Determinants of the Intention to Purchase Flood Cover: an Empirical Evidence from Flood-Prone Area In Malaysia

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Abstract - In places where flood is a regular occurrence, it is apparent and widely known on the devastating effect of flood on properties and human lives. However, statistics revealed by Persatuan Insurans Am Malaysia (PIAM) showed that nearly 70% of homeowners in Malaysia did not have flood insurance. As such, this paper examined the relationships between perceived flood risks, flood damage experience, and charity hazard on the purchase intention toward flood cover. A total of 100 questionnaires were collected from respondents living in flood-prone areas in Kota Bharu, Kelantan, Malaysia. The paper adopted the quantitative method of research design, which utilized descriptive analysis, correlation analysis and regression analysis to assess the raw data. The empirical results revealed that perceived flood risk, flood damage experience and charity hazard have significant relationships with the purchase intention toward flood cover. The implication of this paper provides evidence of the importance of flood cover in the event of flood.

Keywords: Flood Cover, Flood-Prone Area, Malaysia

1. Introduction

In the past decade, about 260 million people worldwide were affected by the world’s most common and destructive natural disaster, which is flood. It was reported that from 2006 to 2016, the frequency of flood events held more than 50% of the natural disaster share. At a more point-by-point level, flood that occurred in 2016 caused the highest number of fatalities, when compared to other natural disasters with over 4,000 deaths (Guha-Sapir, Hoyois, Wallemacq & Below, 2016). Baharudin, Mohd, Maimon, Salmijah, Chen and Heng (2013) defined flood as “any high-water flow that dominates the natural or artificial banks in any part of the river system. Therefore, when a river bank is overtopped, the water extends over the floodplain and generally becomes a hazard to the society”. In Malaysia itself, some of the flood-prone areas located in the peninsular Malaysia include Johor, Kelantan and Terengganu.

Based on the Department of Irrigation and Drainage (DID) (2009), flood is the most prominent among all the natural disasters to have occurred in Malaysia, in terms of losses, lives affected, frequency and impact upon economic. Moreover, 9% of the areas in Malaysia are vulnerable to flood, which might seem like a small number but in actuality, it can affect
nearly 5 million of the population. Not to mention, the annual estimated losses of over RM2 billion are inclusive of losses due to economic disruption. In Malaysia, the types of flood that usually take place are flash floods, river floods, regional floods, localized floods, coastal floods, urban floods, rural floods and monsoon floods (DID, 2009). Monsoon flood is especially frequent in the east-coast region, including Kelantan, and can even last up to months. Flash floods mainly occur in urban areas due to excessive rain and levee failure (Ang, 2014).

Flood occurrence in Malaysia is the country’s worst unavoidable nightmare in the way it affects the environment and the people. Malaysia has experienced more than 20 major flood events in the past century (Aliagha, Jin, Choong, Jaafar, & Ali, 2014). This is especially in 2014, in what was described as the worst monsoon floods to have occurred in Malaysia in decades. It affected nine states, including Kelantan, Terengganu, Pahang, Kedah, Perak, Selangor, Negeri Sembilan, Johor and Sabah (The Star, 2014), with more than 200,000 people affected by the flood (Akasah & Doraisamy, 2015). It was also reported that the losses that accumulated from the major flood incident in Kelantan in 2015 amounted up to at least RM1 billion (Johari, 2017).

At present, the DID is responsible for managing flood in Malaysia. Flood risk management used to center around rural areas to protect the agriculture economy as paddy fields are usually situated in rural areas. However, due to the rapid urbanization in rural areas, the focus has now been shifted to both urban and rural areas (DID, 2009). The government has attempted for years to overcome the flood issues, especially in Kelantan, through structured and non-structured measures. Structural means inclusion of embankments, pond and pump house (Aliagha et al., 2014), whereas non-structural method refers to flood mitigation measures in the form of early warning systems, flood mapping and flood forecasting (Shafai & Khalid, 2016). Despite all these efforts, losses due to flood are still on the rise. Another form of non-structural method of flood mitigation measure is to adopt flood cover. Hence, homeowners can reduce flood risk by purchasing flood cover.

The east-coast region, which includes Kelantan, is frequently affected by monsoon flood. Ibrahim, Zardari, Shirazi, Mohd Hanifah, Mat Talib, Yusop and Mohd Yusoff (2017) concluded that Kota Bharu scored the highest on flood vulnerability index out of the 10 districts situated in Kelantan. This means; the Kota Bharu district is the most vulnerable to flood due to the enormous potential loss that could have been resulted from the occurrence of flood. Additionally, the reason why Kota Bharu scored the highest in the flood vulnerability index is due to its dense population, wherein more lives are at risk to flood losses. A number of studies have been conducted in several nations, such as France, Germany and Austria, to study the determinants of intention to purchase flood cover (Richert, Erdlenbruch & Figuières, 2016). However, studies on flood insurance in Asia are in scarcity, in fact much less in Malaysia. Motivation for this study is that flood cover has been omitted as a vital part of flood management unlike in Germany (Atreya, Hanger, Kunreuther, Linnerooth-Bayer & Michel-Kerjan, 2015) where flood insurance is compulsory. Similarly, the United States and the United Kingdom had long before included flood insurance in their flood risk management as a non-structural flood mitigation measure (Aliagha et al., 2014). The latest penetration rate of flood cover in Malaysia was below 10%, which reflects a slight growth in the penetration rate from 2007 (5%) to 2018 (<10%) (Tan, 2018). Only a handful of studies have looked into the demand for flood cover in Kelantan, a place well-known for its susceptibility to flood occurrence. As such, this study addresses the purchase intention of flood cover among residents in Kota Bharu, Kelantan, Malaysia by examining factors linked to the purchase
intention.

2. Literature Review

2.1. Protection Motivation Theory
The Protection Motivation Theory (PMT) was first developed by Rogers (1975) to describe the motivation of adapting protective behaviors toward health threats. This theoretical model was later extended to explain other forms of hazards, including flood (Maddux & Rogers, 1983). According to PMT, individuals get motivated to behave in a protective manner through the process of threat appraisal and coping appraisal, which resulted in motivations to protect from a given risk, such as floods (Rogers, 1975).

Threat appraisal is the process of assessing the severity and the seriousness of a situation, which consists of perceived vulnerability and perceived severity. The strength of threat appraisal stems from perceived probability and perceived vulnerability toward flood risk (Grothmann & Reusswig, 2006). Maddux and Rogers (1983) added that perceived vulnerability is mediated by fear due to the role of fear in influencing perceived severity of the flood.

Rogers (1975) defined coping appraisal as the manner that a situation is dealt with, or the alternate means of managing the situation. The component of coping appraisal includes response-efficacy, self-efficacy and the cost of implementing the protective measure. Response-efficacy reflects one’s faith in the effectiveness of his protective efforts. Self-efficacy is one’s perceived capability to carry out the protective behaviors. The cost of implementing the protective measure refers to tangible and intangible costs (time and efforts). Later, Grothmann and Reusswig (2006) added the threat experience appraisal and reliance on public flood protection. Reliance of public flood protection is linked to the motivation for protective response in the sense that individuals will be less likely to take responsibility for precaution measures because they feel that the public bodies are already adequately managing the flood risk on their behalf. This scenario is known as the crowding effect or charity hazard.

The PMT framework was applied by Richert, Erdlenbruch, and Figuières (2016) to test its relevancy in describing the components of private flood mitigation in France. The study confirmed that the PMT is a relevant framework that described the components of private flood mitigation in France. This theory is applicable in this study, mainly because the variables embedded in the PMT framework are closely related to the variables in this study. As such, purchase intention toward flood cover would result in the adoption of flood insurance and insurance is one of the many forms of protective response. Besides, charity hazard, perceived flood risk and flood damage experience are similar to under reliance on public protection, threat appraisal, and threat experience appraisal, respectively.

2.2. Intention to Purchase Flood Cover
It is imperative that insurance operators receive sufficient contribution to be able to meet the claims arising out of a natural disaster, hence the need to study the demand for flood insurance to have more people to insure flood risk, especially those residing in flood-prone areas. Some studies revealed that flood damage can be reduced by performing private flood measures, thus reducing the loss resulting from the flood (Bubeck, Botzen, & Aerts, 2012). Hung (2009) emphasized that preference uncertainty causes one to have less interest in
buying flood insurance. Seifert, Botzen, Kreibich and Aerts (2013) studied the demand for flood insurance among those living in Germany and the Netherland, which concluded that willingness to pay emerged as the factor that had a major role in determining the demand for flood insurance in both nations.

2.3. Perceived Flood Risk
A number of studies have shown that public perception of flood risk is greatly influenced by prior flood hazard experience, demographic characteristics (age, gender, etc.) and level of perceived flood risk (Kellens, Zaalberg, Neutens, Vanneuville & De Maeyer, 2011). Aliagha et al. (2014) conducted a research to determine the demand-side variables that influenced flood insurance purchase among communities residing in three districts. The results showed that subjective risk perception best predicted flood insurance purchase of the community. Lechowska (2018) added that perception of flood risk should be approached in a more holistic manner by including socio-cultural and historical-political contexts so as to comprehend how the public perceives the flood risk.

2.4. Flood Damage Experience
Flood damage experience refers to losses that result from the flood that one has encountered, be it tangible or intangible (Messner & Meyer, 2006). Tangible damages can be described as damages that can be valued monetarily, such as the cost to repair and recover damaged properties and medical costs to treat bodily injuries (Romali, Sulaiman, Zulkifli, & Zulhilmi, 2015). Such damages can generally be observed directly. Meanwhile, intangible damages are related to psychological damages that flood might have on the victims, especially high impact floods that can take its toll on the victim emotionally. Floods have been considered as a traumatic event for some people due to the devastating effect it has on their livelihood (Reynaud, Aubert & Nguyen, 2013). Thus, flood damage experience is a major factor that can influence one’s decision to purchase flood insurance (Osberghaus, 2015; Hung, 2009).

2.5. Charity Hazard
The concept of charity hazard was initiated by Ehrlich and Becker (1972), who merely deciphered the idea that one of the reasons people avoid paying for insurance is because they expect to receive assistance from the government. The findings showed the negative correlation between public aids and private disaster preparedness. Such findings later were applied to other studies that focused on charity hazard (Shogren & Crocker, 1999). Similarly, Goeschl and Managi (2017) found that government relief resulted in disincentive on individuals from improving their flood risk as they felt that they received adequate aid from the government. Likewise, households expecting to receive insurance coverage from the federal did not put much effort in improving their flood risk (Osberghaus, 2015; Hung, 2009). The role of the government is somewhat crucial because without cooperation and involvement from the state, not much can be done, and the community needs to be better protected from flood risks (Penning-Rowsell, 2019).

3. Methodology
A survey design was employed to reach the research objectives. This study applied the homogenous purposive sampling, which refers to the non-probability sampling method and where the judgment of the researcher comes into the picture (Black, 2010). Such sampling technique selects respondents who share similar characteristics. In this case, the respondents must have previously experienced flood. The reason for placing focus on one specific trait is due to its link with the research topic (Etikan, Musa & Alkassim, 2016). After having
identified all the flood-prone areas in Kelantan, several districts, such as Kota Bharu, Pasir Mas, and Bachok, appeared to be the most exposed districts to flood. This study focused on the Kota Bharu district. The respondents for this study must be a house owner living in flood-prone areas in Kota Bharu and have had experienced flood. A total of 100 questionnaires were collected, which exceeded the minimum sample of 30 participants required by the probability sampling technique, which displayed suitability for analysis using descriptive statistics (Sekaran & Bougie, 2016). Intention to purchase flood cover was employed as the dependent variable in this study, whereas perceived flood risk, flood damage experience and charity hazard were the independent variables. All instruments had been adapted from prior studies.

4. Empirical Findings

4.1. Reliability Analysis

As presented in Table 1, perceived flood risk and flood damage experience had high Cronbach’s Alpha scores (0.925 and 0.930 respectively), which can be interpreted as the items in the variables having excellent internal consistency. The items for purchase intention toward flood cover portrayed relatively high internal consistency with a score of 0.818. However, the items in charity hazard were only acceptable with a score of 0.754, which reflected moderate internal consistency.

Table 1. Reliability Analysis

<table>
<thead>
<tr>
<th></th>
<th>No of items</th>
<th>Item Deleted</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Flood Risk</td>
<td>7</td>
<td>-</td>
<td>0.925</td>
</tr>
<tr>
<td>Flood Damage Experience</td>
<td>5</td>
<td>-</td>
<td>0.930</td>
</tr>
<tr>
<td>Charity Hazard</td>
<td>6</td>
<td>-</td>
<td>0.754</td>
</tr>
<tr>
<td>Intention to Purchase Flood Cover</td>
<td>6</td>
<td>-</td>
<td>0.818</td>
</tr>
</tbody>
</table>

4.2. Correlation Analysis

Table 2 shows that all three variables had relatively high correlation scores, with charity hazard being the highest (r= -0.857), followed by flood damage experience (r= 0.855) and perceived flood risk (r= 0.837). The correlation score for charity hazard had a negative value; signifying the negative association between charity hazard and purchase intention towards flood cover. On the contrary, flood damage experience and perceived flood risk had a positive correlation with the intention to purchase flood cover. Therefore, as flood damage experience and perceived flood risk increase, the higher the intention to purchase flood cover. The correlation coefficients of perceived flood risk, charity hazard and flood damage experience seemed to be close to 1, which implies that all the three variables have strong correlations with purchase intention toward flood cover.

Table 2. Correlation Analysis

<table>
<thead>
<tr>
<th></th>
<th>Perceived Flood Risk</th>
<th>Flood Damage Experience</th>
<th>Charity Hazard</th>
<th>Intention to Purchase Flood Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Flood Risk</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flood Damage Experience</td>
<td>0.928**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charity Hazard</td>
<td>-0.807**</td>
<td>0.824**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Intention to Purchase Flood Cover</td>
<td>0.837**</td>
<td>0.855**</td>
<td>-0.857**</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: *p<0.01

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4.3. Regression Analysis

As depicted in Table 3, 80.8% of the variation of purchase intention toward flood cover can be explained by perceived flood risk, flood damage experience and charity hazard. The balance of 19.2% could not be explained by the factors in this study. Additionally, there is a pressing need to identify the presence of autocorrelation issue in this study. This can be determined via Durbin-Watson test, whereby the critical values for Durbin Watson test should be as follows: 1.5 < d < 2.5. Based on Table 3, the critical value of this study was d = 1.913, which fell within the critical values of the Durbin Watson test, thus confirming the absence of autocorrelation in this multiple linear regression model.

Table 3. Multiple Regression-Model Summary

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>.899a</td>
<td>.808</td>
<td>.802</td>
<td>.28687</td>
<td>1.913</td>
</tr>
</tbody>
</table>

The multiple regression outputs displayed in Table 4 shows that ANOVA F-test, the P-value of each independent variable was 134.587 and its significant value is 0.000, indicating that its significant value is below the alpha value = 0.05. All the independent variables employed in this research were significant and their hypotheses could be tested.

Table 4. Multiple Regression – ANOVA

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>33.226</td>
<td>3</td>
<td>11.075</td>
<td>134.587</td>
<td>.000b</td>
</tr>
<tr>
<td>Residual</td>
<td>7.900</td>
<td>96</td>
<td>.082</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>41.126</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows that attitude scored $\beta = .557$ and $t = 6.308$. This signified that perceived flood risk had a significant influence on intention to purchase flood cover as the value was 0.000, which is below 0.05. The findings are consistent with past studies, which highlighted the positive link between perceived flood risk and intention to purchase flood cover. Lin, Ho and Shaw (2008) reported that risk perception of the general public toward flood is positively related to mitigation intention, inclusive of insurance adoption (Aliagha et al., 2014; Richert et al., 2016).

Next, flood experience scored $\beta = .323$ and $t = 2.534$. The significant value of trust was 0.000. Hence, flood experience displayed a significant impact on intention to purchase flood cover. This suggests that those with experience of flood damages are more aware and fearful because they reckon that the damages are irrevocable. This leads to the intention to adopt flood cover as a method of risk reduction, as it is indeed a more desirable option (Bubeck et al., 2012; Osberghaus, 2017; Osberghaus, 2015; Richert et al., 2016).

Table 5: Multiple Regressions – Coefficients

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>Beta ($\beta$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>2.994</td>
<td>.424</td>
<td></td>
<td>7.066</td>
<td>.000</td>
</tr>
<tr>
<td>Perceived Flood Risk</td>
<td>.489</td>
<td>.078</td>
<td>.557</td>
<td>6.308</td>
<td>.000</td>
</tr>
<tr>
<td>Flood Experience</td>
<td>.289</td>
<td>.114</td>
<td>.323</td>
<td>2.534</td>
<td>.000</td>
</tr>
<tr>
<td>Charity Hazard</td>
<td>-.372</td>
<td>.066</td>
<td>-.452</td>
<td>-5.61</td>
<td>.000</td>
</tr>
</tbody>
</table>
Meanwhile, the scores for charity hazard were $\beta = -0.452$ and $t = -5.613$. This reflected that charity hazard had a significant influence on intention to purchase flood cover, which is in agreement with the Protection Motivation Theory, which emphasizes that reliance on public protection curtails the need to take protective measures (Grothmann & Reusswig, 2006). Raschky, Schwarze, Schwindt and Zahn (2013) reported the negative influence of public disaster aid on demand for flood insurance.

5. Conclusion and Recommendations

The main factors involved in this study were charity hazard, perceived flood risk and flood damage experience. This study revealed that charity hazard, perceived flood risk and flood damage experience were statically significant in explaining the intention to purchase flood cover. Generally, the study respondents perceived that the probability of flood to take place is considerably high and that they were vulnerable to it due to the frequent flood occurrences in Kota Bharu, Kelantan as a result of the monsoon season. Since the flood has become an annual occurrence in Kelantan, the victims have adapted to the flood as they realize that they would not be able to avoid the natural disaster, thus the high perceived risk of flooding. The negative correlation between charity hazard and intention to purchase flood cover had been due to the regular occurrence of flood, and the victims were used to receiving aid from the government, thus dismissing the need to put much effort in mitigating flood. Nonetheless, some victims claimed that they did not receive adequate help from the government and were more willing to take up flood cover to protect their belongings. As concluded in prior studies, flood damage experience positively affected the intention to buy flood cover because they were careful as to not to underestimate the impact of flood based on their past experience.

It is hoped that the implications from this study can help the insurance industry and the policy makers by providing insights on designing effective flood insurance policies and viable flood risk management. Studies pertaining to floods in Malaysia have mainly been hypothetical. Hence, in order to get a better grasp of the economic aspect in light of flood insurance market, assessing the determinants of intention to purchase flood cover is expected to be a continuous effort to overcome the issue of low penetration rate for flood insurance.

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Lin, S., Ho, M., C., & Shaw, D. (2008). Why are flood and landslides victims less willing to take mitigation measures than the public?. Natural Hazards, 44(2), 305-314.


