

## Households' Natural Disaster Preparedness: A View from a Second Class Municipality in a Developing Country

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### Abstract

The increasing frequency of natural disasters occurrence and severity of climate change impacts in recent years makes disaster preparedness a vital decision among households especially in developing countries like the Philippines. The study was conducted to characterize households' respondents through the use of selected socio-demographic variables. It also aimed to determine their adoption of pre-determined disaster preparedness plans and if an empirical relationship could be established between the adoption of a plan and the selected household socio-demographic variables. Using a stimulus-response framework, a natural disaster preparedness survey protocol with emphasis on households' preparedness plans was developed and implemented from May-July 2015 in one of the typhoon and flood-prone municipalities in the Philippines. With 577 respondents, the average households in the study site consist of 5 members, are below estimated poverty threshold, and residing in the area for more than 30 years. There is variability on the relationships between the socio-demographic characteristic of the respondents and their decision to adopt disaster preparedness plans. These findings call for the expansion of the current climate change adaptation and disaster risk management programs and initiatives of the municipality to include enhancement of households' capacity to prepare and deal with impacts of natural disasters.

**Keywords:** natural disasters; disaster preparedness; stimulus-response; Philippines

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### 1. Introduction

The importance of natural disaster preparedness at the household level has been reiterated and re-emphasized after recent major disasters in several countries throughout the globe. Though various climate change adaptation and disaster risk reduction initiatives were done at the global, national, and local levels, recent disasters have revealed limitations in the timing and mobility of government assistance to the public (Tomio *et al.*, 2014). Therefore, plans to prepare the households for disaster events are areas for improvement (Tomio *et al.*, 2014). This is necessary because households are at the forefront of destruction during a disaster and the first who would suffer from its impacts.

According to Brunie (2007), household preparedness can help save lives, and even curtail staggering losses from natural disasters, and therefore crucial in the attainment of sustainable community. Thus, finding ways to promote preparedness especially among economically challenged households has become urgent in developing countries such as the Philippines. Brunie (2007) observed that the impacts of disasters

are becoming stronger on developing countries, where deaths and damages are getting worse. The Philippines is highly vulnerable to various types of natural hazards such as typhoons, floods, earthquake, volcanic eruption, ground shaking, landslide, and the like. In fact, it has been identified as a natural disaster hot-spot and is ranked third among the most disaster risk countries in the world (Galindo *et al.*, 2014). This is critical for poor households in the Philippines as poverty and disasters are mutually reinforcing. Poverty keeps people vulnerable to disasters, which in turn keep the poor in poverty by consistently wiping out the few resources they have (World Bank, 2001).

This makes the assessment of household's preparedness to disaster an imperative study. The assessment could help identify and analyze practices that could be replicated in other areas to minimize the impacts of disasters. It could also provide information to local government units when developing and implementing their disaster risk reduction and management plans. Using the stimulus-response theory as a framework, the current study was conducted to analyze households' disaster preparedness in

one of the typhoon and flood-prone municipalities in Laguna, Philippines. Specifically, it aimed to: (a) characterize the respondents through the use of pre-selected socio-demographic variables; (b) identify the households' disaster preparedness plans; and (c) determine if empirical relationship could be established between pre-selected socio-demographic characteristics of respondents and the choice of disaster preparedness plans.

## 2. Materials and Methods

### 2.1 The study site

The study was conducted in Bay, which is a second-class municipality in the province of Laguna, Philippines (Fig. 1). According to the 2010 census, it has a population of 55,698 inhabitants (PSA, 2010) distributed in its 17 barangays. Its barangays are classified as lakeshore (3) and inland (14) or urban (2) and rural (15).

Bay is highly vulnerable to flooding because of its geographic location and the presence of several river systems. In 2013, Bay has been placed under a state of calamity because of massive flooding caused by heavy monsoon rain brought about by Tropical Storm Maring (Takumi and Esconde, 2013). Flood came from the surrounding Laguna de Bay (or Laguna Lake) and the rivers that traverse the municipality.

### 2.2 Research design and household sample

The study used a purposive sampling design but with sample population selected from both lakeshore and inland households. Identification of respondents was done through the help of the Barangay Captain, availability of the household members, and consent to participate in the interview.

About 577 respondents were selected from eight out of 17 barangays. More than 50% of the respondents were housewife, 76% was female, 91% in the working age bracket, and 54% unemployed. Prior to the conduct of the study, a courtesy call with the Local Government Unit officials (e.g. Mayor, Administrative Officer, and Barangay Officials) was done to discuss the research, interview protocol, and expected outputs of the study. Also, a prior consent from the respondents was sought before the interview protocol was implemented. With the consent of the officials and the respondents, the interview was conducted from May to July 2015.

### 2.3 Data collection, processing and analysis

The survey questionnaire was modified from Brunie (2007) and collected information on the following: (a) socio-demographic data of the household; (b) respondent's level of knowledge on natural hazards in their place; and (c) household's natural disaster preparedness practices based on

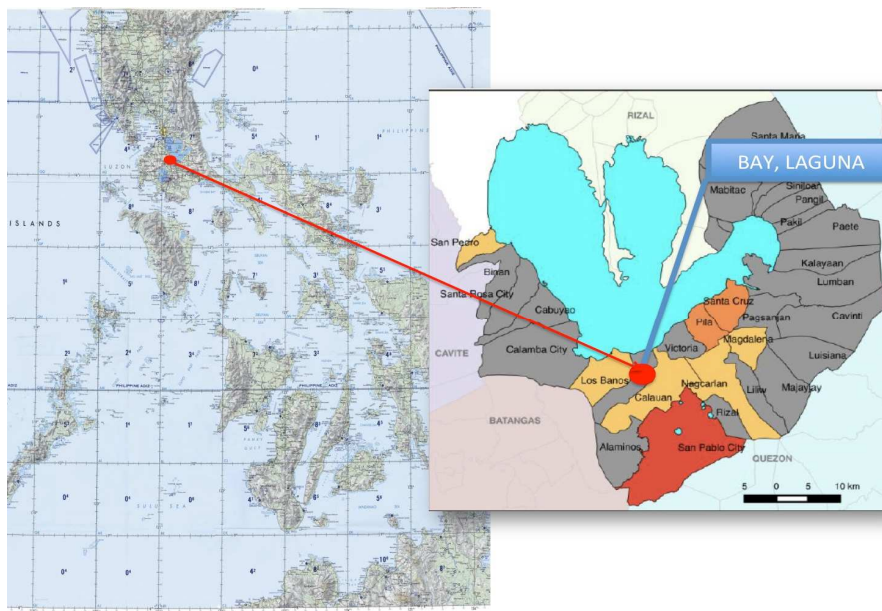


Figure 1. Study site i.e. Bay, Laguna, Philippines (source: PRDP-NPCO Geomapping and Governance Unit, Province of Laguna)

pre-determined disaster plans, which include preparing a 3-day emergency kit and supplies, making a relocation plan, securing and safeguarding family documents, having a member knew first aid, having a communication disaster plan, discussing the disaster plan with the family, knowing the community's disaster plan, and having an out-of-town contact. Interviewers were recruited and trained on implementing the interview questionnaire. The training included interview ethics, mock interview, and a pre-test of the questionnaire on a focus group of a community that is not part of the study sample. Interviewers were debriefed after the pre-test to check for statements that are not clear or problematic so that they can be improved.

Data were processed and analyzed through the use of SPSS. Descriptive and inferential statistics were computed to describe trends and relationships among the variables tested. A correlation analysis was conducted to determine if an empirical relationship could be established between the implementation of the practices and pre-selected socio-demographic variables.

### 3. Results and Discussion

#### 3.1 Socio-demographic characteristics of the respondents

As indicated in Table 1, mean age of the respondents is 44 years. Most of the respondents however are within the working age bracket (i.e. 20-65 years old). Sixty-five (65) years old is the compulsory retiring age in the Philippines.

In addition, about 76% of the respondents were female and only 18% has finished higher education. This could probably explain why more than half of them (54%) don't have any work as of the time of the survey. Consequently, the estimated mean household income is only PhP5,542.46 (or US\$ 118.00), which is far below than the estimated poverty threshold of PhP19,137 (or US\$407.00) for the region (PSA, 2012). This is critical because about 70% of the respondents fall within the income bracket of PhP 5500.00 (US\$117.00) and below, and the estimated mean household size is 5. It is also noted that a considerable number ( $n = 180$ ) of the respondents have a household size of more than 5. Household's purchasing power is usually reduced with increasing household size while income remains the same. The mean length of residence was computed to be 32 years though some of the respondents have lived in the study site for more than 32 years.

#### 3.2 Households' adoption of disaster preparedness plans

Table 2 shows the frequency of respondents who adopted certain natural disaster plans. It appears that there is a growing awareness among the household respondents on preparing for disasters. Espina and Teng-Calleja (2015) reported similar observation among residents in Tacloban and Metro Manila, Philippines. They reported that there is a growing awareness on the role of the community in mitigating disasters (Espina and Teng-Calleja, 2015).

Among the pre-determined plans presented to the respondents during the interview, securing or safeguarding the family records showed the highest number of adopters (94%). About 91% of the respondents reported that they created a relocation plan to prepare for an incoming typhoon. More than 80% indicated discussing their plans with their family while about 82% have known their community's disaster preparedness plan.

The result could be the respondents' response to previous exposure to disasters. About two typhoons that resulted in floodings visited the study site annually in the last 10 years. The most recent one, i.e. Typhoon Rammasun (locally known as Typhoon Glenda) destroyed several houses, flooded many rice fields, and made thousands of families homeless in 2014 (Baraoidan, 2014).

On the other hand, preparing a 3-day disaster emergency supplies and kit is relatively not common among the respondents. Only 63% of the respondents indicated this in the interview. This could be due to the fact that most of the respondents are below the poverty threshold of the study, and hence, their capacity to buy these supplies is limited. This confirms the study of Masozera *et al.* (2007) who reported that households' ability to respond to and cope with the impacts of a natural disaster differ across economic classes. The poor households focus more on securing their daily food rather than spending their money on extra supplies. However, having no supply of medicine and other supplies for disasters is critical 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) made similar remarks when they analyzed the organizational preparedness for natural disasters in Ozamis City, Philippines. For those respondents who practiced preparing emergency supplies and kit, the supplies were not as extensive as those in the Philippine Red Cross lifeline kit. They only contain water, food,

Table 1. Socio-demographic characteristics of respondents ( $n=577$ )

Variable	Mean	Frequency (n)	Percentage (%)
Age	44		
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
Sex			
Male		141	24
Female		436	76
Education			
None		7	1
Elementary		167	29
High school		295	51
College		106	18
Graduate		2	0
Work status			
None		309	54
Student		8	1
Self-employed		92	16
Employed		34	6
Others		134	23
Household income in pesos (US\$)	5,542.46 (118)		
0-5500 (0-117)		404	70
5501-10000 (117- 213)		137	24
10001-20000 (113-426)		26	5
20001-40000 (426-851)		7	1
40001 and above (851 and above)		3	1
Household size	5		
0-5		397	69
9-10		169	29
11 and above		11	2
Length of residence	32		
0-10		84	15
11-20		92	16
21-30		114	20
31-40		85	15
41 and above		202	35

Table 2. Frequency of respondents adopting a disaster preparedness plan ( $n=577$ )

Disaster preparedness practices	No. of Adopters	Percent
1. Discussing disaster preparedness with the family	510	88
2. Preparing a 3-day disaster supplies	409	71
3. Preparing a 3-day emergency supplies kit for the family	365	63
4. Making a relocation plan	524	91
5. Having a member to be trained in first aid	464	80
6. Safeguarding family records	540	94
7. Having a family disaster communication plan	483	84
8. Having an out-of-town contact	408	71
9. Having a plan to compensate loss of electricity, water, or gas	478	83
10. Knowing the disaster preparedness plan of the community	471	82

flashlight, and sometimes transistor radio and medicine while the lifeline kit of the Philippine Red Cross requires to contain water (1 gallon per person per day) and water purification supply, non-perishable food, emergency tools/gear such as maps, whistle, knife, flashlight, sleeping bag, transistor radio, etc., personal hygiene kit, important documents and money, medicines for family members with special needs, and first aid kit (Philippine Red Cross, n.d.). These materials are intended to meet the victims' requirements for the first 72 hours after a disaster. Nonetheless, this result is in contrast from what the Department of Community Safety in Queensland had reported where 73% of their sample population indicated to have no emergency provisions stored in an emergency kit (DCS, 2012).

### 3.3 Respondents' socio-demographic factors and adoption decision

Of the respondents' socio-demographic factors tested for empirical relationships with disaster preparedness, age, education, occupation, household income, and length of residence had shown significant influence on respondents' preparedness behavior. Correlation test results indicate that older respondents are more likely to discuss disaster preparedness plan with their family ( $r = 0.12$ ;  $p = 0.003$ ), prepare a 3-day disaster supplies on hand ( $r = 0.11$ ;  $p = 0.01$ ), and know the community's disaster preparedness plan ( $r = 0.15$ ;  $p = 0.001$ ). This result corroborates with the findings of Mohammad-pajooch and Aziz (2014), which they identified age as an important determinant of Kuala Lumpur residents' to flash flood.

Education has also showed a significant correlation with respondents' decision to send a family member to first aid training ( $r = 0.13$ ;  $p < 0.05$ ). Specifically, highly educated respondents are more likely to send a family member to first aid training than their low educated counterparts. This result is consistent with some studies in Asia (e.g. Muttarak and Pothisiri, 2013; Mohammad-pajooch and Aziz, 2014). Muttarak and Pothisiri (2013) observed that education determines participation of individuals on disaster-related training in Thailand. Likewise, Mohammad-pajooch and Aziz (2014) who studied disaster preparedness in Malaysia also noted similar relationship between education and preparedness for disaster. Other studies (e.g. Frankenberg *et al.*, 2013) show that education can be an important resource to reduce vulnerability of households to environmental hazards.

On the other hand, education showed a negative relationship with respondents' decision to know their community's disaster plan ( $r = -0.12$ ;  $p = 0.004$ ). It

implies that highly educated respondents are less likely to get disaster-related information from their barangay. Muttarak and Pothisiri (2013) observed similar findings and indicated that highly educated individuals take disaster preparedness information from a number of sources. In fact, even their participation in evacuation drills and disaster education is not a priority. McGee (2011) reported different observation among some households in Canada. He reported that households found the information from their community essential in improving their ability to protect their homes and families from wildfire.

Income has also shown a significant positive correlation with respondents' preparation of a 3-day disaster supply kit ( $r = 0.10$ ;  $p = 0.023$ ), and having a member to be trained with first aid ( $r = 0.10$ ;  $p = 0.03$ ). This shows a disparity on the ability of the members of the community to respond to disasters. Moore *et al.* (2004) indicated that high income groups could recover more quickly and effectively than others in a community because they have the resources available for the recovery process. Studies of Najafi *et al.* (2015); Thomas *et al.* (2015); Mohammad-pajooch and Aziz (2014) also reported similar observation where high income-earning households are more likely to prepare a 3-day disaster supplies kit. Leibtag and Kaufman (2003) also indicate that low-income households considered several factors when shopping for food in supermarkets. Generally, they looked at the quantity, quality, price, and nutritional differences when buying for food (Leibtag and Kaufman, 2003).

However, income shows a negative relationship with knowing the disaster plan of the community ( $r = -0.13$ ;  $p = 0.002$ ). As with education, respondents with high estimated mean household income are less likely to go to their barangay and know their community's disaster preparedness plan. Understandably, high-earning households would have diverse sources of disaster preparedness-related information, which they can use to better implement their preparedness plans. According to King (2000), people with higher income would have access to more resources, which include television, radio and/or car that could assist them in relocating from a vulnerable area. Low income households may be dependent on the information and resources provided by their barangays.

Length of residence also showed a significant influence on respondents' decision to prepare a 3-day disaster supplies on hand ( $r = 0.11$ ;  $p = 0.009$ ). Respondents who have lived longer in the area are more likely to prepare a 3-day disaster supplies (Muttarak and Pothisiri, 2013). Respondents' previous experiences with disastrous events may have encouraged them

to collect more information on disaster preparedness including the preparation of supplies for their first three-day survival requirements (Najafi *et al.*, 2015). People who have experienced more losses in previous disasters seem to prepare more for disasters (Espina and Teng-Calleja, 2015). The result also confirms the report of Sattler *et al.* (2000) and the Society for Risk Analysis (2015) that prior experience has been found to predict preparation and risk perception of disasters, respectively. In fact, Takao *et al.* (2011) noted similar behavior among households in Nagoya City after the Toaki flood events. Respondents of their study indicated that the amount of damage from previous floods influenced household preparedness to flood events. Mohammad-pajoo and Aziz (2014) indicated that past experiences with disaster led to better handling of preparedness, faster evacuation, and better reaction toward warning dissemination.

Lastly, sex and household size did not show any empirical relationship with household's adoption of a disaster preparedness plan. This result indicates a limited influence of sex on disaster preparedness. Likewise, the result may imply equality across sexes in taking responsibility, and similarity in decision-making in terms of disaster preparedness (Coninx, 2010). The result contrasted the findings of Muttarak and Pothisiri (2013) and Bourque *et al.* (2010) where females have been observed to be less prepared than males. The World Health Organization (2002) pointed out that such differing influence of sex on disaster preparedness could be due to the difference in the role and responsibility that male and female members have taken in the society as well as the inequality in terms of decision-making, power, participation in the emergency organizations and factors of unemployment. The result of the study however seems to show that females have equal opportunity to make decision in disaster preparedness. In short, they are equally prepared as their male counterpart in case of a disaster.

Overall, the pattern of respondents' responses to the interview signifies the need to examine carefully the emergency planning process at the local government units to make explicit its relationship to household disaster preparedness (Perry and Lindell, 2003). It is also imperative to examine both the elements and products of planning to ensure that households' ability to respond to disasters is integrated.

#### 4. Conclusions

Disaster preparedness is an imperative decision that every household should make especially in a developing country such as the Philippines. Any study that looks at how a household prepare for a disaster is necessary to be able to develop a community responsive disaster preparedness plan. The current study presented how the respondents in one of the typhoon and flood-prone municipalities in the Philippines behave in case of a disaster. It also presented empirical bases on the influence of pre-selected respondents' socio-demographic factors on their decision to adopt a preparedness plan.

Results indicate that most of the respondents belong to the low-income class, and were either not employed or under-employed though most of them fall within the working age. Correlation analysis also showed variations on the empirical relationships between the respondents' pre-selected socio-demographic variables and disaster preparedness behavior. These variations are important inputs in the development of a community-responsive disaster preparedness plan in the study site. There is a need for the local government to improve community's literacy and livelihood especially among the poor households in the area. It is further recommended that a research at the national level on household disaster preparedness should be conducted to be able to develop a national household disaster preparedness program that will address the influence of households' socio-demographic characteristics on disaster preparedness.

However, the study is not without limitations. The study has been limited in its representation across income classes. Respondents may also have potentially misreported their preparedness actions. With the potential interest that they be viewed favorably by the interviewers, it is possible that respondents over-reported their disaster preparedness actions. Nonetheless, the study could be used as baseline information with regard to how the respondents in the study site prepare in case of a disaster.

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