Community preparedness to flood disaster in Johor, Malaysia

Noor Diyana F. A.*, Fakhru’l-Razi A., Aini M. S., Ahmad Azan R., Mohd Muha’imin R. W.

HADR Research Centre, National Defence University of Malaysia
*Corresponding author e-mail: n.diyana@upnm.edu.my

ABSTRACT

Malaysia is a country that is affected by monsoonal floods yearly causing a significant amount of casualties, displacement of communities, damages to property and crops. The flood affects the community extensively and it is crucial for them to be prepared to reduce the risk faced in the event of a flood disaster. This study aims to determine the current level of flood preparedness amongst communities in Segamat, Johor as well as other contributing factors to preparedness such as attitude towards flood, risk perception, trust in agencies, sense of community and intention to prepare. A total of 22 villages were selected with the assistance of the District Office ensuring villages at risk were selected and a total of 150 self-administered questionnaires were distributed. Using descriptive analysis, the findings indicated that the other factors above were moderate to high and overall preparedness level was found to be moderately low. Measures taken by the respondents such as owning a first aid kit and financial preparedness such as purchasing property insurance and emergency savings were found to be much lower than other measures of preparedness.

Keywords: flood; community; disaster risk reduction; disaster preparedness

1. Introduction

Malaysia is most frequently affected by floods such as flash floods, monsoon floods and flood caused by high tides which causes significant and large damages [1]. The country has experienced various extreme weather and climatic events over the past few decades which includes El Nino in 1997 leading to severe droughts and La Nina in 2011 and 2012 causing massive flooding. Additionally, the country is no exception to severe thunderstorms, monsoonal floods and haze amounting to flash floods, loss of properties and poor air quality respectively [2]. Monsoonal floods in Malaysia occurs annually affecting several states in Malaysia with the worst flood in recent history specifically the 2014 flood resulted in the highest number of evacuees. The National Disaster Management Agency (NADMA) recorded a total of 25 deaths with an estimated loss exceeding RM 2.58 billion nationwide [3]. Communities affected by the 2014 floods in Kuala Krai were still found to be dependent of authorities for food, basic necessities and shelter and seemed to be fairly unprepared for future disaster [4].

In 2017, Malaysia faced another flood which affected several states in the country such as Perak, Sabah, and Johor. The Segamat district was the worst affected district during the flood [5] with a total of 3,434 evacuees reported by NADMA which is the highest number of evacuees in the state as tabulated in Table 1. Besides heavy rainfall, the frequent flood occurrence in Segamat is due to the naturally low-lying topography [6] with the addition of rapid urbanization and inadequate drainage management [7], causing the district to be highly susceptible to flood. Subsequently, the frequency of flood disasters is predicted to increase in coastlines of both Peninsular Malaysia and East Malaysia [8] which suggests that an inclusive and cohesive approach is important to manage flood risk to reduce the consequences of flood disasters in Malaysia. Even though several mitigation measures are in place such as high concrete levees and pump along the Kelantan River [9] and flood warning and forecasting system [10], flood preparedness of the local community is essential as flood impacts their daily activities and livelihood. As the district is prone to flood events [11], it is imperative to identify the current level of flood preparedness and other influential factors of the local community.
2. Literature Review

Previous studies have found that personal factors (attitude, risk perception and intention to prepare) and societal factors (sense of community and trust in agencies) [12, 13] were found to be key determinants to disaster preparedness [13, 14]. Personal factors namely attitude towards flood stems from [15] where the author illustrates attitude as a degree of either favourable or unfavourableness in regards to opinion, intentions or actual behaviours towards an object. The process of belief changes over time and the way belief influences attitude is best described through Fishbein expectancy value model which was also used as a basis in Theory of Reasoned Action (TRA).

As for risk perception, it is conceptualized as the likelihood of the hazard occurring and the impact from extreme environmental event [16]. The ability to sense danger and avoid harm is a necessary condition to survive for all living things. Survival and becoming resilient is aided by learning from past experience and respond positively to reduce future risk. In order to produce a flood resilient community, a household living in a flood risk area will not start making protective measure decision if they view flood disaster as a low threat.

Subsequently, an individual’s intention to perform behaviour indicates the possibility of whether the person will actually perform the behaviour. Behavioural intention depicts a blueprint of an expectation or plan of how a person intends to behave in general. The extent of how intention to prepare predicts preparedness relies on the continuum underlying factors of volition control, correspondence of measurement under the same dimension and time between measurements of intention to prepare to when preparedness will take place. Intention to prepare mediates preparedness behaviour providing valuable insights on how people reason criterion that motivates to prepare and covert intention into action [17]. Therefore, an individual’s intention to perform behaviour indicates the possibility of whether the person will actually perform the behaviour.

Additionally, societal factors such as sense of community and trust in agencies was also explored in this study. In the context of this study, sense of community is defined as the psychological sense of belonging to a community with similar beliefs and values accomplished by committing to each other is based on the proposed theory by [18]. The theory focuses on community and social psychology elements experienced by the community and is considerably the most influential social psychology theory applied in disaster preparedness studies. The behaviour of the people in the community with similar values and belief system will bring out a sense of responsibility to the community they belong.

Another societal factor, trust in agencies is the willingness of a person to be vulnerable to the actions of another party based on the faith the other party will deliver what has been promised [19]. Trust does not mean simply taking any risk but the willingness to take risk. For the relationship to be meaningful and reach the level of trust, contribution to the agreed action must exceed the expectation [20]. Thus, trust in agencies or government agencies in this study is referred to when a community
acknowledge an existing threat and reduces the uncertainty creating a form of understanding when dealing with unfamiliar hazards. Consequently, it is essential to determine households’ level of preparedness in facing flood disaster as it is the first step in emergency management as being in a state of readiness to respond to a disaster, crisis and emergency situation [21]. The first 72 hours is most critical for an individual to be self-sufficient and self-reliant to save themselves [22]. Personal preparedness can be describe as behaviours that involve both planning activities and adaptive response, representing a course of self-protective behaviours that could reduce loss of life, property or personal injury during disaster [16]. Previous studies have shown that residents living in area exposed to hazard are aware of the risk but remain unprepared [24] and continue to do so even though countless effort have been made [25]. Thus, the objective of this study is to explore the levels of attitude, risk perception, intention to prepare, sense of community, trust in agencies and flood preparedness among households in the district of Segamat, Johor.

3. Method

A multi-stage sampling method was used to obtain respondents from this study whereby flood evacuees data from 2012 until 2017 was retrieved from NADMA. The data was used as a basis to identify one state and district with the highest number of evacuees based on central, north, east coast and south zones of Malaysia. Segamat was selected to represent the southern zone of Malaysia as it recorded the highest number of flood evacuees in the zone with a total of 3,434 evacuees. After the selection of the district, the villages were then selected based on the recommendation of the Segamat District and Land Office to ensure that the villages chosen are those with flood and evacuation experience. Subsequently, the selection of households were assisted by the head of selected village in the district with each household represented by either the head of household or the spouse.

The data collection was carried out during December 2017 using a self-administered questionnaire as part of the cross-sectional research design to collect data from the respondents comprising of communities at risk of flood in the district. The questionnaire consisted of nine sections namely the demographic background of respondents, attitude towards flood preparedness, risk perception, intention to prepare, sense of community, trust in agencies and flood preparedness. The demographic background includes age, gender, education background, occupational status and income level. Other variables in the study consisted of multiple statements and adopted from various authors as depicted in Table 2 below.

| Variable                  | No. of statements | Source | Reliability (Cronbach’s Alpha) |
|---------------------------|-------------------|--------|-------------------------------|
| Attitude towards flood † | 8                 | [26]   | Pre-test 0.72 Actual 0.78     |
| Risk Perception †        | 8                 | [13]   | 0.50 0.95                     |
| Intention to prepare †   | 4                 | [27]   | 0.93 0.91                     |
| Sense of community †     | 9                 | [13]   | 0.77 0.83                     |
| Trust in agencies †      | 5                 | [13]   | 0.87 0.81                     |
| Flood preparedness ‡      | 23                | [13]   | 0.71 0.87                     |

† Scale: Strongly disagree (1) to Strongly agree (5)
‡ ‘Yes’ and ‘No’ option

Prior to the survey, a pre-test was conducted among 20 respondents from communities located in flood risk area and the variables were tested using a reliability test with all the variables having an alpha score higher than 0.5 as listed in Table 1. The study used self-administered questionnaires however interview mode was used for respondents that were unable to read. Respondents that participated in the survey was given a token appreciation when the completed survey was returned. Descriptive data analysis for this study was conducted with Statistical Package for Social Science (SPSS) to identify the levels of attitude, risk perception, intention to prepare, sense of community, trust in agencies and preparedness level.
4. Results and Discussion

The results from the survey shows the slightly more than half (64.5%) of the respondents were male. On average, the respondents were 51 years old and have lived in the area for a duration of 35 years. In terms of education level, most respondents completed upper secondary (36%) and primary school (35%) with an average of five household members. The respondents’ mostly work in the private sector (28%) or as entrepreneurs (25%) and have an average household income of RM1,646 which is well below the median household income for the Johor state population (RM 5,652) [28]. The information of flood received were mainly through television (80%), friends (58%) and family (47%).

Table 3. Mean values of variables.

| Variable                | No. of statements | Mean |
|-------------------------|-------------------|------|
| Attitude towards flood | 8                 | 3.26 |
| Risk Perception         | 8                 | 4.45 |
| Intention to prepare    | 4                 | 4.23 |
| Sense of community      | 9                 | 4.35 |
| Trust in agencies       | 5                 | 4.17 |

Scale: Strongly disagree (1) to Strongly agree (5)

Results of the mean values of variables depicted in Table 3 shows that all the variables except attitude towards flood have an average mean above 4 whereas only the average mean of attitude towards flood is below 4. Correspondingly, the average mean for risk perception, intention to prepare, sense of community and trust in agencies were moderately high. These results are consistent with the respondent’s background as they were residing in areas that have been exposed to flood disaster in the past. Subsequently, the respondents agree in seeking information on flood risk and involving in a local group to discuss how to reduce damage and losses from floods and to work together with others to improve their community. Additionally, respondents reported that they would use information from government agencies and agree that they can count on the government agencies to provide crucial information on flood disaster.

Table 4. Flood preparedness level.

| Level of preparedness | Frequency (N) | Percentage (%) |
|-----------------------|---------------|----------------|
| Low                   | 68            | 34             |
| Moderate              | 40            | 20             |
| High                  | 90            | 46             |

The flood preparedness level of the respondents were calculated based on 23 items indicate that less than half of the respondents have a high level of preparedness (46%) as illustrated in Table 4. Among the list of preparedness actions taken by respondents were placing important documents in a watertight container, identify evacuation routes and centres near to them, and packed clothing and basic items in case of evacuation. Preparedness measures such as purchasing additional insurance for property and car as well as learning CPR were the least done by the respondents.

5. Conclusion

Findings from this study indicates that the attitude of the community at risk of flood in Segamat can be improved as it is was found to be have the lowest average mean compared to other variables in the study. This reveals that encouragement of the community is needed to ensure that the community will be more proactive in saving themselves in the event of a flood disaster. Also, this study reveals that even if there is an intention to prepare, it doesn’t necessarily translates into action [29] as the level of preparedness is still relatively low. This requires further guidance by the relevant authorities to further enhance the community flood preparedness level. Additionally, the community should be encouraged to be involved in the design and planning process of disaster risk reduction as ineffective policies and programs is due to the lack of community participation [30].
Subsequently, people in the lower income group are more vulnerable to disaster [1] and its effects as the average monthly household income of the respondents were below the average Johor state household income. Those within the lower income group will face difficulties in their expenses to not only rebuild or make necessary protective measures to their property [31] but also to purchase additional insurance to protect their cars and homes financially in the event of a disaster. The government can provide financial assistance such as providing an affordable insurance plan for the community at risk of disasters ensuring less dependency on financial aids from the government. Furthermore, the respondents have a high sense of community and are willing to cooperate with each other and government agencies such as the local agencies and responding agencies to enhance their preparedness. Community events involving the local community, local government and responding agencies can be organised to increase awareness and promote community-based disaster preparedness. The enhancement of community preparedness can develop a community that can build back better especially communities that face flood disaster frequently.

6. REFERENCES

[1] Chan N W 2012. Impacts of Disasters and Disasters Risk Management in Malaysia: The Case of Floods, in Sawada Y, and S Oum (eds.), Economic and Welfare Impacts of Disasters in East Asia and Policy Responses. ERIA Research Project Report 2011-8, Jakarta: ERIA. 503-551.

[2] Tangang F, Farzannamanesh R, Mirzaei A, Supari S E, Jamaluddin A F, & Juneng L 2017. Characteristics of precipitation extremes in Malaysia associated with El Niño and La Niña events. International Journal of Climatology, 37(2), 696–716.

[3] Hashim J H and Hashim Z 2016. Climate Change, Extreme Weather Events, and Human Health Implications in the Asia Pacific Region. Asia-Pacific Journal of Public Health, 28(2 Suppl), 8S-14S.

[4] Aini M S, Fakhru'l-Razi A, Elistina A B, and Norhasmah S 2016. Emergency shelter experiences and preparedness among 2014 flood victims in Kelantan, Malaysia. In International Disaster and Risk Conference IDRC. Davos, Switzerland.

[5] International Federation of Red Cross and Red Crescent Societies (IFRC) 2017. Information Bulletin-Malaysia: Seasonal flooding.

[6] Ab Razak N, Aris A, Ramli M, Looi L and Juahir H 2016. Temporal flood incidence forecasting for Segamat River (Malaysia) using autoregressive integrated moving average modelling. Journal of Flood Risk Management, 11, 794-804.

[7] Sach A, Wild A, Hoeun I, Nicholas Y, Baynard-Smith R, Mohd Hanif K, Muhammad Hazwan M, Mohd Fakhruddin F, Umi Salaman M Z 2018. Mitigation and adaptation to floods in Malaysia: A study on community perceptions and responses to urban flooding in Segamat. 1-41.

[8] Ercan A, Mohamad Fauzi M, and Kavvas M L 2013. The impact of climate change on sea level rise at Peninsular Malaysia and Sabah–Sarawak. Hydrological Processes, 27(3), 367-377.

[9] Tuan Pah Rokiah S H, Abd Rahim M N, and Hamadi I 2014. The level of satisfaction towards flood management system in Kelantan, Malaysia. Pertanika Journal of Social Science and Humanities, 22(1), 257-269.

[10] Mohit M A, and Sellu G M 2013. Mitigation of climate change effects through non-structural flood disaster management in Pekan Town, Malaysia. Procedia-Social and Behavioral Sciences, 85, 564-573.

[11] Department of Irrigation and Drainage Malaysia (DID). Flood management programme and activities. https://www.water.gov.my/index.php/pages/view/419

[12] Becker J S, Johnston D M, Daly M C, Paton D, Mamula-Seadon L, Petersen J, and Hughes M E and Williams S 2011. Building community resilience to disasters: A practical guide for the emergency management sector. GNS Science Report, 1–44.

[13] Frandsen M 2012. Promoting community bushfire preparedness: Bridging the theory - practice divide. Doctoral Thesis, University of Tasmania, Australia.

[14] Syakura A R 2014. Intention to prepare for tsunami disaster among households in Penang. Master Thesis, Universiti Putra Malaysia, Malaysia.
[15] Fishbein M, and Ajzen I 2011. Predicting and Changing Behavior: The Reasoned Action Approach. Psychology Press.

[16] Lindell M K, Prater C S, Gregg C E, Apatu E J, Huang S K, and Wu H C 2015. Households' immediate Responses to the 2009 American Samoa Earthquake and Tsunami. *International Journal of Disaster Risk Reduction*, 12, 328–340.

[17] Paton D, Kelly G, Burgelt P T, and Doherty M 2006. Preparing for bushfires: Understanding intentions. *Disaster Prevention and Management*, 15(4), 566–575.

[18] McMillan D W, and Chavis D M 1986. Sense of Community: A Definition and Theory. *Journal of Community Psychology*, 14(1), 6–23.

[19] Mayer R C, Davis J H, and Schoorman D 1995. An integrative model of organizational trust. *The Academy of Management Review*, 20(3), 709–734.

[20] Saunders M N K, Skinner D, Dietz G, Gillespie N, and Lewicki R J 1996. Organizational trust: a cultural perspective. In *Brain Theory* (p. 454). Elsevier.

[21] Haddow G D, Bullock J A, and Coppola D P 2017. Introduction to emergency management. Butterworth-Heinemann.

[22] Kohn S, Eaton J L, Feroz S, Bainbridge A A, Hoolachan J, and Barnett D J 2012. Personal disaster preparedness: An integrative review of the literature. *Disaster Medicine and Public Health Preparedness*, 6(3), 217–231.

[23] Lindell M K 2013. Disaster studies. *Current Sociology*, 61(5-6), 797–825.

[24] Aini M S, Fakhru'l-Razi A, Ahmad Rodzi M, and Fuad A 2011. Community preparedness for tsunami disaster: A case study. *Disaster Prevention and Management*, 20(3), 266–280.

[25] Becker J S, Paton D, Johnston D M, and Ronan K R 2013. Salient beliefs about earthquake hazards and household preparedness. *Risk Analysis*, 33(9), 1710–1727.

[26] McIvor D, and Paton D 2007. Preparing for natural hazards: Normative and attitudinal influences. *Disaster Prevention and Management*, 16(1), 79–88.

[27] Paton D, Smith L, and Johnston D 2005. When good intentions turn bad: Promoting natural hazard preparedness. *The Australian Journal of Emergency Management*, 20(1), 25.

[28] Department of Statistics Malaysia 2016. Report of Household Income and Basic Amenities Survey 2016. Putrajaya, Malaysia: Department of Statistics Malaysia.

[29] Paton D 2003. Disaster preparedness: A social-cognitive perspective. *Disaster Prevention and Management: An International Journal*, 12(3), 210-216.

[30] United Nations Office for Disaster Risk Reduction (UNISDR) 2015, Sendai Framework for Disaster Risk Reduction 2015-2030.

[31] Reza, M.I.H., Choy, E.A. and Pereira, J.J., 2017. Vulnerabilities of local people and migrants due to flooding in Malaysia: Identifying gaps for better management. In *Living with Floods in a Mobile Southeast Asia*. Routledge, 167-187.

Acknowledgement

We would like to express our gratitude to UK Space Agency for providing the funds to conduct this project and thank NADMA for their support in this project. We would also like to acknowledge all individuals and organizations who have contributed to the successful completion of this project either directly or indirectly.