

## PREPARING FOR A NATURAL DISASTER: A KNOWLEDGE SURVEY OF RURAL HOUSEHOLDS IN A DEVELOPING COUNTRY

Ricardo T. Bagarinao<sup>1\*</sup>

<sup>1</sup>Faculty of Education  
University of the Philippines Open University  
Maahas, Los Baños, Laguna  
Philippines

\*Corresponding author: [ricardo.bagarinao@upou.edu.ph](mailto:ricardo.bagarinao@upou.edu.ph)

**ABSTRACT** – Disaster preparedness in recent years is no longer an option among households who are at the forefront of a disaster. It is imperative that each household should learn certain disaster preparedness strategy to better manage the potential impacts of a disaster. The study was conducted to determine the households' knowledge on disaster preparedness strategies in a flood-prone municipality in the Philippines. A survey involving 577 household respondents was conducted from May-July 2015 by using a natural disaster preparedness protocol. Most of the respondents are within the working age group, without job, having a basic education, below the poverty threshold, having a big family, and living in the area for more than 30 years. They also appeared to have known more than one disaster preparedness strategies. Age, education, household income, occupation, and length of residence showed a significant relationship with respondents' knowledge albeit in varying direction. The study could help the local government to target its disaster risk reduction and management efforts, and therefore help its constituents prepare for a disaster.

*Keywords: natural disaster, household disaster preparedness, rural households, knowledge survey, Philippines*

### INTRODUCTION

The increasing impacts of natural disasters are highly correlated to the increasing vulnerability of households and communities especially in developing countries (Vatsa & Krimgold, 2000). Hence, the impacts of any disastrous events could result in an immediate increase in poverty (Carter et al, 2007). This condition highlights the importance of disaster preparedness especially in Asia where most developing countries are located. The socioeconomic vulnerabilities of these countries may exacerbate the impact of a natural disaster, and thereby making the process of recovery more difficult (Vatsa & Krimgold, 2000).

Knowledge on disaster preparedness is an imperative step towards disaster prepared families especially among households in developing countries such as the Philippines. According to Groves (2013), individuals who have higher knowledge could become more aware of their personal responsibility in emergency preparedness. Higher knowledge could move individuals to a more active state, i.e. individuals are more likely to take action (Groves, 2013). For instance, Thomas et al. (2015) reported that persons with advanced preparedness knowledge were more likely to prepare such emergency kit items as multipurpose tools, emergency blankets, and first aid kits. For households that operate under meager resources, preparedness knowledge could help reduced their vulnerabilities to disastrous events. As Groves (2013) argued, vulnerabilities lie in the lack of preparedness of populations.

Unfortunately, there is little information on the households' knowledge on disaster preparedness. There appears to be a lack of study on the state of knowledge among the households of a developing country in Asia such as the Philippines. This is crucial because most of the human impacts of natural disasters were felt in Asia, with 332,000 deaths and 3.7B people affected (Montenegro, 2015). And the Philippines is one of the Asian nations that are highly vulnerable to natural disasters. In fact, the country was ranked fourth in the world among the countries hit by the highest number of disasters over the past 20 years (UNISDR, 2015). Therefore, any study that analyzes the state of knowledge on household disaster preparedness in the country in particular or in Asia in general might provide an opportunity to create messages that promote household preparedness (Thomas et al, 2015). According to Groves (2013), knowledge on disaster preparedness is essential to effective communication campaigns especially for the promotion of personal responsibility in emergency preparedness. With high level of preparedness, households might be able to successfully evacuate during flood events and hurricane (Howell & Bonner, 2005) or improve resilience in coping with trauma (Bravo et al., 1990). Therefore, knowing the level of knowledge on disaster preparedness of households could guide practitioners in creating valid actionable plans that consider both the specific geographic and individual variables.

The current study was conducted to determine the households' level of knowledge on disaster preparedness in one of the flood-prone municipalities in the Philippines. Respondents were characterized according to pre-selected socio-demographic variables. The study also analyzed the relationship between respondents' socio-demographic characteristics and level of knowledge on disaster preparedness.

## **MATERIALS AND METHODS**

### **A. The Study Site**

The study was conducted in Bay, Laguna, Philippines (Figure 1) with a population of 62,143 in 2015, which is expected to increase annually at a rate of 2.11% (PSA, 2010). It is bounded on the north by Laguna de Bay, which together with several rivers traversing the area, makes the study site highly vulnerable to flooding. For instance, the study site has been placed under a state of calamity in 2013 due to massive flooding brought about by Tropical Storm Maring, which caused the rivers and the lake to overflow (Takumi & Esconde, 2013). Bantayan (2015) also indicated that among the 10 low lying barangays of the Municipality, about nine barangays are highly vulnerable to flood risks. This condition puts the study on assessing households' knowledge on disaster preparedness an important activity in the study site.

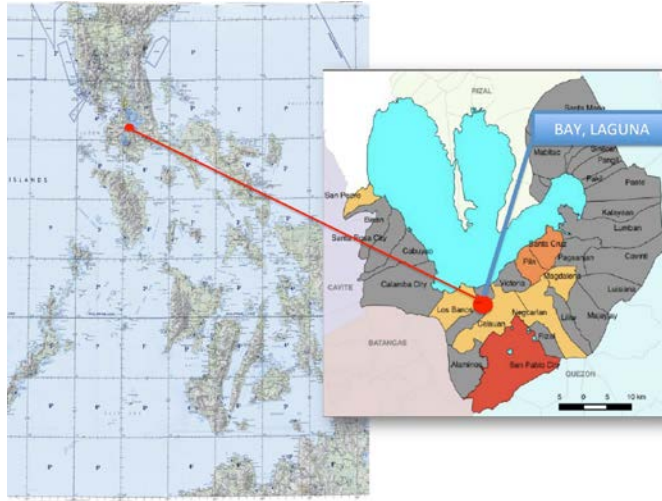


Figure 1. Study site i.e. Bay, Laguna, Philippines (source: PRDP-NPCO Geomapping and Governance Unit, Province of Laguna)

## B. Research Design and Household Sample

The study involved about 577 household respondents from eight out of its 17 barangays using a purposive research design. Respondents were identified through the help of barangay officials while their participation depended on their willingness to be interviewed. The research team made a courtesy call with the municipal mayor, administrative officer, and some barangay officials where an orientation about the study and its protocol was conducted. The respondents were distributed as follows: more than 50% were housewife, 76% was female, 91% in the working age bracket, and 54% unemployed. The interview was conducted from May to July 2015 (Bagarinao, 2016).

## C. Data Collection, Processing, and Analysis

Modified from Brunie's (2007) survey questionnaire for household's disaster preparedness study, an interview protocol was used to collect information on the following: (a) socio-demographic data of the household; and (b) respondent's knowledge on natural disaster preparedness based on pre-determined plans. The plans include preparing a 3-day emergency kit and supplies, making a relocation plan, securing and safeguarding family documents, having a family member sent for first aid training, developing a communication disaster plan, discussing the disaster plan with the family, knowing the community's disaster plan, and having an out-of-town contact. Enumerators were recruited, trained on the implementation process, involved and debriefed after the pre-test of the interview questionnaire.

Collected data were subjected to descriptive and inferential statistical analysis to address the objectives or research questions of the study. They were presented as tables and graphs.

## RESULTS AND DISCUSSION

### A. Socio-demographic characteristics of the respondents

Table 1 shows that though about 91% of the respondents is within the working age group (20-60 years old), only 46% is actually working probably because most of them (80%) are only elementary and high school graduates. Only 18% had finished higher education, which is necessary to get a job in the Philippines. This condition is critical especially that most of them have bigger household size but with low income (Table 1). The estimated mean household income is only PhP5,542.46 (or US\$ 125.00), which is far below than the estimated poverty threshold of PhP19,137 (or US\$435.00) for the region (PSA, 2012). With meager income, it may be difficult for these households to prepare for any disaster. Most of their income might be spent for their basic necessities, and none may be used for disaster preparedness. Interestingly, the respondents have lived in the study site for more than 30 years already, and therefore, they might have developed strategies that can address the problems associated with disasters though this concern is beyond the scope of the study.

**Table 1. Socio-demographic profile of respondents (n = 577) (Bagarinao, 2016)**

Variable	Mean	Frequency	Percentage
<b>Age</b>	<b>44</b>	<b>20</b>	<b>4</b>
13-19		17	3
20-30		100	17
31-40		126	22
41-50		140	24
51-65		162	28
66 and above		32	6
<b>Sex</b>			
Male		141	24
Female		436	76
<b>Education</b>			
None		7	1
Elementary		167	29
High School		295	51
College		106	18
Graduate		2	0
<b>Occupation</b>			
None		309	54
Student		8	1
Self-employed		92	16
Employed		34	6
Others		134	23

**Table 1 (continued). Socio-demographic profile of respondents (n = 577) (Bagarinao, 2016)**

Variable	Mean	Frequency	Percentage
<b>Household Income (US\$)</b>	<b>5,542.46 (126)</b>	<b>83</b>	<b>14</b>
0-5500 (0-125)		404	70
5501-10000 (126-227)		137	24
10001-20000 (228-456)		26	5
20001-40000 (457-909)		7	1
40001 and above (909 and above)		3	1
<b>Household Size</b>	<b>5</b>	<b>162</b>	<b>28</b>
0-5		397	69
9-10		169	29
11 and above		11	2
<b>Length of Residence</b>	<b>32</b>	<b>5</b>	<b>1</b>
0-10		84	15
11-20		92	16
21-30		114	20
31-40		85	15
41 and above		202	35

These patterns confirm what Asian Development Bank (2009) reported that poverty incidence in the Philippines is higher in rural communities than in urban areas though urban poor households are rapidly growing in recent years. Especially for income, educational attainment, and household size, the observed patterns are important in developing a community disaster preparedness plan in the study site. Empirical studies (Woerschling & Snyder, 2003; Woerschling & Snyder, 2004) indicated that rural residents were generally vulnerable to disasters and had a higher likelihood of receiving inadequate support for housing and chronic ailment after a disaster. The local government officials at the municipality and barangay levels should be able to provide support, financial or otherwise, to residents so that the capacity of the households to respond to a natural disaster would be enhanced.

### **B. Households' Knowledge on Natural Disaster Preparedness**

Table 2 summarizes the distribution of respondents by natural disaster preparedness strategy. It seems that most respondents knew the disaster preparedness plans presented to them during the interview. Of the plans presented, only having an out-of-town contact appeared to be relatively uncommon among the respondents with only 408 (71%) respondents reported that they have knowledge about it. Many respondents (n = 571) knew that they need to safeguard or secure their important documents. Some of them (n = 567) indicated that they knew the need to discuss their disaster preparedness plans with their family. Still others (n = 97) knew that they need to develop a disaster communication plan. Likewise, making a relocation plan appears to be a common knowledge among the respondents with 548 respondents who reported having knowledge on it.

**Table 2. Distribution of respondents by knowledge of a disaster preparedness plan**

Strategy	With Knowledge		Without Knowledge	
	Frequency	Percentage	Frequency	Percentage
Discussing disaster preparedness in the household	567	98	10	2
Preparing a 3-day disaster supplies on hand	553	96	24	4
Having a family member being trained in first aid	464	80	113	20
Securing and safeguarding family documents	571	99	6	1
Developing a disaster communication plan	559	97	18	3
Having an out-of-town contact	408	71	169	39
Knowing the community's disaster plan	471	82	106	18
Making a relocation plan	548	95	29	5

Similar pattern was reported in Myanmar where a greater number of residents in Rakhine reported having their important documents secured or safeguarded during a disaster (REACH Initiatives, 2015). In addition, the study had indicated that only 35% of the people did not know where to go in the event of a disaster but only 48% and 29% of the respondents indicated to have known the importance of an emergency food supply and a list of important contact number being already prepared, respectively. In India, Kangabam, Panda, and Kangabam (2012) had reported that residents in Itanagar are not well prepared to meet disaster if it occurs anytime in the locality or community. They also reported that these respondents have poor knowledge on the governmental and other services available following a natural disaster. Kanhai et al (2016) reported the same findings among the residents in one Caribbean country. They reported that about 93% of the coastal respondents did not have any emergency plan for tsunami. Unfortunately, being aware of and having knowledge on disaster preparedness plans is critical amongst local populations in highly vulnerable communities. It is necessary to mitigate the devastating impacts of natural disasters such as tsunamis, floods, typhoons, or earthquakes (Kanhai, et al., 2016).

The observed pattern on household's knowledge could be attributed to the regular exposure of the respondents to typhoons and flood events. There are empirical evidences that households' prior experience to disaster had a significant influence on disaster preparedness. Najafi et al. (2015), for instance, had reported that previous disaster experience is among the demographic factors that significantly influence the disaster preparedness behavior of inhabitants in Tehran, Iran. Likewise, Lindell and Whitney (2000) had indicated that prior experience to disaster has shown to be one of the preparedness determinants.

The respondents of the current study had been exposed to several typhoons and flood occurrences given their length of residence and the frequency of occurrence of these disasters in the study site. To cite, about five (5) worst typhoons had passed the study site since 1970, which wreaked havoc among the households, agricultural farms, and other structural and non-structural resources in the area (<http://www.typhoon2000.ph/>). In addition, Ardales et al. (2015) reported that the number of days of flood in the study site had increased from 87 days in 1972 to 108 days in 2009. The extent and duration of flood occurrences are affected by the amount of rainfall, the condition of the lake and its surrounding watersheds, increased population in the region and the proliferation of communities in lakeshore areas

and along the Napindan Channel (Ardelas, et al. 2015). The respondents' past experiences to these disasters may have increased their preparedness to natural disasters, and therefore, enhanced their knowledge on certain disaster preparedness strategies. According to Lindell and Perry (2000), past experiences can influence people to gather more information about the natural disaster and brings better judgment toward natural disaster preparedness.

### **C. Influence of Socio-demographic Variables on Respondents' Knowledge on Disaster Preparedness Plans**

Among the respondents' socio-demographic variables (i.e. age, sex, education, occupation status, household income, household size, and length of residence) tested for influence on their knowledge on a disaster preparedness plan, only sex and household size did not show any empirical relationship ( $p > 0.05$ ) with any of the disaster preparedness plans presented to them. All other factors showed a significant relationship with respondents' knowledge on one or more disaster preparedness plans.

Age had a significant correlation with respondents' knowledge on the need to discuss disaster preparedness plans with the household members ( $r = 0.13$ ,  $p = 0.003$ ), prepare a 3-day disaster supplies on hand ( $r = 0.12$ ,  $p = 0.01$ ), and know the disaster plan of the community ( $r = 0.15$ ,  $p = 0.000$ ). Lindell and Perry (2000) observed similar findings as they reviewed existing studies on predictors of households' adoption of earthquake hazard adjustments. On their review on 23 studies, they observed that age has been associated with preparedness behaviors. Dash and Gladwin (2007) also reported that age is one of the demographic factors that influenced households' evacuation decision. In the current study, age is directly correlated with the respondents' knowledge, implying that older respondents are more likely to discuss their disaster plans with their family, prepare a 3-day disaster supplies, and know their community's disaster plan.

On the other hand, education has been observed to be negatively correlated with the respondents' knowledge on discussing disaster preparedness plans with household members ( $r = -0.10$ ,  $p = 0.028$ ) and knowing the community's disaster preparedness plan ( $r = -0.13$ ,  $p = 0.002$ ). The result implies that highly educated respondents are less likely to know their community's disaster plan as well as discuss their plans with the household members. Muttarak and Pothisiri (2013) reported similar findings in their study on some households in Thailand. They observed that highly educated individuals took disaster preparedness information from a number of sources, and not necessarily from their own community in general or family in particular.

In addition, household income is positively correlated with respondents' knowledge on preparing a 3-day disaster supplies on hand ( $r = 0.10$ ,  $p = 0.022$ ) and having a member being trained for first aid ( $r = 0.10$ ,  $p = 0.030$ ) but negatively correlated with knowing the community's disaster plan ( $r = -0.13$ ,  $p = 0.002$ ) and having a relocation plan ( $r = -0.12$ ,  $p = 0.004$ ). This confirms the study of Masozera et al (2007) who reported that the ability of a household to respond to and cope with the impacts of a natural disaster differs across economic classes. Kim and Kang (2010) also indicated that income determines the households' ability to obtain disaster resources. Mohammad-pajoo and Aziz (2014) reported similar findings in their investigation on the factors for disaster preparedness among residents of Kuala Lumpur, Malaysia. They observed that level of income has the highest correlation with level of preparedness. However, the results of the current study imply that low income respondents are less likely prepare a disaster supplies that could meet the 3-day requirements of the family after a disaster, and less likely send a member of the family to first aid training. Understandably, poor households usually focus more on securing their daily food rather than spending their money on extra supplies or training. In fact, Leibtag and Kaufman (2003) had indicated that low income households consider price when buying for food in supermarkets. They usually prioritize low-priced food though it has a poor quality and low nutritional value. Toya and Skidmore (2007) reported that less income would lead to have less precautionary measure, and will experience more loss during natural disaster. Having no supply of medicine and other

supplies for disasters at the household level is critical especially in rural areas in the Philippines because stocks of emergency medicines and disaster supplies in the local government units could not cater a large number of patients when disaster happens (Galindo *et al.*, 2014). On the other hand, high income households could recover more quickly and effectively from a disaster than others in a community because they have the resources available for the recovery process (Moore et al (2004).

The results also imply that high income respondents would be less likely know their community's disaster plan and make a relocation plan than their low income counterparts. High earning households would usually have diverse sources of disaster preparedness-related information, such as the Internet, television, and radio (King, 2000), which they can use to better implement their preparedness plans. They could probably increase their knowledge on disaster preparedness from these sources, and therefore, they would become less dependent on the information provided by their community. Likewise, with high income, households could construct more disaster-resilient houses, and therefore, would not see the need to evacuate or relocate in case of a natural disaster.

Lastly, occupation ( $r = 0.11$ ,  $p = 0.015$ ) and length of residence in the study site ( $r = 0.11$ ,  $p = 0.007$ ) showed a significant positive correlation with the knowledge in preparing a 3-day disaster supplies on hand. Good occupation provides higher income, which in turn, may enhance respondents' ability to look for knowledge on disaster preparedness including the preparation of a 3-day food, water, and medicine requirements of their households after a disaster. High income earning respondents would have broader sources of information than their low income counterparts. In addition, the relationship between length of residence and respondents' knowledge on preparing a 3-day disaster supplies could be related to respondents' past experience with disaster. As indicated in the result, respondents who lived longer in the study site are more likely know the importance of preparing a 3-day disaster supplies as they experienced more occurrences of natural disasters through the years. As cited above, the study site had experienced several flood events and typhoons since 1970s. Such experiences have enhanced the respondents' knowledge on how to prepare for the next occurrences of these events (Espina and Teng-Calleja, 2015). Several studies (e.g. Sattler et al, 2000; Society for Risk Analysis, 2015; Espina and Teng-Calleja, 2015) confirmed that prior experience of people in disastrous events could predict their disaster preparedness behavior and risk perception. This could probably be due to the knowledge they learned from such experience. In such case, victims of disasters could be seen as more prepared than those who have no experience with a disaster at all. The amount of damage that they experienced in a disaster could probably predict the level of preparation they would undertake in case of a disaster (Takao et al, 2011). In effect, past experiences could possibly lead to a better handling of preparedness, faster evacuation, and better reaction toward warning dissemination (Mohammad-pajooch & Aziz, 2014).

Overall, more respondents have knowledge on important disaster preparedness plans though their behavior had been influenced by certain set of socio-demographic variables. The empirical relationships between these variables and respondents' knowledge could be useful in improving or enhancing the disaster preparedness strategy of the local government. Priority should be focused on low income households though the security and safety needs of the high income earners during a disaster should likewise be addressed.

## CONCLUSION

Having a better knowledge on disaster preparedness strategies or plans is already a one significant step that a household could take to prepare for a disaster. Disaster preparedness in recent years is no longer an option among households who are at the forefront of a disaster. It is imperative that each household should learn certain disaster preparedness strategy to better response to a disaster or minimize its impacts.



The study was conducted to determine the households' level of knowledge on disaster preparedness in one of the flood-prone municipalities in the Philippines, and to explore if empirical relationship could be established between pre-selected socio-demographic characteristics of respondents and their level of knowledge.

In general, more respondents have knowledge in more than one disaster preparedness strategies. Except for having an out-of-town contact, all other disaster preparedness plans are a common knowledge among the respondents as indicated in the number of respondents who have reported of having known them. Among the socio-demographic variables tested for an empirical relationship with respondents' knowledge, age, education, household income, occupation, and length of residence showed a significant correlation albeit in varying directions. Of greater importance, however, is income since most of the respondents are below the poverty threshold estimated for the region of the study site. Additional income is needed so that they can prepare at least for their 3-day food, water, and medicine requirements after a disaster. The local government unit should be able to address this concern, and integrate certain livelihood programs in their disaster risk reduction and management action plans. It is also recommended that an empirical study at the national level be conducted to assess the level of knowledge of the households especially in areas that are highly vulnerable to natural disasters. The information could help facilitate the national government focused its information, education, and communication activities in order to create more disaster-resilient communities.

However, any use of the information in this study should be done with care. At the very least, further analysis of the data should consider the limitations of the study especially in the representation of income classes and sex. As noted, more respondents came from the low income households and females, respectively because of the unavailability of their counterparts during the conduct of the survey. Likewise, since the study utilized a face-to-face interview, it could be possible that respondents have over-reported their knowledge on disaster preparedness plans so that the interviewers may view them favorably. The study could however be used as inputs in any local government's planning activities especially in enhancing its constituents' awareness on certain disaster preparedness plans.

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