According to Frost [25], it will show no statistically significant relationship between the variables when the p-value is larger than 0.05. Hence, when gender, age, household member, type of houses with Adoption of Protective Behaviour has p-value of 0.490, 0.939, 0.213 and 0.863, it demonstrates that there is no significant relationship between these few variables with Adoption of Protective Behaviour. On the other hand, there are significant relationships shown between race, household income, and area of region with Adoption of Protective Behaviour as the p-value are 0.048, 0.034 and 0.040 respectively. The p-value of these three variables with Adoption of Protective Behaviour is less than 0.05.

According to the results, the race, household income and area of region of the respondents affect the flood preparedness of the residents. Different races may have different perspectives as they may have different religions, background, and cultures that may cause them to have different opinion towards flood preparedness. As for household income, it is obvious that the respondents with higher household income are well prepared to face a flood in comparison to those respondents with lower income. Those with higher household income may have the financial ability to adapt their houses to flood and lower the flood risk by buying the natural disaster insurance. In the case of area of region, respondents from areas with high risk of flooding are more prepared in facing flood. The other variables such as gender, age, number of household members and type of houses may not directly affect the respondents' decision in Adoption of Protective Behaviour. For example, male respondents may not have the similar opinions or actions in flood preparedness. Therefore, the level of the flood preparedness between the respondents is not depending on these few characteristics of the respondents. However, a previous study by [8] mentioned that demographic data such as gender, age and level of education will affect the results of Adoption of Protective Behaviour even though the p-value is slightly higher than 0.05.

Table 4. Correlation Analysis

Variable	Gender	Age	Race	Household Member	Household Income	Area of Region	Type of Houses	Adoption of Protective Behaviour
Gender		.399	.155	.885	.415	.517	.832	.490
Age	.399		.067	.855	.532	.019	.550	.939
Race	.155	.067		.305	.369	.250	.201	.048
Household Member	.885	.855	.305		.093	.423	.105	.213
Household Income	.415	.532	.369	.093		.457	.546	.034
Area of Region	.517	.019	.250	.423	.457		.157	.040
Type of Houses	.832	.550	.201	.105	.546	.157		.863
Adoption of Protective Behaviour	.490	.939	.048	.213	.03	.040	.863	

5. Conclusions

In the view of results presented in the previous sections, the proposed measurement items of Adoption of Protective Behaviour can be shown to have affected the flood preparedness among the residents in Melaka. The higher the mean gained in the results, the more the residents prepare to face the flood. However, the mean point from the results is not substantial. Therefore, the results suggest that flood preparedness among the residents in Melaka is still inadequate. Based on the results shown in Table 2, only one measurement item in which respondents agree that they know the need to turn off the gas and electrical appliances before they leave the house during the flood, had achieved a mean more than 4. Another two measurement items which are 'buying natural disaster insurance' and 'knowing the location of the evacuation centre and disaster relief centre' had gained mean that is less than 3. All the other measurement items had gained the mean in the range of 3 which shows a high level of uncertainty among the respondents. Hence, the results directly signify that the respondents are not well prepared to face a flood.

In summary, the 12 measurement items are significantly correlated with flood preparedness of the residents in Melaka. The findings in this research can help the authorities and government to plan for educating the residents to be more prepared for a flood. This study could also assist the residents in Melaka in identifying what preparations that they are lacking, what actions they should undertake to reduce flood risks, and knowing the importance of preparing for a flood. Efforts can also be focused on educating residents on the importance of buying natural disaster insurance, knowing the location of the evacuation centre and disaster relief centre as these measurement items are of low level. However, it is suggested that the residents themselves take the necessary actions instead of relying only on the authorities to put all the effort in reducing the flood risk. Thus, the residents could cooperate with the authorities in order to achieve high efficiency in reducing the flood risk.

6. Recommendation

It is recommended that future research should select a certain category of residents. For example, future researchers could exclude the residents staying at high buildings such as flats and apartments in order to get more accurate results to find out the flood preparation of the residents as the residents that are living in higher floors may have the lower risk of flood and also different perspective in preparation of flood. Additionally, future research can also identify the flood preparedness by analyzing the results according to the demographic data. For example, the household income may affect the flood preparedness. Hence, future researchers can analyze the flood preparedness of residents by finding out whether their household income may affect their flood preparedness.

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