Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Disasters, Poverty, and Coping Strategies: The Framework and Empirical Evidence from Micro/Household Data - Philippine Case
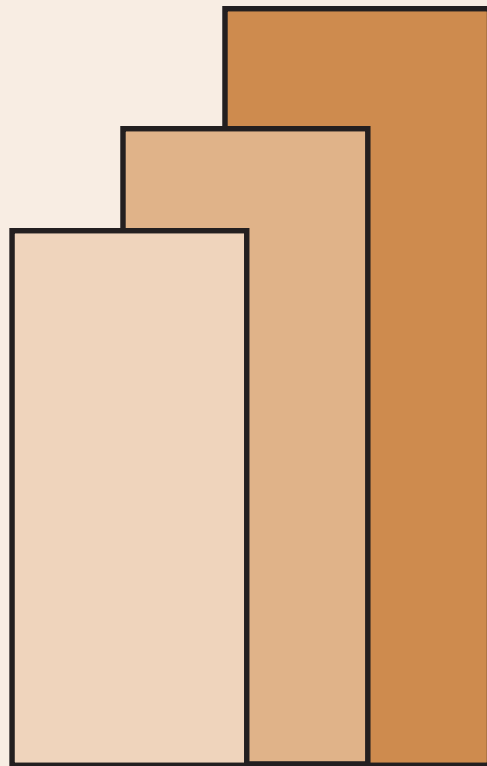
Danilo C. Israel and Roehlano M. Briones

DISCUSSION PAPER SERIES NO. 2014-06

January 2014

Disasters, Poverty and Coping Strategies: The Framework and Empirical Evidence from Micro/Household Data - Philippine Case

Danilo C. Israel and Roehlano M. Briones

Abstract

This study analyzed the interactions between natural disasters and household poverty and discussed the coping strategies used by households in response to natural disasters in the Philippines. It used data from the 2011 CBMS Household Profile Survey for Pasay City, Metro Manila and results of relevant past studies. The study found that a) there are existing analytical frameworks for the study of the interactions between natural disasters, household poverty and household coping strategies; b) some empirical studies have been done in the Philippines analyzing the aforementioned interactions; c) relevant past studies generally point to the negative effect of natural disasters on household income and subsequently on household poverty; and d) past studies also showed that households practice several coping mechanisms to address the effects of natural disasters. Furthermore, based on own estimation done, the study found that the occurrence and frequency of typhoons and/or floods in Pasay City, Metro Manila have significant and negative effects on household per capita income. It concluded that for Pasay City and other similarly situated urban areas in the country, natural disasters have a negatively impact on household income and consequently on household poverty. The study proposed future studies that can be conducted on the interactions between natural disasters and household poverty in the Philippines.

Keywords

Natural Disasters, Typhoons, Floods, Household Poverty, Household Coping Strategies, Pasay City, Metro Manila

Disasters, Poverty and Coping Strategies: The Framework and Empirical Evidence from Micro/Household Data - Philippine Case

Danilo C. Israel and Roehlano M. Briones[1]

I. Introduction

Although understanding the interactions between natural disasters and poverty at the household level is highly important particularly for disaster-prone and poverty-stricken developing countries, empirical works on the subject have been limited so far. A major reason behind this is that standard national household surveys that have been conducted by countries generally do not include the collection of data and information relevant to natural disasters (de la Fuente et al. 2009). In more recent years, however, this situation has started to change with the design of hazard modules in some household surveys that include questions on natural disasters.

In the Philippines, specifically, national household surveys have not yet included natural disasters in their coverage. While this is so, a number of site-specific and natural disaster-specific surveys have already been conducted by some studies and projects. In particular, a survey covering numerous selected sites in the country, the Community-Based Monitoring System (CBMS) Household Profile Survey, has recently added some natural disaster-related data and information among those that it collects and monitors. The availability of these new data and information may now allow some empirical analyses of the interactions between natural disasters and poverty in the country.

Likewise, some site-specific and natural disaster-specific surveys on household adaptation and coping strategies in response to natural disasters have been undertaken in the Philippines. The results of these surveys indicated that numerous strategies have been employed by households before, during and after the occurrence of natural disasters. At present, however, there is there remains need to review and compare the results of these studies and see if some important commonalities and differences exist in the practice of coping strategies among households.

This study looks into the interactions between natural disasters and household poverty in the Philippines. As corollary objectives, it reviews the adaptation and coping strategies used by households in response to natural disasters and the overall disaster risk reduction and management system existing in the Philippines. The study uses data from the 2011 CBMS Household Profile Survey for Pasay City, Metro Manila and results of relevant past studies. The specific objectives of the study are to: a) discuss the existing frameworks for analyzing the interactions between natural disasters and household poverty and the practice of coping strategies by households; b) review the evidence based on existing literature in the Philippines on the interactions between natural disasters and household poverty and on the practice by households

of coping strategies; c) review the disaster risk reduction and management system in the Philippines; d) empirically estimate the relationship between natural disasters and poverty at the household level using Pasay City, Metro Manila as case study; and e) present the summary, conclusion and recommendations.

II. Framework of Analysis

2.1 Natural disasters and household poverty

A general framework for studying the effects of natural disasters at the household or community level was developed by Lindell and Prater (2003). In summary, the physical impact of a natural disaster on the households (e.g. damage on the house) is determined by several contributing factors (Figure 1). These factors include the geographical and natural conditions surrounding the households (e.g. whether the location of the household is hazard prone or not); hazard agent characteristics (e.g. intensity, scope and duration of the impact of the natural hazard); hazard mitigation practices of the households (e.g. building of a sturdy house); and emergency preparedness practices of the household (e.g. sandbagging of house surrounding).

Figure 1: Model of Disaster Impact at the Household Level
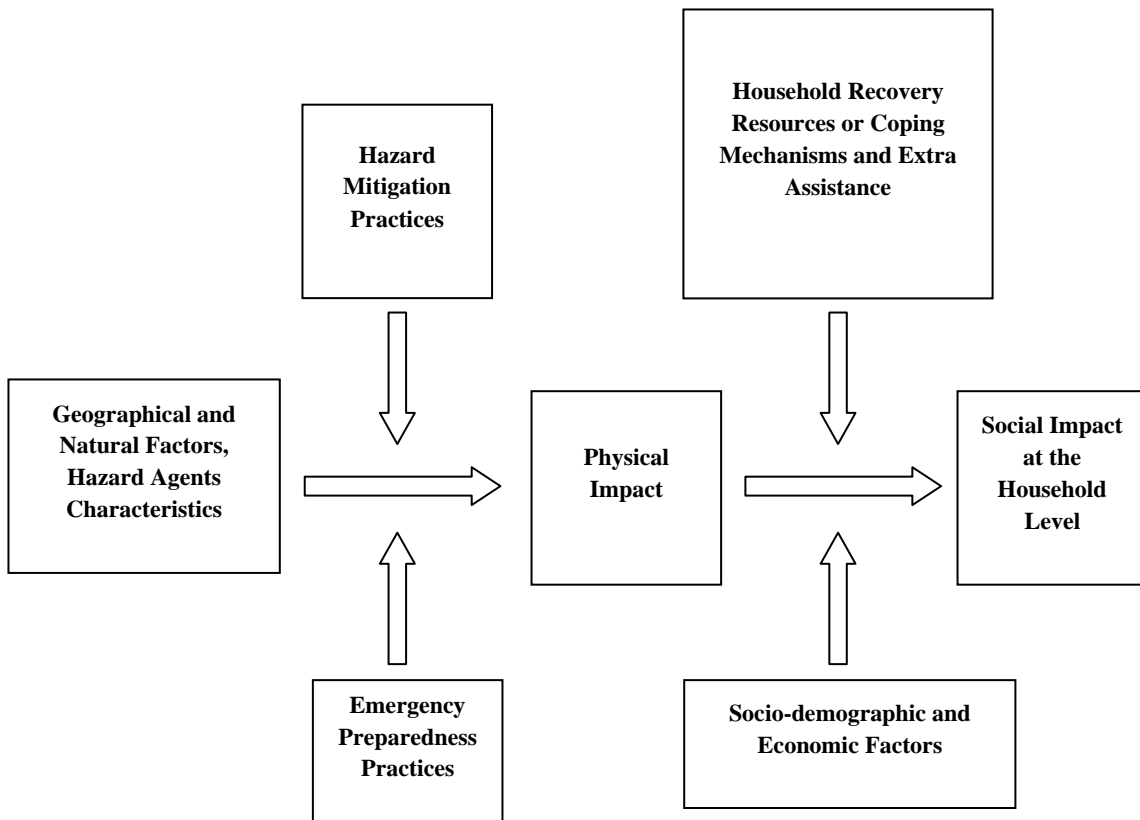
Sources: Adapted from Lindell and Prater (2003) and Rodriguez-Oreggia et al. (2008)

The aforementioned framework showed that after the physical impact, the social impact of a natural disaster on the households follows. This social impact is determined by the physical impact as well as a host of other contributing factors including the recovery resources available to or coping mechanisms practiced by the households (e.g. use of household savings for house repair), availability of extra assistance (e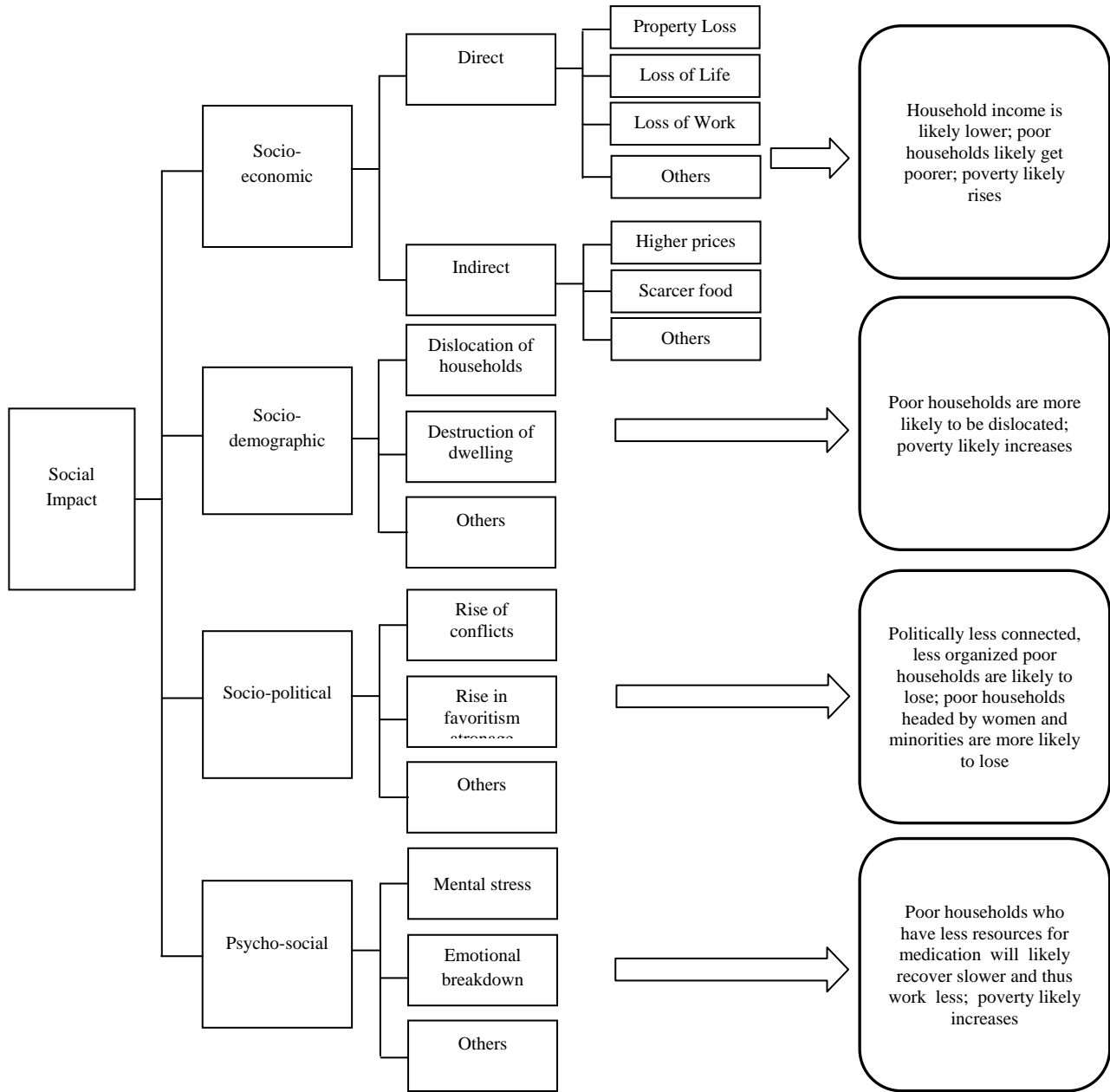.g. government, non-government and other outside relief efforts) and the prevailing post-disaster socio-demographic and economic factors surrounding the households (e.g. the prevailing states of the economy of the household locality, region and country).

An extension of the above framework that will allow the identification of the links between natural disasters and poverty among the affected households can be developed. To continue, the social impact of natural disasters can be classified into four different types (Figure 2). The first, socio-economic effects, consists of the direct losses (e.g. property loss) and the indirect losses (e.g. losses due to higher prices of food and other necessities) experienced by households after the occurrence of the natural disaster. These socio-economic losses are seen to likely reduce household income (from work and other income generating sources) resulting to increased poverty among poor households. The second, socio-demographic effects (e.g. dislocation of households), is also viewed to likely negatively affect households resulting again to reduced household income and increased poverty among poor households. The third, socio-political effects (e.g. rise in conflicts), are likewise seen to negatively affect households, particularly the less connected and less organized poor households and households headed by women and minorities, thereby reducing household income and increasing poverty among the poor households (It should be noted that, in contrast, politically favored and well organized poor households may actually significantly benefit from political favoritism and patronage resulting to higher incomes and reduced poverty on their part). The last, psycho-social effects (e.g. mental stress), is similarly viewed as negatively impacting households likewise leading to reduced incomes and increased poverty among the poor households. In the end, the reduced incomes and increased poverty particularly among poor households lower their overall household welfare manifested in their decreased consumption and access to education, health and other social services.

It should be emphasized that the above framework explains only the one directional impact of natural disasters on household poverty. The actual relationship, however, may be a two-way process where not only do natural disasters increase household poverty particularly among poor households but household poverty in turn raises the exposure of the same households to natural hazards and their susceptibility to suffer losses from these events. Considering this point, de la Fuente et al. (2009) developed another framework for analyzing the interactions between natural disasters and household poverty based on the concept of household assets (Figure 3). Explained briefly, a natural hazard at time t affects households differently. Households with a narrow asset base (i.e. poor households) experience a reduction of their assets and opportunities to use them thus resulting to higher hazard loss. These households may then be more likely to practice informal livelihoods including the provision of manual labor for environment-degrading activities around their areas of abode (e.g. deforestation). As a result, the negative practices expose households further to and magnify the risks of natural hazards that they face. The eventually effect on these households are reduced welfare outcomes, i.e. consumption below the poverty line in time t+1.

Figure 2: Social Impact of Natural Disasters at the Household Level


```
                                        ┌──────────────┐
                                   ┌────│ Property Loss│
                        ┌────────┐ │    ├──────────────┤
                        │ Direct │─┤    │ Loss of Life │        ┌──────────────────┐
                        └────────┘ │    ├──────────────┤        │ Household income │
           ┌──────────┐            ├────│ Loss of Work │        │  is likely lower;│
           │  Socio-  │────────────┤    ├──────────────┤   ───► │  poor households │
           │ economic │            └────│    Others    │        │  likely get      │
           └──────────┘                 └──────────────┘        │  poorer; poverty │
                                        ┌──────────────┐        │  likely rises    │
                        ┌──────────┐ ┌──│ Higher prices│        └──────────────────┘
                        │ Indirect │─┤  ├──────────────┤
                        └──────────┘ ├──│ Scarcer food │
                                     └──│    Others    │
                                        └──────────────┘
```

- Direct
  - Property Loss
  - Loss of Life
  - Loss of Work
  - Others
- Indirect
  - Higher prices
  - Scarcer food
  - Others

→ Household income is likely lower; poor households likely get poorer; poverty likely rises

Socio-demographic
- Dislocation of households
- Destruction of dwelling
- Others

→ Poor households are more likely to be dislocated; poverty likely increases

Socio-political
- Rise of conflicts
- Rise in favoritism atronoge
- Others

→ Politically less connected, less organized poor households are likely to lose; poor households headed by women and minorities are more likely to lose

Psycho-social
- Mental stress
- Emotional breakdown
- Others

→ Poor households who have less resources for medication will likely recover slower and thus work less; poverty likely increases

Social Impact

Source: Constructed partly based on the narrative of Lindell and Prater (2003)

Figure 3: Assets, Natural Disasters and Poverty: Suggested Causalities
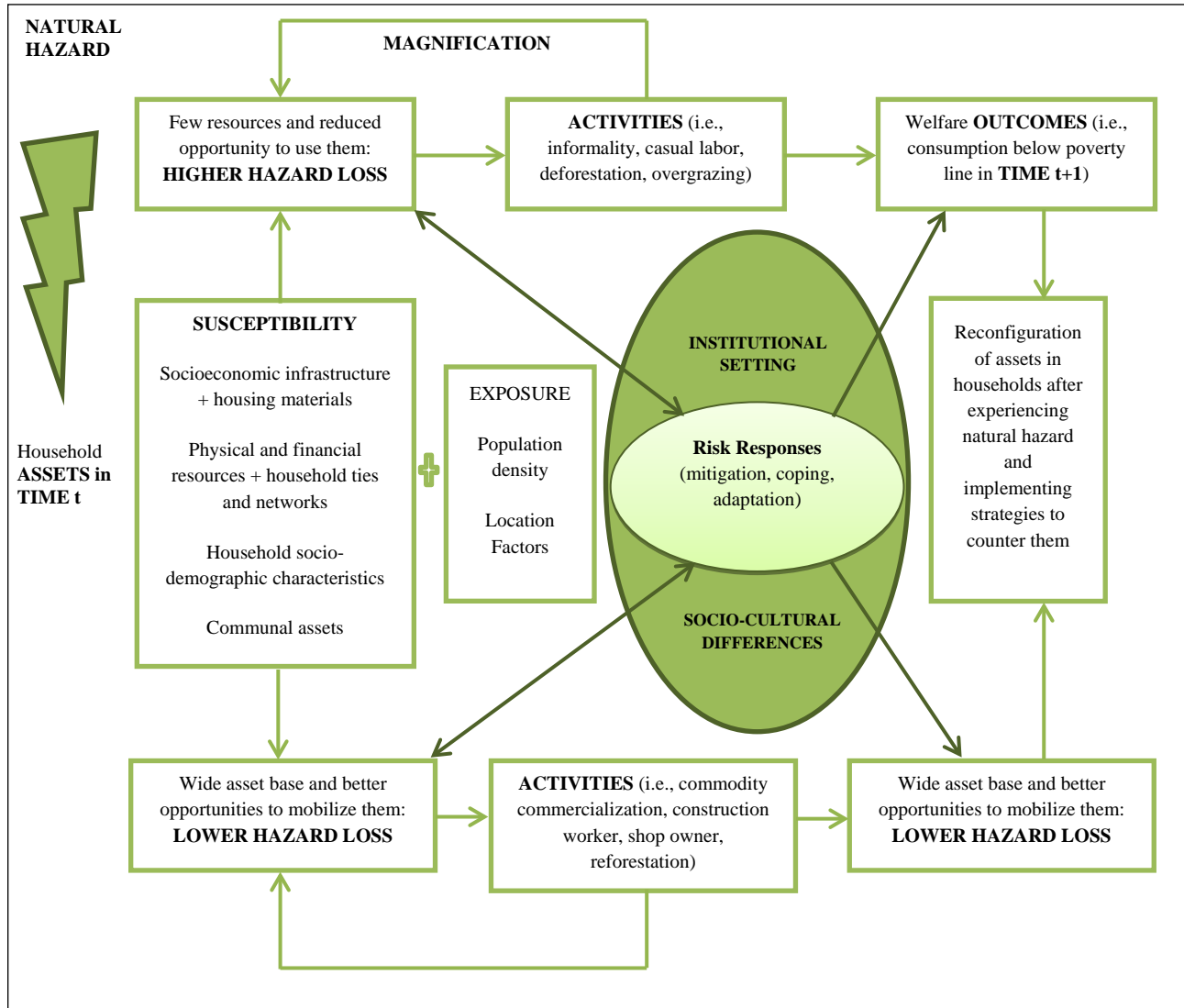
Source: De la Fuente et al. (2009)

In contrast to the poor households, the above framework indicates that the households with a wide resource base (i.e. rich households) have better opportunities to mobilize in times of a hazard event and therefore have lower hazard loss. These households are more likely to practice alternative livelihoods (e.g. operating a store) and environment-friendly activities (e.g. reforestation). In turn, these positive practices expose the households less to and reduce their risks of natural hazards. The eventually effect on these households are better welfare outcomes, i.e. consumption above the poverty line in time t+1. As Figure 3 shows, this framework also

shows that household susceptibility and exposure to natural hazard events as well as hazard loss and welfare outcomes are affected by different demographic, socioeconomic, cultural, institutional and other factors.

2.2 Natural disasters and household coping strategies

As indicated in Figures 1 and 3 above, coping strategies or mechanisms are implemented by households to address the problems they face related to natural disasters. Coping strategies are defined as the choices that households make to manage natural disasters which can be divided into ex-ante and ex-post (e.g. Helgeson et al. 2012, Mechler 2004). Adaptation strategies, on the other hand, are defined as adjustments in the behavior and characteristics of a system, such as a household, that enhance its ability to cope with external stresses, such as a natural disaster (e.g. Brooks 2003). To a significant extent, therefore, coping strategies and adaptation strategies are similar.

A framework was presented by Schwarzer and Schwarzer (1996) which describes four types of coping behaviour in a crisis: reactive, anticipatory, preventive, and proactive, and precautionary, defined as follow:

a) Reactive coping - is as an effort to deal with an on-going crisis or one that has already happened. In this case, since the crisis has already taken place, coping efforts aim to either compensate for loss or alleviate harm.

b) Anticipatory coping - is as an effort to deal with an imminent threat. Thus, the person has to manage this perceived risk, either by solving the actual problem through increased effort, getting help and investing resources, or by redefining the situation as less threatening through distraction or reassurance from others.

c) Preventive coping - is an effort to build up general resistance resources that result in less strain in the future (minimizing the severity of the impact of potential distress) and an overall reduced risk of the crisis.

d) Proactive coping - is an effort to build up general resources that facilitate promotion toward challenging goals. In proactive coping, people have a vision. They see risks, demands, and opportunities in the far future, but they do not appraise these as threats, harm, or loss but as challenges.

Another framework for analysing coping mechanisms of households was presented by Patnaik and Narayanan (2010) which categorizes coping strategies as ex-ante and ex-post. Ex-post strategies may include adaptive behavior such as dissaving, borrowing, and sale of assets. On the other hand, ex-ante strategies may include income diversification (or crop diversification in rural areas) and insurance.

Still another framework for understanding coping strategies employed by households in the face of natural disasters is by classifying them into three types, namely, as risk reducing (ex-ante), self-insurance, and risk sharing, defined as follow (e.g. Ghorpade 2012).

6

a) Risk reducing strategies – These include strategies that seek to achieve income smoothing in order to reduce household exposure to more volatile sources of income and choosing more secured ones (e.g. pursuance of diversification, less risky specialization, self-sufficiency, and flexibility in their livelihood activities).

b) Self-insurance – These strategies include the accumulation and sale of household assets to deal with disaster shocks (e.g. accumulation and later sale of land, livestock, farm implements and other assets; increasing household labor supply; reducing consumption; borrowing from others).

c) Risk sharing strategies – These include strategies that share risks within a group either implicitly or explicitly (e.g. mutual assistance, barter of goods, joint cultivation, labor pooling).

In a study covering selected Asian countries, Francisco et al. (2011) presented an adaptation framework which classified adaptation strategies used by households in response to natural disasters into four types: behavioral, structural, technological, and financial (Figure 4). It also explained that broadly, adaptation strategies can be classified into reactive and proactive measures. Reactive strategies refer to actions that are done at the very last minute or when the event is already happening while proactive strategies come from anticipating the event way in advance. The study further explained that the decision of the household on whether or not to undertake adaptation strategies for extreme climate events can be considered under the general framework of utility maximization or loss minimization. In this case, it is assumed that the households use adaptation options only when their perceived utility or net benefit from using a particular option was significantly greater than in the case without it (A mathematical presentation of this framework which is not presented here is contained in the study).
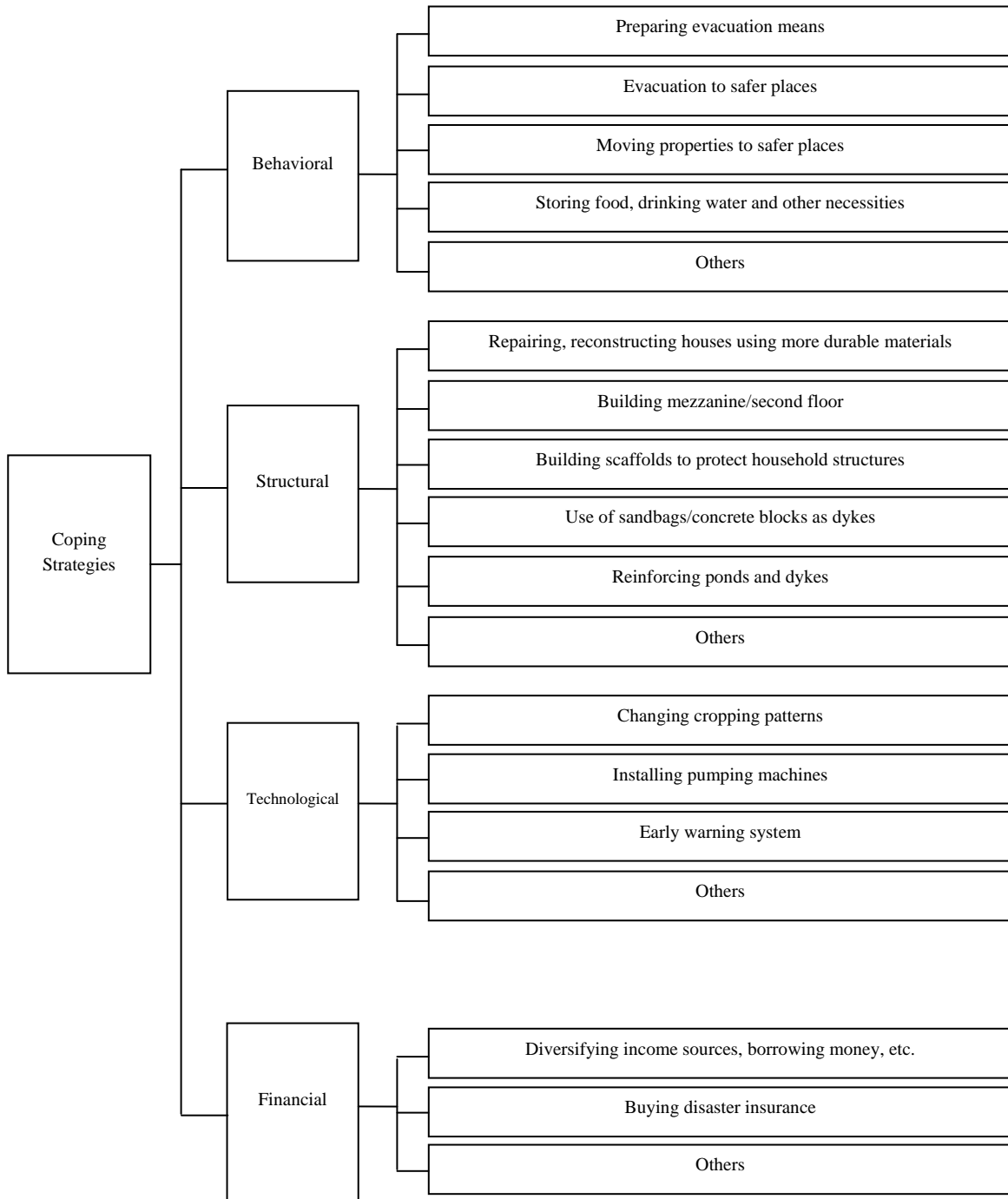
In summary, analytical frameworks for analyzing the relationships between natural disasters and household poverty as well as for studying the coping strategies employed by households in light of natural disasters are already available. While in some ways different, the frameworks in general are similar in that they assert that natural disasters worsen household poverty. The available frameworks furthermore explain that households, in general, employ different coping mechanisms to address the negative impact brought about on them by natural disasters.

III. Evidence from Past Studies in the Philippines

3.1 Natural disasters and household poverty

Some studies have been conducted in the Philippines which in one way or another touched on the interactions between natural disasters and household poverty. The available studies are briefly discussed individually below in chronological order and then summarized together.

Figure 4: Adaptation Strategies and Practices of Households in Selected Asian Countries

		Preparing evacuation means
		Evacuation to safer places
	Behavioral	Moving properties to safer places
		Storing food, drinking water and other necessities
		Others
		Repairing, reconstructing houses using more durable materials
		Building mezzanine/second floor
Coping Strategies	Structural	Building scaffolds to protect household structures
		Use of sandbags/concrete blocks as dykes
		Reinforcing ponds and dykes
		Others
		Changing cropping patterns
	Technological	Installing pumping machines
		Early warning system
		Others
		Diversifying income sources, borrowing money, etc.
	Financial	Buying disaster insurance
		Others

Source of data: Constructed based on Francisco et al. (2011)

Zoleta-Nantes (2000) looked into the vulnerability of different urban groups in Metro Manila to flood hazards using participant observation, intensive interviews, and case studies. Among others, the results of the study indicated that the flood problems of the urban poor are intimately linked to survival problems such as decent housing availability, infrastructure maintenance, and financial resource scarcity. The results also showed that while the monetary value of the losses from the floods incurred by the poor were much lower compared to that of the wealthy, these losses have more adverse impacts on their livelihoods, daily survival, and future capability to deal with flood hazards. The study concluded that the poor need considerable government support and interventions during hazardous conditions. It also asserted that the chances for developing an effective hazard reduction program for a community are great if there is cooperation among all affected sectors.

Sawada et al. (2009) studied the welfare effects of typhoon Milenyo (International name: Xangsane) which hit the Philippines in September 2006. It conducted a household survey of a village in Laguna province, the East Laguna Village, which is located about 70 kilometers southeast of Manila, facing the east coast of Laguna de Bay. A major finding of the study is that rural households were able to cope with the disaster by changing their consumption expenditure in response to changes in commodity prices caused by the disaster. Specifically, poorer households decreased their expenditure on protein and food taken outside their homes and increased their consumption on cheaper alternative commodities such as fish. In addition, the study found that the availability of emergency informal transfers from close relatives and aid from the local government in the form of food basket and house repair materials helped the affected households, most importantly the poor landless households, to cope with the damages brought about by the typhoon. Furthermore, the study found that households shifted their fuel use away from fossil fuels such as liquefied petroleum gas, kerosene, and electricity toward firewood because of the sharp decrease in the shadow prices of firewood due to the typhoon. In conclusion, the study suggested that the environmental consequence of such shifts in usage should be investigated carefully in future studies.

WFP (2009) studied the effects of typhoons Ondoy (Ketsana) and Pepeng (Parma) which hit several parts of the Philippines within a span of two weeks in September and October 2009. This study conducted a survey of 721 affected households northern Luzon, particularly Regions I (Ilocos), CAR (Cordillera Autonomous Region), II (Cagayan Valley), III (Central Luzon), NCR (National Capital Region and IVA (Calabarzon). The study explained that more than three-quarters of the respondents in Regions, I, CAR and III were farmers. By contrast in NCR and region IVA, which are mainly urban areas, the income generated by the respondents of the study came from a variety of means including unskilled labour, petty trade, salary, skilled labour and fishing.

The results of the study showed that for farmers in Regions I, CAR and III, the impact of typhoons Ondoy and Pepeng was two-fold: loss of land, crop and equipment through landslide and/or flooding coupled with loss of homes and lives. In some cases, families lost not only their means of livelihood (as once fertile land was reduced to rock when sections of mountain side slid away or buildings were reduced to rubble) but also their loved ones. The study further found that in NCR and region IVA, most of the flood affected households were very poor and had few assets before the floods. Thus, the flood compounded what was already a squalid life and added

to the mix an increased risk of disease from an environment which became substantially more unsanitary, while at the same time reducing their capacity to work and access food. The study suggested that the households affected would require support for some time to come if they are to be enabled to begin to rethread and rebuild their lives and their livelihoods.

GOP (2009a, 2000b) also studied the effects of typhoons Ondoy and Pepeng. Among others, the study analyzed the impacts of the two calamities on the poverty and livelihoods on the affected population as well as on the social impact on vulnerable groups. To estimate these effects of the two typhoons, the study employed a methodology which was developed originally by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) in the early 1970s, and which has subsequently been used in post-disaster analysis around the world (The details of the methodology, however, was not provided by the study).

Based on its computations, the study estimated that Ondong and Pepeng resulted in about 172 million work-days lost and about P50.3 billion worth of lost livelihoods in the areas affected by the typhoons. This translated into a reduction in income of about P24,000 per affected household, which was equivalent to 12 percent of the average household income in these regions. The impact on poverty at the national level was estimated as not large, however, increasing national poverty incidence (headcount rate) by only 0.5 percent in 2009 and 0.7 percent in 2010 (Table 1). Similarly, the effects of the two typhoons on the poverty gap (0.3 % 2009 and 0.4 % in 2010) and severity of poverty (0.2% in 2009 and 0.3% in 2010) were small, and the impact on income inequality (0.0% in 2009 and 0.0% in 2010) was likewise negligible.

The study further found that although the national-level poverty impact of the disasters was not large, the most affected regions in Luzon could experience higher poverty rates in 2009 and 2010. The six regions in Luzon that were heavily affected by the disasters were Region I, Region II, Region III, Region IV-A, CAR, and NCR (Figure 5). The increase in poverty was highest in Region I, in particular, where the poverty rate was estimated to increase by 2.8 percentage points in 2009. Furthermore, since the impact of the two typhoons will continue to weigh on household incomes in 2010, the study explained that the poverty incidence in Region I in particular was estimated to likely to increase by 3.5 percentage points in that year.

In addition, the study found that in the rural areas, farmers and agricultural laborers were particularly hard hit by Ondoy and Pepeng resulting to near total loss of crops and livestock reported across all sites visited. It also found that the most severely affected households in urban areas were those that relied on a single home-base business for income (sari-sari stores, eateries, shoemaking, rug making, street vendors and tricycle drivers for example). The study asserted that the ability of these households to recover is further hampered by very limited access to credit and in some cases by pre-existing debt. To help households and communities recover more quickly from the calamities, the study proposed some short-term interventions including cash transfers to help the most vulnerable re-establish their households, community block grants to establish basic services and other public goods not supported by the other sectors, and trauma counseling for severely affected individuals.

Table 1: Philippines: Impact of the Disasters on National Poverty (2009-2010)

| | 2009 | | | | | |
| | Benchmark | Typhoon | Impact | Benchmark | Typhoon | Impact |
	(1)	(2)	(2)-(1)	(1)	(2)	(2)-(1)
Poverty (%)						
Headcount Rate	32.40	32.90	0.50	32.40	33.00	0.66
Poverty Gap	10.30	10.60	0.30	10.40	10.80	0.42
Severity of Poverty	4.50	4.70	0.20	4.60	4.90	0.29
Inequality						
Gini (%)	0.476	0.478	0.001	0.478	0.480	0.002

Note: Benchmark=assumes growth on trend; Typhoon=assumes disaster scenario
Source: GOP (2009a)

Figure 5: Impact of Typhoons Ondoy and Pepeng on Poverty Incidence in the Affected Regions
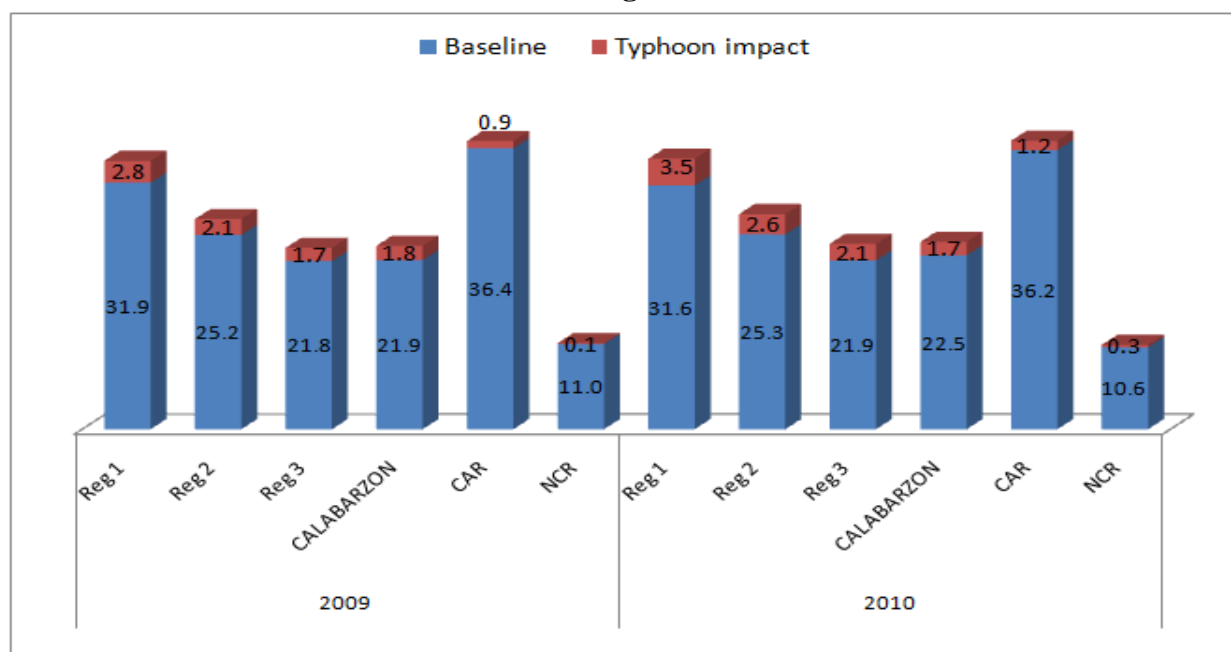
Source: GOP (2009a)

Porio (2011) studied the effects of typhoons Ondoy and Pepeng in 2009 on the incomes of households located in the Pasig-Marikina River Basin using focus group discussions (FGD). The study found that the average income losses due to the floods caused by Ondoy rose to 300 percent for male-headed households and 200 percent for female-headed households. The study opined that this difference was perhaps due to the longer closure of factory-based work for males while home-based females opened earlier than the former. The study also mentioned that based on the opinion of the affected households, the following principles for recovery and reconstruction must be applied: a) the design of the recovery and reconstruction program must be transparent, accountable and must deliver evidence-based results and outcomes and b) the approach must be community-based, people-centered, equitable and lower risks in recovery and reconstruction.

CBMSIN (2012) studied the effects of typhoon Sendong (Washi) which hit the Philippines in December 2011. The study conducted FGDs in Barangay Barra in the municipality of Opol in the province of Misamis Oriental which was one of the areas hardest hit by the typhoon. The results showed that the typhoon greatly affected the livelihoods in the affected areas. Households with farms, in particular, recalled that their plants were totally damaged while their livestock and poultry were affected as well. Aside from the losses in livelihoods, the lack of supply of clean water was a major problem encountered as the flood water contaminated the river, wells, and other sources of water. The study asserted that to aid the recovery process in the affected areas, programs that will allow households to pursue livelihoods immediately after the shock are important such as those that promote access to credit to buy agricultural inputs or provide free seeds to farmers.

GOP (2013) analyzed the effects of typhoon Pablo (Bopha) which hit the Philippines in December 2012, particularly Eastern Mindanao. The study conducted a survey covering 865 households in the 4 worst affected provinces of Davao Oriental, Compostela Valley, Surigao del Sur and Agusan del Sur as well as key informant interviews. The study explained that before the typhoon, agriculture, including livestock and poultry-raising, was the most important livelihood in the affected areas along with skilled and unskilled labor. The results of the study showed that due to the impact of Typhoon Bopha, agriculture as the primary source of livelihood declined by 23 percent followed by poultry and livestock as well as and fishing which fell by 18 percent and 26 percent respectively. Furthermore, nearly 12 percent of the respondents were rendered completely jobless as a result of typhoon, majority of which were from the agriculture and fishing sectors. The study concluded that the shock on food security and livelihoods resulting from Typhoon Pablo was widespread and comprehensive, impacting all sectors. It recommended that in the immediate term, the food and nutrition security and livelihood strategy must focus on ensuring adequate food consumption and income support to allow people to get on with the most pressing needs of recovery. It also argued, among others, that providing agricultural inputs and technical support for the next rice and maize crop was needed as well as the provision of assistance in the restoration of assets associated with household banana and coconut production, fishing and other traditional and substitute livelihoods in the affected areas.

Antilla-Hughes and Hsiang (2013) used econometric analysis in studying the post-disaster losses among Filipino households using combined secondary data from a panel dataset of province-level typhoon incidence, Family Income and Expenditure Survey (FIES),

Demographic and Health Survey (DHS). Among others, the study found that an average Filipino household's income was 6.57 percent lower in an average year due to the previous year's typhoon exposure. These income losses are closely tracked by a 7.08 percent reduction in expenditures, with particularly large reductions to human capital investments such as education (13.3%) and medicine (14.3%). The study asserted that taken together, its results indicate that economic and human losses due to environmental disaster may be an order of magnitude larger than previously thought and that adaptive decision-making may amplify, rather than dampen, disasters' social cost. In relation to poverty, the study suggested, among others, that subsidizing the development of credit markets for low-income households may increase their resilience. It also argued that it may also be optimal to tax adults to finance human capital subsidies that specifically target children.

In summary, the past studies in the Philippines which touched on the effects of natural disasters on household poverty were done in the last two decades (Table 2). The studies, except Zoleta-Nantes (2007) which dealt on floods and Antilla-Hughes and Hsiang (2013) which studied typhoons in general, concentrated on specific natural disasters. Furthermore, except GOP (2000a) and Antilla-Hughes and Hsiang (2013) which presented disaster effects on the country as a whole, the studies covered specific areas. Case studies of specific villages were done in two studies using either a household survey or FGD. For studies covering larger areas, household surveys or FGDs in the affected areas were utilized. GOP (2009a, 2009b) employed a methodology developed by ECLAC while Zoleta-Nantes (2007) used various data gathering methods. For its part, Antilla-Hughes and Hsiang (2013) used secondary survey data. While the studies differ in coverage and methods, all except Antilla-Hughes and Hsiang presented only descriptive statistics and used descriptive analysis in the discussions of their results and findings. In general, the studies indicated that poor households in both urban and rural areas are greatly affected by natural disasters specifically by reducing their asset base, their livelihood opportunities and incomes thus consequently worsening their poverty situation and reducing their overall welfare. Furthermore, in general, the studies indicated that outside help, specifically government assistance programs as well as other forms of assistance, are highly necessary in the immediate term if the poor households were to recover from the ill-effects of disasters.

3.2 Natural disasters and household coping strategies

A number of studies were also conducted in the Philippines investigating the coping strategies of households affected by natural disasters. As done earlier here, these studies are briefly discussed individually in chronological order and thereafter summarized as a group below.

Studying flood hazards in Metro Manila, Zoleta-Nantes (2000) mentioned numerous coping activities practiced by residents of wealthy villages, urban poor in slums and squatter areas and street children (Table 3). The study argued that residents of wealthy communities of Metro Manila have the capability to make the widest range of adjustments to flooding. On the other hand, because of their scarce resources, the residents of poor neighborhoods are able to practice a significantly narrower range of adjustment. For their part, the homeless street children in the metropolis are able to practice only the narrowest range of adjustment and most of these

are concerned with personal survival during floods. The study argued that specific groups have specific needs in times of calamities and that interventions should address these varying needs.

Table 2: Summary of Past Studies Related to Natural Disasters and Household Poverty in the Philippines

Study	Methods used	Type of statistics and analysis conducted	Important poverty-related finding	Important poverty-related recommendation
Zoleta-Nantes (2000)	Participant observation, intensive interviews, and case studies	Descriptive statistics and analysis	While the value of the losses from the floods incurred by the poor were much lower compared to that of the wealthy, these flood losses more adverse impacts on their livelihoods, daily survival, and future capability to deal with flood hazards.	The poor need considerable government support and interventions during hazardous conditions. The chances for developing an effective hazard reduction program for a community are great if there is cooperation among all affected sectors.
Sawada et al. (2009)	Case study employing household survey of a village in Laguna province using a survey	Descriptive statistics and analysis	Due to typhoon Milenyo, poorer households decrease their expenditure on protein and food taken outside their homes and increase their consumption on cheaper alternative commodities such as fish.	The environmental consequence of shifts in usage of resources, e.g. use of firewood as substitute for oil-based fuel, among poorer households should be investigated carefully in future studies.

WFP (2009)	Survey of households in affected regions	Descriptive statistics and analysis	Among the urban poor, typhoons Ondoy and Pepeng compounded what was already a squalid life and added to the mix an increased risk of disease from an environment which became substantially more unsanitary, while at the same time reducing their capacity to work and access food.	The households affected, particularly the poor, would require support for some time to come if they are to be enabled to begin to rethread and rebuild their lives and their livelihoods.
GOP (2000a, 2000b)	Methodology developed by ECLAC	Descriptive statistics and analysis	Although the national-level poverty impact of typhoons Ondoy and Pepeng was not large, the most affected regions in Luzon could experience higher poverty rates in 2009 in 2010.	Conduct of interventions including cash transfers to help the most vulnerable re-establish their households, community block grants to establish basic services and other public goods not supported by the other sectors, and trauma counseling for severely affected individuals.
Porio (2011)	FGD	Descriptive statistics and analysis	The average income losses due to the floods caused by Ondoy rose to 300 percent for male-headed households and 200 percent for female-headed households.	The design of the recovery and reconstruction program must be transparent, accountable and must deliver

				evidence-based results and outcomes. The approach must be community-based, people-centered, and equitable approaches and reduce future risks in recovery and reconstruction.
CBMSIN (2012)	Case study of Barangay Barra, Opol employing FGD	Descriptive statistics and analysis	Typhoon Sendong totally damaged farms while their livestock and poultry were affected as well. Aside from the losses in livelihoods, the lack of supply of clean water was a major problem encountered.	Programs that will allow households to pursue livelihoods immediately after the shock are important such as those that promote access to credit to buy agricultural inputs or provide free seeds to farmers.
GOP (2013)	Survey of households in Davao Oriental, Compostela Valley, Surigao del Sur and Agusan del Sur	Descriptive statistics and analysis	The shock on food security and livelihoods resulting from Typhoon Pablo was widespread and comprehensive, impacting all sectors.	In the immediate term, the food and nutrition security and livelihood strategy must focus on ensuring adequate food consumption and income support to allow people to get on with the most

				pressing needs of recovery.
Antilla-Hughes and Shiang (2013)	Secondary data from a panel dataset of province-level incidence of typhoons, Family Income and Expenditure Survey (FIES), Demographic and Health Survey (DHS)	Econometric analysis	An average household's income was 6.57% lower in an average year due to the previous year's typhoon exposure. These income losses are closely tracked by a 7.08% reduction in expenditures, with particularly large reductions to human capital investments such as education (13.3%) and medicine (14.3%).	Among others, subsidizing the development of credit markets for low-income households may increase their resilience. It may also be optimal to tax adults to finance human capital subsidies that specifically target children.

Table 3: Coping Activities of the Three Groups in Times of Flood Event

Groups	Coping Activities
Residents of wealthy villages	-pray, clean up, self-medicate, stay inside their homes -stock up food, prepare flash lights and other emergency tools -bring extra sets of clothes, shoes, to offices or schools -move furniture and appliances upstairs before the rainy season -keep their refrigerators and furniture on wooden stilts -move their treasured items to relatives' homes in elevated places -park their cars on higher areas -buy boats as emergency transportation vehicles -dispose of garbage properly and clean their drainage canals -troop to nearby hotels to have uninterrupted power and water supply -work long hours after the flooding events -get loans from office, bank, friends and relatives -use their savings to cover flood losses -build second stories and added another floor or level to their dwelling structures -elevate the level of the first floor of their houses -spend P 40,000.00 to P 75,000.00 for filling materials to elevate their lots -sell their homes and buy a new house in a flood-free place

	-the homeowners' associations raised money to build flood walls around the villages
	-purchased boats steered by persons walking on floodwaters
	-planted trees and installed efficient garbage collection and disposal system
	-maintained pumps to draw out flood waters from their subdivision to adjoing places
	-collect an additional monthly contribution for pump maintenance and operator's salary
Urban poor in slums and squatter areas	-strengthen the house posts
	-stock up canned goods and candies
	-pack things ahead of time
	-stay calm, pray and exercise perseverance
	-use plastic water basins as buoys
	-use wide planks of wood as rafts to transport themselves and their few possessions
	-go to evacuation centers, if there are open ones
	-observe precautions on flooded streets to avoid open manholes
	-be extra careful so as not to be wounded by concealed sharp objects
	-avoid being electrocuted by exposed live wires
	-cut down food consumption and expenses on clothing, shelter and recreation
	-self-medicate and buy over-the-counter medication
	-work extra hours, if employment is available
	-cut their expenses
	-children stop going to school
	-all household members engage in any form of employment
Street children	-do not go to a clinic or see a doctor- they buy cold, diarrhea and fever medications from convenient stores
	-simply let their fever or sicknesses pass away
	-continue working, e.g. dust off the jeepney passengers' shoes even if one has fever
	-ride a jeepney and get off in a flood-free area to find temporary sleeping quarters
	-scavenge wood planks, big stones, or hollow blocks
	-build makeshift bridges between pavements of flooded alleys
	-collect coins from anyone who crosses the makeshift bridges
	-push flooded cars
	-wash one's body and clothes in flooded streets
	-dry soaked clothes by facing air conditioning units in the back if most buildings
	-hop to top of air conditioning units to keep warm and sleep there
	-stay for a night or two in the backyard of a flood-free apartment

Discussing local coping strategies and technologies for adaptation in the Philippines by presenting descriptive statistics, Tibig (2003) listed numerous coping mechanisms employed by some indigenous communities in response to natural disasters (Table 4). The study argued that among these indigenous communities, continued/sustained practice of these strategies is certain because the elders who constitute their councils are chosen on the basis of their perceived wisdom and credibility. The study also mentioned that the spirit of "Bayanihan" or community spirit and mutual assistance could be exploited to foster self-help and self-sufficiency.

Table 4: Coping Strategies of Some Indigenous Communities in the Philippines

Coping Strategies	Tribes Practicing
1. Forecasting and prediction techniques through indigenous ways (i.e. abnormal behavior of animals, appearance of clouds, etc.)	All
2. Early warning systems (use of horns, drums, etc.)	All
3. Storage/stock piling of food and emergency supplies	All
-subsisting on hunting wild plants and animals	6, 8
-preserving food to be stored through drying	8
-locating water sources in hills and mountains	7
4. Carefully choosing settlement sites (hazard mapping)	1, 2, 3, 9
-above rivers or in areas between opposing hills/mountains ensure typhoon winds are weakened	3, 9
-settling in upper parts of the mountains or hillsides or in the middle portion of the mountain	3, 9
5. Building flood-and-typhoon-resilient houses and/or strengthening houses, infrastructures	
-use of high and strong posts of houses	1, 5
-building houses close to the ground/over areas with stable foundation, with tapered roofs and tightly-closed windows	2
-building houses with stilts or wooden piles (towering 3 to 7 meters from the ground along slopes of mountains)	2, 4, 6
-building houses to take advantage of the countour of the terrain/situated near the sea/facing the direction which affords protection from frequent strong winds	2

-lessen the effects of wind loading by aligning windows directly	8

6. Easy mobility

-during floods, small boats called bancas are held ready and used/non-motorized modes of transport are also used	
-migration to higher grounds seeking refuge in caves, big trees, etc.	5, 6, 7, 8
-transfer to productive areas located deep into the mountains where water sources could be found	

7. Crisis adaptive agricultural practices

-planting of tree belts along farm boundaries as wind breakers	1
-pruning and cropping of fruit and flowering trees to lessen weight of trees	1
-multicropping and intercropping	1
-planting fields are usually located in high elevated and mountainous slopes	1, 2
-use of ditches/canals to divert rainwater away from their crops during rainy days	1, 2
-herding of cows/buffalos to the part of the hills where wind velocity is less	1
-speedy harvest of ready crops before the typhoon hits the area	3, 9
-use of drought-resistant crops/root crops only	6

8. Agricultural/engineering interventions and countermeasures

-construction of seawalls, embankments and more massive ripraps (usually a meter thick and 2-3 meters tall) as protection against storm surges/floods/to prevent water	1, 2, 7, 10
-planting trees in areas above carefully-chosen settlements	3, 9
-rainwater collection technique as used by tribes in Mindanao	10
-planting of trees along riverbanks and steep inclines	8
-declogging of waterways/riverflow (creeks, canals, etc.) of debris	7

9. Organizing themselves and through the "bayanihan" spirit, establish self-sufficiency efforts for a more profitable livelihood than farming or when farming becomes untenable   2, 5, 10

10. Setting up guiding principles by the tribe elders, specifically the empowerment of the tribes with primary right over the management of the ancestral domains together with tenured migrant settlers (i.e. sustainable harvesting of products, hunting only those destructive to crops, planting indigenous species, etc.)	8
11. Conservation of forest cover of the watersheds -woodlot forests ("Muyung") to prevent soil runoff and erosion -preserving mangroves growing at or near piers	2, 9
12. Preparing/implementing comprehensive land use plan to protect watersheds	2
13. Proper maintenance of the catchment areas and rational/proper utilization of all available natural resources	9
14. Organizing women of the tribes as a support group when natural disasters occur	9, 11

Note: 1- Ivatans, Ibanags, Bugkalots, 2- Tribes in the Cordillera (Igorots), 3- Mangyans, 4- B'laans, 5- Maguindanaos, 6- Subanens, 7- Mandayas/Mansakas, 8- T'bolis, 9- Maranaws. 10- Tausugs, 11- Samals and Yakans

Source: Tibig (2003)

Discussing the life experiences in the Philippines related to coping with natural disasters by conducting a review of literature, Bankoff (2007) mentioned that migration and relocation, as well as architectural syncretism and agricultural diversification, are important coping mechanisms of communities. The study also explained that following a natural disaster like the earthquake in Baguio in 1990, the affected households and neighborhoods immediately responded by sharing food, shelter, and transportation by operating communal kitchens, providing shelter to the homeless, and pooling available vehicles. Furthermore, the study mentioned that in the Philippines, the degree of interdependence, the need for cooperation, and for constructing strong social support networks are important coping mechanisms in cultures faced by continual environmental uncertainly. It suggested that western developed countries have as much to learn about disaster preparedness, management, and recovery from non-western countries as the latter do from the former.

Sawada et al. (2009) studied the coping mechanisms employed by households by conducting a survey of households in East Laguna Village, Laguna in response to Typhoon Milenyo in 2006. The study found that nonfarm employment played a very important role as a coping strategy (Table 5). It argued that nonfarm employment served as an effective insurance mechanism for rural households because non-farm income to a large extent was not affected by fluctuations in farm income. The study further found that aid from local government and non-governmental organizations (NGO) and reduced food consumption were important household

coping mechanism as well. The study, however, did not make specific recommendations related to its findings on coping mechanisms employed by households.

Table 5: Description of Household Coping Mechanisms, East Laguna Village, Philippines, 2006

Coping Mechanism	Farmer Households (%)	Landless Households (%)	Nonagricultural Households (%)
1. Reduce food consumption	27	76	47
1.1. Rice	0	15	8
1.2. Protein	5	27	13
1.3. Food taken outside	22	34	26
2. Switch consumption to own produce	12	34	22
3. Reduce child schooling	2	1	4
4. Reduce medical expenses	0	3	3
5. Sale of valuable items	0	4	6
6. Emergency borrowing	33	50	30
6.1. Bank	5	3	2
6.2. Relatives	12	13	10
6.3. Friends	3	7	3
6.4. Neighbors	0	6	0
6.5. Moneylender	10	6	5
6.6. Pawnshop	0	0	0
6.7. Sari-sari Store	3	15	10
7. Emigration	0	0	0
8. Received remittances	25	16	21

9. Aid from local government and NGO	46		65		58
10. Nonfarm employment	85		60		94

Source: Sawada (2009)

WFP (2009) studied the coping strategies that households in Regions I, CAR, II, II, NCR and IVA practiced in response to typhoons Ondoy and Pepeng. The study found that for all households in all regions, the more common consumption-related coping strategies adopted by the affected households were: eating less preferred food and buying food on credit which were used by more than 50 percent of the households (Table 6). The other consumption-related strategies employed by households were borrowing food from neighbors/friends, eating wild/gathered food, reducing meal portions, reducing number of meals by children, reducing number of meals by adults, skipping meals for the whole day, and sending family members outside for food. The study further found that the more common non-consumption related coping strategies employed the affected households was selling labor in advance and out-migration which were practiced by more than 15 percent of the households. The other non-consumption-related strategies cited were out-migration, taking children out of school, selling household assets for food, and selling agricultural assets for food. The study argued that since many households reported adopting several negative coping strategies in response to typhoons Ondoy and Pepeng, the establishment/strengthening of a community-based surveillance system could be an effective disaster preparedness and response tool.

Table 6: Consumption and Non-consumption Negative Coping Strategies adopted by Flood Affected Households (% of households)

Coping Strategies	Northern Regions (I, CAR, II)	Region III	NCR	Region IVA	Overall
Consumption Coping Strategies					
Eating less preferred food	42	95	94	82	79
Borrowing food from neighbors/friends	44	33	55	34	37
Buying food on credit	53	46	50	54	51
Eating wild/gathered food	45	39	10	21	33
Reducing meal portions	31	34	32	50	39
Reducing number of meals by children	4	10	33	16	12
Reducing number of meals by adults	13	45	46	35	34
Skipping meals for the whole day	7	20	26	13	15
Sending family members outside for food	3	2	15	9	5

Non-consumption Coping Strategies					
Out-migration	5.2	4.3	18.2	15.3	9.1
Selling labor in advance	18.5	2.4	26.3	23.4	15.1
Taking children out of school	2.2	0.5	10.6	10.7	5.7
Selling household assets for food	-	1	13.3	12.8	5.2
Selling agricultural assets for food	10.4	5.3	-	2.5	5.2

Source: WFP (2009)

Predo (2010) studied the adaptation and coping strategies of households which were affected by flooding and/or storm surge/sea level rise in selected municipalities in Southern Leyte in 2007. A household survey was conducted in selected sites among selected households using random sampling. Presenting descriptive statistics, the study found that majority of households (77.3%) has implemented adaptation measures to minimize the impacts of climate-related disasters (Table 7). Of these measures, the more common ones practiced by more than 35 percent of the households were to transfer to an evacuation area temporarily and to restructure the housing unit. The other measures used were to relocate residence to a safe place permanently, build stone breakwaters, improve dike system or canal near residence, change land use to fit new condition, change livelihood and sources of income, and prepare household needs and safety precautions.

Table 7: Adaptation Measures/Strategies being Implemented by Households to Minimize the Impacts of Climate-related Disasters, Leyte, Philippines, 2007

Item	Frequency	Percent
Household with Adaptation Measures		
Yes	109	77.3
No	32	22.7
Total	141	100
Adaptation Measure/Strategy		
Relocate residence to a safe place permanently	15	13.8
Transfer to an evacuation area temporarily	43	39.4
Restructure housing unit	41	37.6
Build stone breakwaters	17	15.6
Improve dike system or canal near residence	21	19.3
Change land use to fit new condition	3	2.8
Change livelihood and sources of income	5	4.6
Prepare household needs and safety precautions	14	12.8

The study further found that households employed coping mechanisms as an immediate response to climate-related disasters. Of these, the most common measure employed was to use family savings which was practiced by 41.8 percent of the households (Table 8). The other mechanisms employed were getting a loan from friends, relatives, and other persons; receiving support from government; getting a loan from money lender; own initiative (work/business); support from family/relatives; asked/received grants; sold livestock; sold land; and pawned land. Interestingly, 20.6 percent of the households did not employ any coping mechanism as an immediately response to climate-related disasters. The study explained that households and communities that have experienced climate-related disasters have implemented adaptation measures that were mostly adhoc and temporary in nature except in a few cases. It argued that since climate change-induced natural disasters are inevitable, there is a need for local government units and decision makers to identify the factors/measures and policy options that could improve the adaptive capacity of vulnerable households and communities in dealing with climate change impacts.

Table 8: Coping Strategy of Households from the Impacts of Climate-related Disasters, Leyte, Philippines, 2007

Coping Strategy	Frequency	Percent
Used family savings	59	41.8
Got a loan from friends, relatives, and other persons	18	12.8
Received support from government	10	7.1
Got a loan from money lender	9	6.4
Own initiative (work/business)	7	5
Support from family/relatives	5	3.5
Asked/received grants	5	3.5
Sold livestock	1	0.7
Sold land	1	0.7
Pawned land	1	0.7
None	29	20.6

Penalba and Elazequi (2011) analyzed the adaptive capacity of households and their experiences and adaptive behavior in dealing with the impacts of Typhoon Milenyo. The study used primary data generated from personal interviews of lowland and coastal households in two localities of Batangas. Results showed that the adaptation strategies of the households to deal with Typhoon Milenyo were mostly structural such as reinforcing their houses and household properties as well as behavioral such as securing food, water, and other household

needs including boats and livestock (Table 9). The results further showed that the awareness of households on climate change-related events has not been always translated to individual actions. This lack of action was not only because of the low adaptive capacity of households but also because of their attitude and perception of climate change-related problems and solutions, including the belief that extreme typhoon events such as Milenyo was a matter of fate over which they had little control. The study concluded that the lessons learned from the Typhoon Milenyo experience highlighted the importance of disaster preparedness among households. It suggested that since the multi-stakeholder nature of adaptation to climate change implies that the solution rests not on a single actor but on all affected sectors, policymakers need to be aware of the barriers to action, and treat policy options accordingly.

Table 9: Adaptation Strategies Adopted by Lowland and Coastal Households to Deal with Typhoon Milenyo

| Adaptation Strategy | Respondents/Ecozone | | | |
| | Lowland | | Coastal | |
	N	%	N	%
Behavioral				
Moved family members to safe place	60	30	56	28
Stayed in shelters and waited for the disaster to stop	136	68	154	77
Secured belongings (ships, boats, livestock, household items	94	47	77	38.5
Monitored typhoon warning signal	44	22	43	21.5
Stored food and water	121	60.5	130	65
Helped neighbors	12	6	5	2.5
Sought government assistance	20	10	10	5
Sought support from relatives	10	5	7	3.5
Structural				
Reinforced house	97	48.5	136	68
Repaired house and furniture	10	51	120	60
Repaired dykes/ponds	16	8	3	1.5
Technological				
Cut the trees around the house to prevent damage from falling branches	14	7	20	10
Financial				

Coping with financial shortage (withdrawing from savings, selling stocks, borrowing money)	1	0.5	5	2.5
Sold assets: gold, motorbike, land, livestock; sold means of production: seeds, cattles, machines	4	2	0	0

Source: Penalba and Elazequi (2011)

Porio (2011) studied the adaptation strategies of households located in the Pasig-Marikina River Basin and affected by the extreme flooding caused by Typhoons Ondoy and Pepeng in 2009. Using results of an interview of 200 households, the study narrated that most of the adaptation made by households can be categorized into physical-structural adjustments and changes in lifestyles and habits. Of the first, common measures used by households were adding a floor or raising the floor and strengthening the foundation of their homes, moving the storage of goods, valuables and irreplaceable goods to a higher level, preparing ready packed clothes/toiletries and emergency supplies, securing emergency evacuation place with relatives/friends, cleaning their surrounding canals/drainage channels for garbage/debris, and listening to the local early warning system installed by the local governments. Only a small minority of about 5 percent of the households asserted that they just prayed to God to protect them from natural disasters. Among the strategies that the study recommended to reduce the impact of natural disasters in Metro Manila were to strengthen community-based preparedness system for disasters and to strengthen/"climate proof" buildings and structures especially the infrastructure system in the area.

Francisco et al. (2011) studied the adaptation strategies and practices of households in response to extreme climate events in selected Asian countries including the Philippines using household surveys in these countries. Employing descriptive statistics, the study explained that there were four types of adaptation strategies practiced in the countries: behavioral, soft structural, technological, and financial. Of the behavioral adaptation strategies, preparing evacuation means was employed in Vietnam, China and Indonesia but by only a small percentage of households (Table 10). Evacuation to safer places was employed in all countries and more prevalently in China and Vietnam. Moving properties to safer places was used by all countries and more prominently in Thailand and the Philippines. Storing food, drinking water and other necessities was used by the countries particularly in the Philippines, Vietnam and China.

Table 10: Adaptation Strategies and Practices of Households in Selected Asian Countries

Adaptation Strategies	China (%)	Indonesia (%)	Philippines (%)	Thailand (%)	Viet-Nam (%)
A. Behavioral					
Preparing evacuation means	1	2	-	-	14
Evacuation to safer places	49	26	29	8.5	32

Moving properties to safer places	30	22	43	92	30
Storing food, drinking water and other Necessities	59	5	63	1	60
B. "Soft Structural"					
Repairing/ reconstructing houses using more durable materials or more resilient structures	69.0	46.0	51.5	-	51
Building mezzanine/ second floor	1.0	8.0.	-	2.5	9.0
Building scaffolds to protect household structures	-	-	-	24.5	48.5
Use of sandbags/ concrets blocks as dykes	-	4.0	-	55.5	9.0
Reinforcing ponds and dykes	2.0	2.0	1.0	-	25.0
C. Technological					
Changing cropping patterns	1.0	-	0.5	8.0	4.0
Installing pumping machines	-	10.0	-	-	9.0
Early warning system	20.0	4.0	14.6	55.0	27.0
D. Financial					
Diversifying income sources, borrowing money, etc.	46.0	12.0	2.0	-	18.0
Buying disaster insurance	-	-	-	-	-

Source: Francisco et al. (2011)

The study also found that of the soft structural strategies, repairing/ reconstructing houses using more durable materials or more resilient structures were used by more than 50 percent of the households in China, the Philippines, and Vietnam. Building mezzanine/second floor was employed by a small percentage of households and in not at all utilized in Philippines. Building scaffolds to protect household structures was employed only in Vietnam and Thailand and use of sandbags/ concrete blocks as dykes was practiced only in Thailand, Vietnam, and Indonesia. Reinforcing ponds and dikes as a strategy was employed in all countries except Thailand but only by a minority of the households.

The study further found that of the technological strategies, changing cropping patterns was practiced by only a minority of households in all countries except Indonesia. Installing pumping machines was used by a minority of households in Indonesia and Vietnam. Early warning system was utilized by all countries and particularly by a majority of households in Thailand. Moreover, the study found that of the financial strategies, diversifying income

sources, borrowing money, and others was employed by a minority of households in all countries except Thailand while buying disaster insurance was not practiced in any country.

In the case of the disaster insurance, however, the results of the study indicated that while households opted not to buy disaster insurance, a sizable number expressed interest in this strategy. The proportion of those willing to pay for insurance was 46 percent among the Chinese respondents, 37 percent among the Thai respondents, 33 percent among the Filipino respondents, and about 20 percent among respondents in rural Vietnam. Very few city resident respondents from Jakarta and Hanoi, however, were willing to pay for insurance.

The study further classified the adaptation practices undertaken by households in the face of extreme climate events into reactive and proactive measures. It defined reactive measures as actions that are done at the very last minute or when the event is already happening (e.g. evacuation). In contrast, it defined proactive measures as those coming from anticipating the event way in advance (e.g. relying and acting on early warnings). Thereafter, the study performed a multinomial logit regression analysis to determine the factors influencing a household's choice of proactive or reactive adaptation strategies related to climate extreme events using the "no adaptation" option as base category. The study explained that the generated parameter estimates of the model provided only the direction of the effect of the independent variables on the dependent (response) variable and not the magnitude of change of probability.

The results of the estimation of the aforementioned study showed that households with permanent type of houses (HTYPE), and more number of storeys in the houses (MSTOREY) have a higher probability of adopting proactive measures (Table 11). These variables are reflective of the higher economic status of the households, indicating that wealthier households would be more likely to take proactive adaptation measures. Households which have attended training in disaster preparedness in the last five years (TRAIN), have higher education (EDUC) and have larger household size also have a higher probability of adopting proactive measures as well as households in China (CHINA), the Philippines (PHIL) and Thailand (THAI). In contrast, results showed that households which asked for outside help (HELP) and households who perceived the risk of future climate change-induced events to become more serve than what was experienced have a lower probability of adopting proactive measures.

Table 11: The Marginal Effects of the Determinants of Household Adaptation Decisions

Independent Variables	No Adaptation Measure		Reactive Measures		Proactive Measures	
CONSTANT	-0.1768	***	0.9650	***	-0.7882	***
FREQD	0.0035		-0.0405		0.0369	
TKNOW	0.0050		-0.0264		0.0214	
HTYPE	0.0090		-0.1586	***	0.1496	***
MSTOREY	-0.0011		-0.0981	***	0.0992	***
TRAIN	0.0073		-0.1049	**	0.0976	**

29

HOWN	-0.0082		-0.0187		0.0269	
WEALTH	-0.0093		-0.0185		0.0279	
HHSIZE	-0.0035	**	0.0120	*	-0.0085	
EDUC	0.0012		-0.0168	***	0.0157	***
AGE	0.0009	***	-0.0020		0.0010	
NINFO	0.0074	***	-0.0597	***	0.0523	***
MEMORG	-0.0141	*	0.0392		-0.0252	
GROUP	-0.0014		0.0031		-0.0017	
STAY	0.0005	**	-0.0014		0.0009	
HELP	-0.0102		0.1139	***	-0.1037	***
FATE	0.0061		0.0452		-0.0513	
FUTURE	0.0037		0.0600	**	-0.0638	**
CHINA	-0.0216		-0.2183	***	0.2400	***
PHIL	0.0736	***	-0.3696	***	0.2960	***
THAI	0.0634	***	-0.5946	***	0.5312	***
Pseudo-R^2	0.2488					
Log likelihood function	-1046.6440					
Restricted log likelihood	-1393.3030					
Chi-squared	693.3190					
Prob[ChiSqd>X^2-value]	0.0000	***				
% Correct prediction	74.46					
No. of observations	1711					
Base category: No adaptation						

Note: ***,**,*= significant at 1%, 5% and 10% level, respectively
Source: Francisco et al. (2011)

The study concluded that financial constraints and lack of information about the occurrence of climate events limit the extent of climate change adaptation. Thus, it argued that government policies should ensure that households have access to adequate and timely information related to climate events. Furthermore, at the community level, it concluded that adaptation was hampered by the lack of cooperation among the various stakeholders and constituents, particularly in the urban areas. Therefore, government and non-government organizations should play a stronger role in strengthening community-based climate change adaptation action. Equally important, the study concluded that promoting collective action was likely to positively influence the buying of climate-related disaster insurance and should therefore be encouraged.

Mias-Mamonong and Flores (n.d.) studied the adaptation strategies of five urban-coastal villages in Sorsogon City, Sorsogon that are prone to floods and storm surges. Using FGD, the study asserted that communities cope with the impact of previous extreme events by employing the following: dependence on relief, loans from friends and relatives, doing minor

repairs through indigenous manners like tying their houses to what they believe are sturdy community posts, seeking support from micro-finance and loan sharks, and reducing expenses for food and other basic needs. The study also noted that disaster mitigation, preparedness and early recovery (livelihoods & restoration of houses) programming are increasingly becoming crucial part of the path of the communities towards safety and resiliency. The study asserted that mitigation as well as adaptation framework be mainstreamed in the local governance and development planning process.

In summary, past studies in the Philippines which touched on coping strategies employed by households due to natural disasters were also done in the last two decades (Table 12). Many of the studies also touched on the relationship between natural disasters and poverty. Most studies used descriptive statistics and descriptive analysis in the discussions. The exception is Francisco et al. (2011) which employed econometric analysis in addition to descriptive analysis as well as covered other countries in Asia. In general, the studies showed that households use various coping strategies in order to address the problems posed by natural disasters. Also in general, the studies proposed various recommendations to encourage the practice of appropriate coping strategies by households including the active participation of the national and local governments and other relevant sectors of society.

Table 12: Summary of Past Studies Related to Natural Disasters and Household Coping Strategies in the Philippines

Study	Methods Used	Type of statistics and analysis conducted	Important coping strategies-related finding	Important coping strategies-related recommendation
Zoleta-Nantes (2000)	Participant observation, intensive interviews, and case studies	Descriptive statistics and analysis	Because of their scarce resources, the residents of poor neighborhoods are able to practice a significantly narrower range of adjustment compared to residents of wealthier neighborhoods.	Specific urban groups have specific needs in times of calamities and that interventions should address these varying needs.
Tibig (2003)	Not mentioned	Descriptive statistics	Among the indigenous	The spirit of "Bayanihan" or community spirit and mutual

		and analysis	communities, continued/sustained practice of these strategies is certain because the elders who constitute their councils are chosen on the basis of their perceived wisdom and credibility.	assistance could be exploited to foster self-help and self-sufficiency.
Bankoff (2007)	Review of literature	Descriptive analysis and statistics	The degree of interdependence, the need for cooperation, and for constructing strong social support networks are important coping mechanisms in cultures faced by continual environmental uncertainly.	Western developed countries have as much to learn about disaster preparedness, management, and recovery from non-western countries as the latter do from the former.
Sawada et al. (2009)	Case study employing household survey of a village in Laguna province using a survey	Descriptive statistics and analysis	Nonfarm employment served as an effective insurance mechanism for rural households because non-farm income to a large extent was not affected by fluctuations in farm income	None
WFP	Survey of	Descriptive	The more	The

(2009)	households in affected regions	statistics and analysis	common consumption-related coping strategies adopted by the affected households were eating less preferred food and buying food on credit.	establishment/strengthening of a community-based surveillance system could be an effective disaster preparedness and response tool.
Predo (2010)	Survey of households in affected areas	Descriptive statistics and analysis	The most common coping measure employed was used family savings. About 20 percent of the households did not employ any coping mechanism.	There is a need for local government units and decision makers to identify the factors/measures and policy options that could improve the adaptive capacity of vulnerable households and communities in dealing with climate change impacts.
Penalba and Elazegui (2011)	Personal interviews of lowland and coastal households in two localities of Batangas	Descriptive statistics and analysis	Adaptation strategies of the households were mostly structural such as reinforcing their houses and household properties as well as behavioral such as securing food, water, and other household needs including boats and livestock.	Since the multi-stakeholder nature of adaptation to climate change implies that the solution rests not on a single actor but on all affected sectors, policymakers need to be aware of the barriers to action, and treat policy options accordingly.
Porio (2011)	Household interviews	Descriptive statistics and analysis	Most of the adaptation made by households can	Community-based preparedness system for disasters should be

			be categorized into physical-structural adjustments and changes in lifestyles and habits.	strengthened and buildings and structures should be "climate proofed".
Francisco et al. (2011)	Household interviews	Descriptive statistics and analysis, econometric analysis	Financial constraints and lack of information about the occurrence of climate events were found to limit the extent of climate change adaptation. At the community level, adaptation was hampered by the lack of cooperation among the various stakeholders and constituents. Promoting collective action was likely to positively influence the buying of climate-related disaster insurance.	Government policies should ensure that households have access to adequate and timely information related to climate events. Government and non-government organizations should thus play a stronger role in strengthening community-based climate change adaptation action. Collective action in buying of climate-related disaster insurance should be encouraged.
Mias-Mamonong and Flores (n.d.)	FGD in villages in Sorsogon City, Sorsogon	Descriptive statistics and analysis	Disaster mitigation, preparedness and early recovery programming are	Mitigation as well as adaptation framework be mainstreamed in the local governance and development planning process.

Periods	Laws	Agencies and their functions
		increasingly becoming crucial part of the path of the communities towards safety and resiliency.

IV. Disaster Risk Reduction and Management in the Philippines

4.1 Laws, institutions, and recent initiatives

The history of disaster risk management (DRM) in the Philippines began during the Commonwealth period with Executive Order 355 which created the Civilian Emergency Administration (CEA). Thereafter, other laws were passed and agencies were established for DRM in the country (Table 13).

Table 13: Periods, laws, agencies and their functions related to disaster risk management in the Philippines

Periods	Laws	Agencies and their functions
Commonwealth to Post-Commonwealth	Executive Order No. 335	This law created the Civilian Emergency Administration (CEA) which was tasked primarily through the National Emergency Commission (NEC) to formulate and execute policies and plans for the protection and welfare of the civilian population under extraordinary and emergency conditions.
Japanese Occupation	Executive Order No. 36	This law created the Civilian Protection Service (CPS) which was empowered to formulate and execute plans and policies for the protection of civilian population during air raids and other national emergencies.
1954-1968	Republic Act 1190, otherwise known as the Civil Defense Act of 1954	This law created the Civil Defense Administration (NCDA) which was tasked primarily to provide protection and welfare to the civilian population during war or other national emergencies of equally grave character. To support the NCDA in carrying out its mission, this law also provided for the

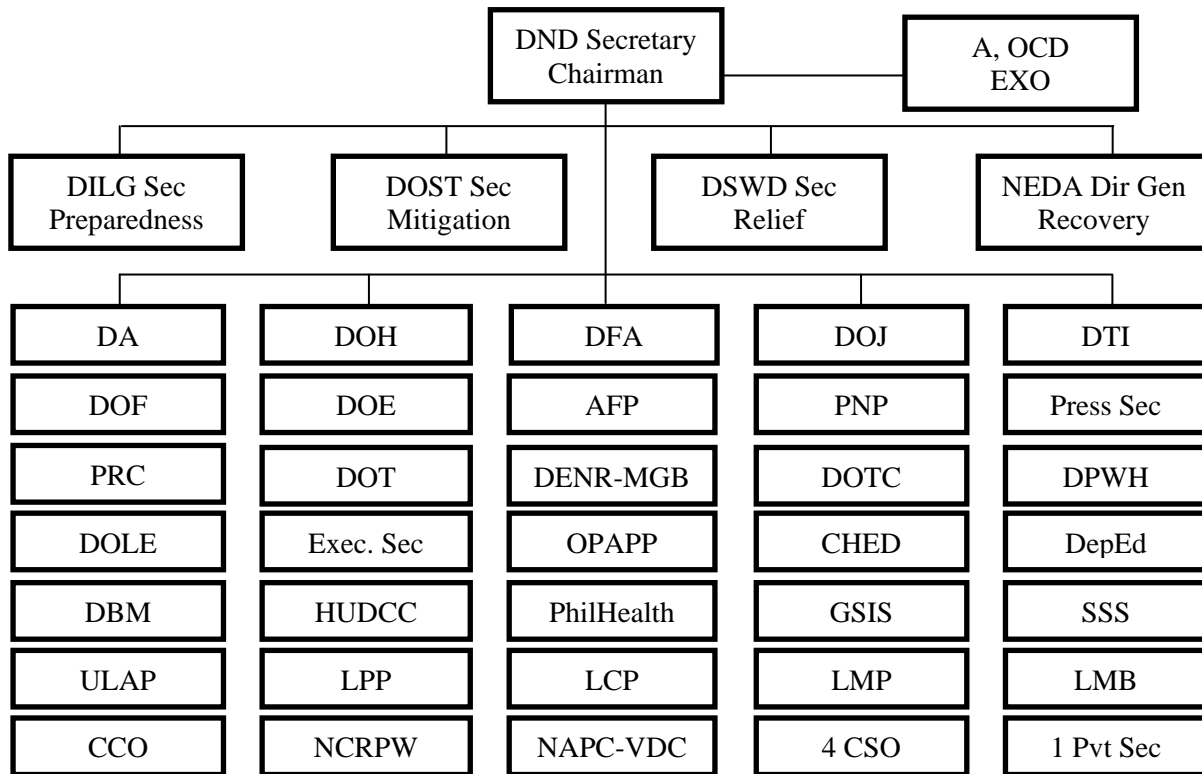|		establishment of civil defense councils at the national and local levels. namely: the
		National Civil Defense Council (NCDC) and the provincial, city and municipal civil defense councils, respectively.
1970s		In 1970 a disaster and Calamities Plan prepared by an Inter-Departmental Planning Group on Disasters and Calamities, was approved by the President. The Plan has provided, among others, the creation of a National Disaster Control Center (NDCC).
		In 1973, The Office of Civil Defense (OCD) was created with the mission of ensuring the protection and welfare of the people during disasters or emergencies.
	Presidential Decree 1566	This law was issued in 1978 to strengthen the Philippine disaster control capability and to establish a community disaster preparedness program nationwide. It also created the National Disaster Coordinating Council (NDCC) as the highest policy-making body for disasters in the country.
2000s		In February 2010, the NDCC was renamed, reorganized, and subsequently expanded into the National Disaster Risk Reduction & Management Council (NDRRMC), an agency responsible for ensuring the protection and welfare of the people during disasters or emergencies.
	Republic Act No. 10121 or the Philippine Disaster Risk Reduction and Management Act of 2010	This law acknowledges the need to adopt a disaster risk reduction and management approach that is holistic, comprehensive, integrated, and proactive in lessening the socio-economic and environmental impacts of disasters including climate change, and to promote the involvement and participation of all sectors and all stakeholders concerned, at all levels, especially the local community.

In 2010, the Republic Act (RA) 10121, otherwise referred to as the Philippine Disaster Risk Reduction and Management Act, was passed reconstituting the National Disaster Risk Reduction and Management Council (NDCC) into the National Disaster Risk Reduction and Management Council (NDRRMC). This agency is empowered with policy-making, coordination, integration, supervision, monitoring and evaluation functions related to disaster risk management. It is headed by the Secretary of the Department of National Defense (DND) as Chairperson with Secretaries of other selected departments as Vice Chairpersons. The organizational structure of the NDRRMC is shown in Figure 6.

In fulfillment of the requirement of RA 10121, the NDRRMC drafted the National Disaster Risk Reduction and Management Plan (NDRRMP). This plan is implemented by the NDRRMC through the Office of Civil Defense (OCD) and sets out goals and specific objectives for reducing disaster risks together with related actions to accomplish these objectives. The NDRRMP is in conformity with the National Disaster Risk Reduction and Management Framework (NDRRMF), which provides for a comprehensive, all hazards, multi-sectoral, inter-agency and community-based approach to disaster risk reduction and management in the Philippines (Figure 7). The vision of the framework is safer, adaptive and disaster-resilient Filipino communities towards sustainable development (NDRRMC 2011). Among others, it emphasizes that through time, resources invested in disaster prevention, mitigation, preparedness and climate change adaptation will be more effective towards attaining adaptive, disaster resilient and sustainable development.

The Philippine Congress also passed RA 9729 otherwise known as The Climate Change Act of 2009. This law aims to mainstream climate change into the formulation of government policy by setting up a National Framework Strategy and Program on Climate Change. It has also created the Climate Change Commission (CCC) which is tasked with the coordination, monitoring and evaluation of the programs and actions of the government in order to mitigate and adapt to the effects of climate change.

Other recent DRM-related initiatives have been conducted in the Philippines. On June 7 2010, Executive Order No. 888 was signed, adopting the Strategic National Action Plan (SNAP) for the years 2009 to 2019. The SNAP serves as the road map for the Philippines to strategically implement disaster risk reduction (DRR) programs and projects both at the national and local levels. Furthermore, the SNAP contains a strategy that focuses on safety and well-being enhancements that aims to increase capacity, reduce vulnerability, and achieve improved public safety and well-being and build resilience to disasters in the country. Administrative Order No. 1 Series of 2010 was also issued directing the local government units (LGUs) to adopt and use the DRR Guidelines to enhance natural disaster risk reduction efforts in the local development planning process. The National Economic and Development Authority (NEDA) is directed to conduct capacity-building activities for planning offices at local, regional and national levels towards DRR Guidelines. Moreover, the NDRRMC and the CCC have signed a Memorandum of Understanding (MOU) to harmonize the Local Climate Change Action Plans (LCCAP) and the Local Disaster Risk Reduction Management Plans (LDRRMP) by local government units (LGUs).

Figure 6: Organizational Structure of the National Disaster Risk Reduction and Management Council, Philippines

DND Secretary Chairman		A, OCD EXO

DILG Sec Preparedness	DOST Sec Mitigation	DSWD Sec Relief	NEDA Dir Gen Recovery

DA	DOH	DFA	DOJ	DTI
DOF	DOE	AFP	PNP	Press Sec
PRC	DOT	DENR-MGB	DOTC	DPWH
DOLE	Exec. Sec	OPAPP	CHED	DepEd
DBM	HUDCC	PhilHealth	GSIS	SSS
ULAP	LPP	LCP	LMP	LMB
CCO	NCRPW	NAPC-VDC	4 CSO	1 Pvt Sec

Notes: DND- Department of National Defense, OCD- Office of Civil Defense , DILG- Department of Interior and Local Government, DOST- Department of Science and Technology, DSWD- Department of Social Welfare and Development, NEDA- National Economic and Development Authority, DA- Department of Agriculture, DOH- Department of Health, DFA- Department of Foreign Affairs, DOJ- Department of Justice, DTI- Department of Trade and Industry, DOF- Department of Finance, DOE- Department of Energy, AFP- Armed Forces of the Philippines, PNP- Philippine National Police, PRC- Philippine Red Cross , DOT- Department of Tourism, DENR-MGB – Department of Environment and National Resources Mines and Geosciences Bureau, DOTC- Department of Transportation and Communications, DPWH- Department of Public Works and Highways, DOLE- Department of Labor and Employment, OPAPP- Office of the Presidential Adviser on the Peace Process, CHED- Commission on Higher Education, DepEd- Department of Education, DBM- Department of Budget and Management, HUDCC- Housing and Urban Development Coordinating Council, GSIS- Government Service Insurance System, SSS- Social Security System, ULAP- Union of Local Authorities in the Philippines, LPP- League of Provinces of the Philippines, LCP- League of Cities of the Philippines, LMP- League of Municipalities of the Philippines, LMB- Liga ng Mga Barangay, CCO- Climate Change Office, NCRPW- National Commission on the Role of Filipino Women, NAPC-VDC- National Anti-Poverty Commission Victims of Disasters and Calamities Sector
Source: NDRRMC

Figure 7: Philippine Disaster Risk Reduction and Management Framework
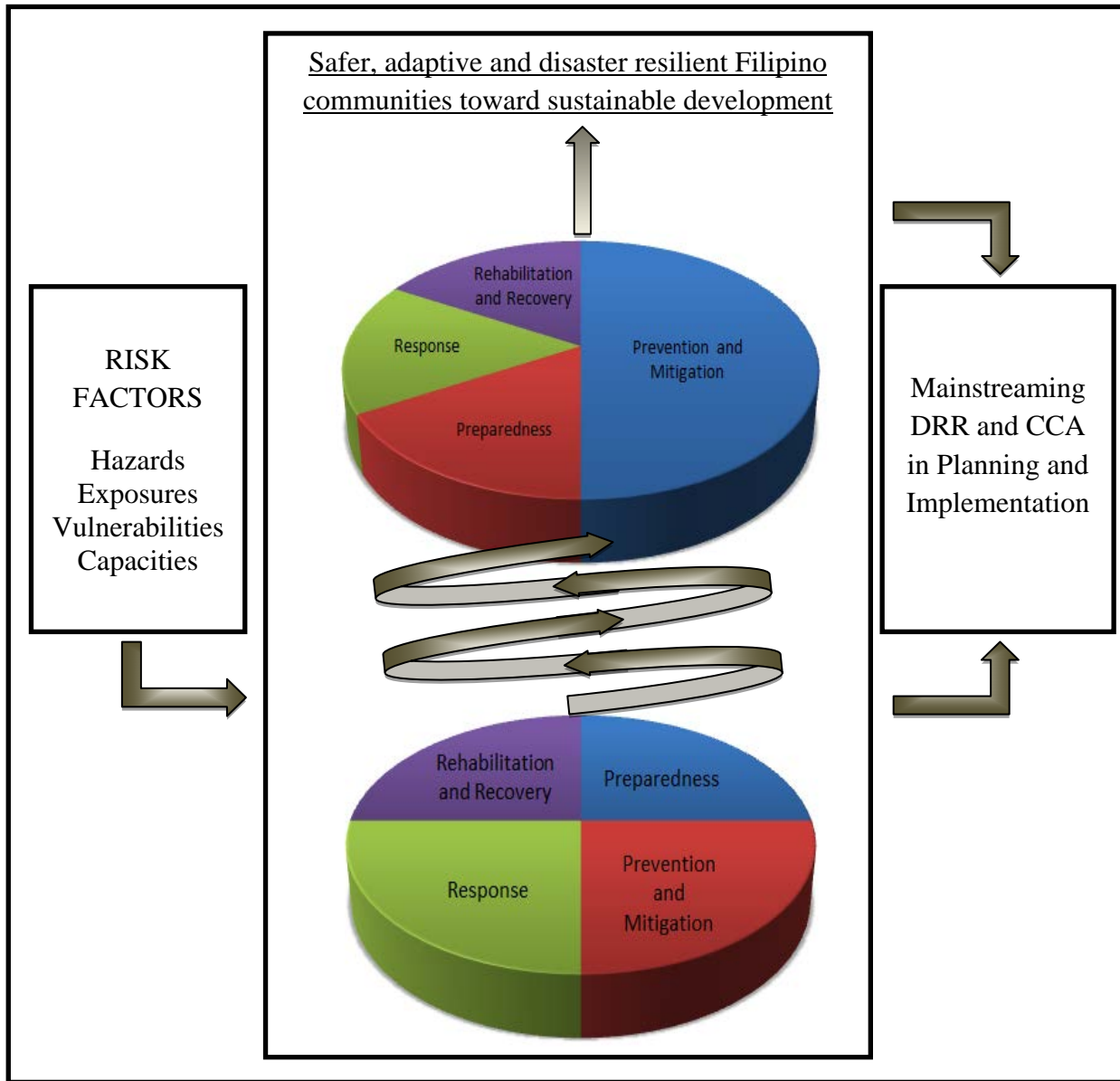
Source: NDRRMC (2011)

4.2 Regional participation in disaster risk management

At the level of the Association of Southeast Asian Nations (ASEAN), the Philippine Senate ratified the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) in September 2009. AADMER binds member states together to promote regional cooperation and collaboration in reducing disaster losses and intensifying joint emergency response to disasters in the ASEAN region. It contains provisions on disaster risk identification, monitoring and early warning systems, prevention and mitigation, preparedness and response, rehabilitation, technical cooperation and research, mechanisms for coordination, simplified customs and immigration.

The Philippines is also an active member of the ASEAN Committee on Disaster Management (ACDM). At present, the regional cooperation is underway to fully establish an operational ASEAN Coordinating Centre for Humanitarian Assistance in disaster management (AHA Centre), as mandated by AADMER. Simultaneously, under the AADMER Work Programme 2010-2015, regional systems for risk identification and assessment, early warning, and monitoring systems are in the process of being established by the ACDM. Furthermore, the PAGASA has collaborated with the Asian Disaster Preparedness Center (ADPC) and Regional Integrated Multi-Hazard Early warning System for Africa and Asia (RIMES) as well as with neighboring countries with respect to typhoon monitoring. The Philippine Institute of Volcanology and Seismology (PHIVOLCS) is also already a part of the tsunami warning system for the Pacific region.

5.3 Constraints and issues facing disaster risk management

The following are the constraints and issues facing the DRM in the Philippines as identified by the government (NDRRMC 2011): a) ineffective vertical and horizontal coordination among its member agencies; b) existing DRM efforts of governmental and partner organizations are still limited in coverage due to limited available resources; c) ineffective institutional capacities of LGUs such as the lack of managerial and technical competencies; d) limited funds, equipment and facilities for monitoring and early warning; e) Insufficient hazard and disaster risk data and information; f) inadequate mainstreaming of DRM in development planning and implementation; g) poor enforcement of environmental management laws and regulations, and other relevant regulations; and h) inadequate socioeconomic and environmental management programs to reduce the vulnerability of marginalized communities. Overall, the current state of the DRM in the Philippines has been rated as low to very low in the ladder of accomplishments and progress in implementation.

V. Evidence from Present Study

5.1 Natural disasters and household poverty

5.1.1 Background of CBMS

As mentioned earlier, the CBMS Household Profile Survey has gathered some natural disaster-related data and information. In light of the lack of useful data from the national household surveys conducted by the government, particularly the Family Income and Expenditure Survey (FIES) and the Annual Poverty Indicators Survey (APIS), CBMS data and information was chosen for use in the study (The option of conducting a household survey to gather primary data for this work was considered impractical given the limited time and resources available).

CBMS is an organized way of collecting information at the local level for use of local government units, national government agencies, non-government organizations, and civil society for planning, program implementation, and monitoring (Reyes n.d.). It is conducted regularly every three years, with 2011 as the latest year, and through complete enumeration of households (although in some urban areas, households in condominiums and gated subdivisions were not covered). Among the key indicators the CBMS monitors are health, nutrition, shelter,

water and sanitation, basic education, income, employment, and peace and order. The 2011 survey gathered data and information that can be used to measure the occurrence and intensity of the effects of natural disasters on households. The CBMS covers selected sites all over the country and formal permission from the CBMS management and concerned local government of any site has to be granted before data and information specific to a site can be used.

In the National Capital Region, Pasay City and Valenzuela City were covered by the 2011 CBMS survey. For this study, the results of the 2011 CBMS survey for Pasay City were utilized because early permission from the Pasay City government was granted while permission from the other local governments was not generated in time for the conduct of this study. It should be noted that the use of Pasay City as case study was considered appropriate for an analysis of the interactions between natural disasters and poverty in an urban environment only.

5.1.2 Background of Pasay City

Pasay City has a total land area of 18.50 square kilometers and is located southwest of the NCR (Figure 8). It is bordered by the City of Manila to the north, Parañaque City to the south, Makati City and municipality of Taguig to the northeast, and Manila Bay to the west. Pasay City is composed of seven districts, divided into twenty Zones, with a total of 201 Barangays. Zone 19, covering Barangays 178 and 191, is the largest among the zones with an area of 5.10 square kilometers. Zone 1, on the other hand, covering Barangays 1 to 3 and 14 to 17, is the smallest with an area of only 100,000 square meters. Based on NSO (2011), Pasay City has a population of 403,064 people and population density of 21,787 persons per square kilometer in 2007.

There are different explanations about the origin of the name of Pasay City but the one given the most historical acceptance is that it was named after a princess of the Namayan Kingdom, Dayang-dayang Pasay. The Namayan kingdom is the confederation of barangays, which began to peak in the year 1175. Its land coverage stretched from Manila Bay to Laguna de Bay now comprising the territories of Culi-culi, Pasay and Baclaran. The royal capital of the kingdom was built in Sapa, known today as Santa Ana.

5.1.3 Background on typhoons and floods

Typhoons and floods are the two specific natural disaster events considered by the study. While the CBMS data also contained information on other natural calamities particularly droughts, earthquakes, volcanic eruption, landslide, tsunami, and forest fire, their effects are considered absent or minimal in Pasay City. According to the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) which is the institution that provides meteorological, astronomical, climatological, and other specialized data and information and services, a typhoon is defined as a tropical cyclone with winds that exceed 118 kilometers per hour that occurs in the Western Pacific (Israel 2012). A flood is defined as an abnormal progressive rise in the water level of a stream that may result in the overflowing by the water of the normal confines of the stream with the subsequent inundation of areas which are not normally submerged.

Typhoons and their associated hazards, such as strong winds, storm surges, and floods pass the Philippine Area of Responsibility (PAR) from 17 to 20 times every year (PCG n.d., Israel 2012). They happen most often during the months of May to December with peak occurrences in the month of November. Some of the typhoons passing the country directly hit or significantly affect Metro Manila including Pasay City on an annual basis. In times of strong typhoons, residential areas, infrastructure, power systems, and other utility installations in Metro Manila and Pasay City experience heavy damages, some of which took months to rehabilitate.

As in the case of typhoons, floods due to typhoons and storm surges oftentimes occur in Metro Manila including in Pasay City (PCG 2012). The flood hazard maps of Metro Manila and Pasay City are shown below (Figures 9 and 10). While inundations affect all of Metro Manila, some areas are more vulnerable than others (Bankoff n.d.). About 20 percent of the capital is designated as flood-prone, with areas to the east, southeast and south, especially those adjacent to Laguna de Bay, acutely susceptible to flooding. In Pasay City, in particular, flooding is generally concentrated along Taft Avenue and the areas along the Estero de Tripa de Gallina and Maricaban Creek (PCG n.d.). Besides natural factors, other aspects that tend to aggravate the flooding problems in Metro Manila and Pasay City among others are the following: a) infrastructure development leading to the creation of more impervious areas, resulting to higher peak run-offs that usually cause standing floods; b) inadequate or non-existent drainage system; c) improper solid waste disposal that leads to the clogging of drainage systems, further lowering their water retaining capacity; d) heavy siltation of rivers due to previous floods, indiscriminate dumping of garbage, encroachment of squatters and slum dwellers, and limited maintenance works; and e) institutional problems and financial constraints which delay the implementation of proper flood control measures.

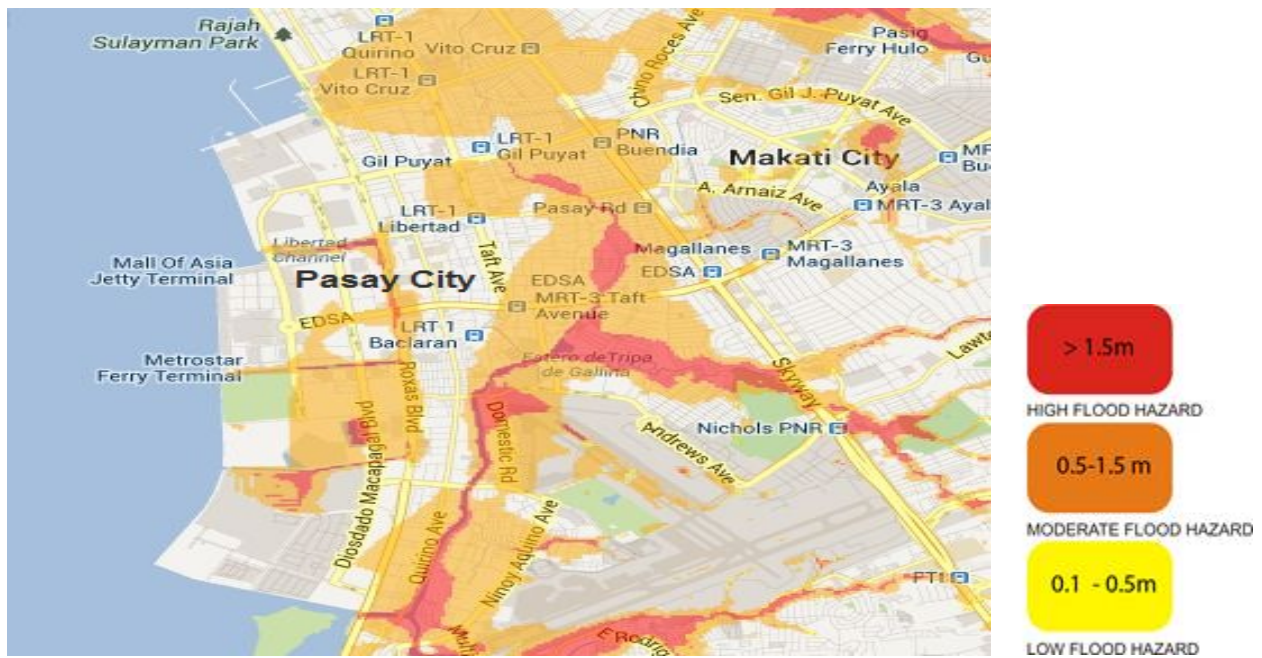**Figure 8: Map of Metro Manila with Pasay City Highlighted**

Source: https://maps.google.com

Figure 9: Flood Hazard Map of Metro Manila
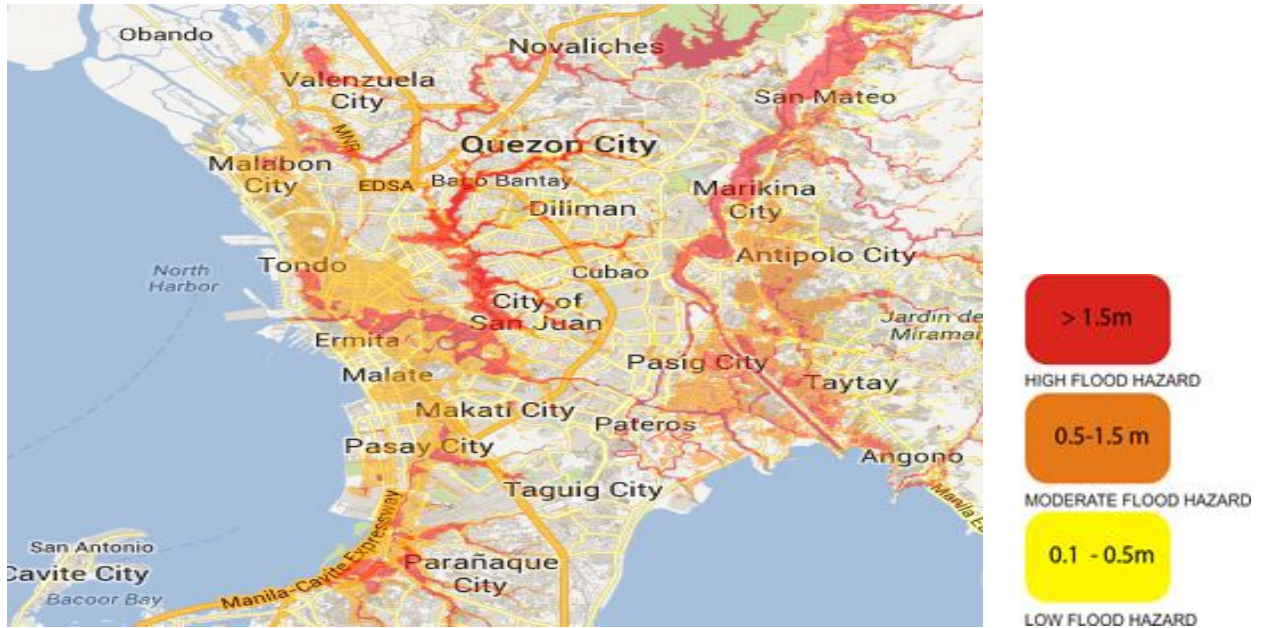
Source: Philippine Flood Hazard Map- National Institute of Geological Sciences, UP Diliman
http://nababaha.appspot.com/static/flood/manila.html

Figure 10: Flood Hazard Map of Pasay City

Source: Philippine Flood Hazard Map- National Institute of Geological Sciences, UP Diliman
http://nababaha.appspot.com/static/flood/manila.html

5.1.4 Background on household poverty in Pasay City

On household poverty in Pasay City, based on CBMS data for 2008-2009, the percentage of households with income below the poverty threshold was 10.4 percent while the percentage of households with income below the food threshold was 4.5 percent. The maps of Pasay City showing the proportion of households with income below the poverty and food thresholds by barangay for 2008-2009 are provided below (Figures 11 and 12). The maps show that the areas in Pasay City where the percent of the population are below the poverty and food thresholds are highest (colored red), are scattered in the north central part of the city. Furthermore, they show that some areas have the highest population below both the poverty and food thresholds. For other important poverty indicators directly related to natural disasters, among others, the proportion of the households in Pasay city that were living in makeshift housing was estimated by CBMS at 4 percent in 2009-2009 while the proportion of households that were informal settlers was at 4.4 percent.

5.1.5 Background on data used for present study

The descriptive statistics of the 70,326 households covered in the 2011 CBMS dataset for Pasay City are provided below (Table 14). Of the households in the city, approximately 11 percent were poor while about 89 percent were non-poor. About 9 percent were affected by typhoons only, 2 percent were affected by flood only, 17 percent were affected by both typhoon and flood, and 71 percent were not affected at all by typhoon and/or flood. Among the poor households, about 14 percent were affected by typhoons only, 3 percent were affected by flood only, 29 percent were affected by both typhoon and flood, and 54 percent were not affected at all by typhoon and/or flood.

### 5.1.6 Description of estimation done for present study

The following equations are estimated for this study using the Pasay City, Philippines CBMS data for 2011 and assuming household per capital income as the measure of household welfare:

$$LnINCOME_i = a_0 + a_1 SEX_i + a_2 LnAGE_i + a_3 STATUS_i + a_4 LnEDUCATION_i + a_5 LnSIZE_i$$
$$+ a_6 OFW_i + a_7 PROGRAM_i + a_8 CALAMITY_i + e_i$$

and

$$LnINCOME_i = a_0 + a_1 SEX_i + a_2 LnAGE_i + a_3 STATUS_i + a_4 LnEDUCATION_i + a_5 LnSIZE_i$$
$$+ a_6 OFW_i + a_7 PROGRAM_i + a_8 CALAMITY1_i + e_i$$

Figure 11: Map of Pasay City Showing the Proportion of Households with Income below the Poverty Threshold, by Barangay, 2008-2009
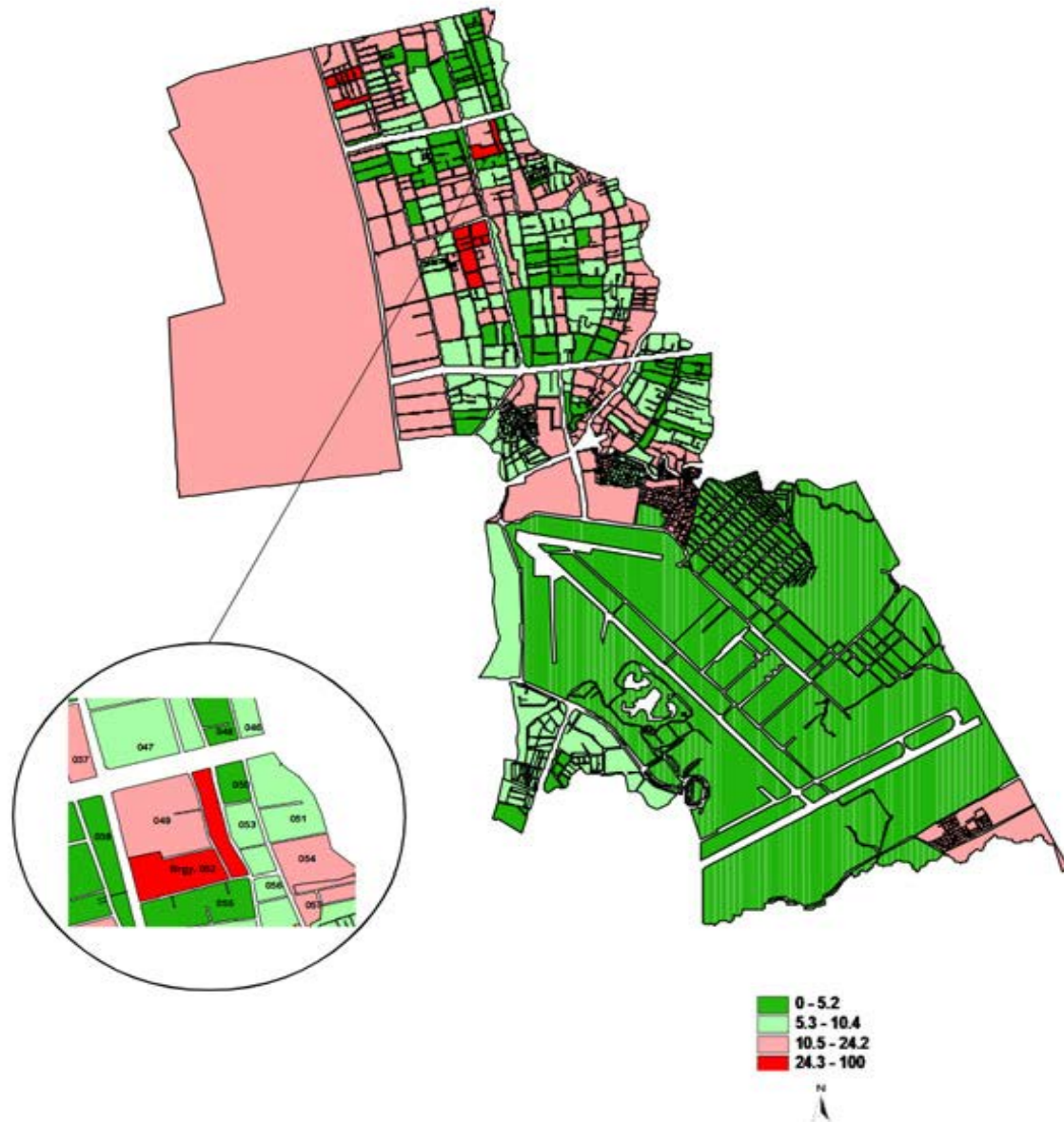
Note: The colors show the proportion of households with income below the poverty threshold with red indicating the highest proportion. The annual poverty threshold for 2008 was P18,816 and for 2009 was P19,802 for Pasay City.
Source: CBMS

Figure 12: Map of Pasay City Showing the Proportion of Households in Pasay City with Income below the Food Threshold, by Barangay, 2008-2009
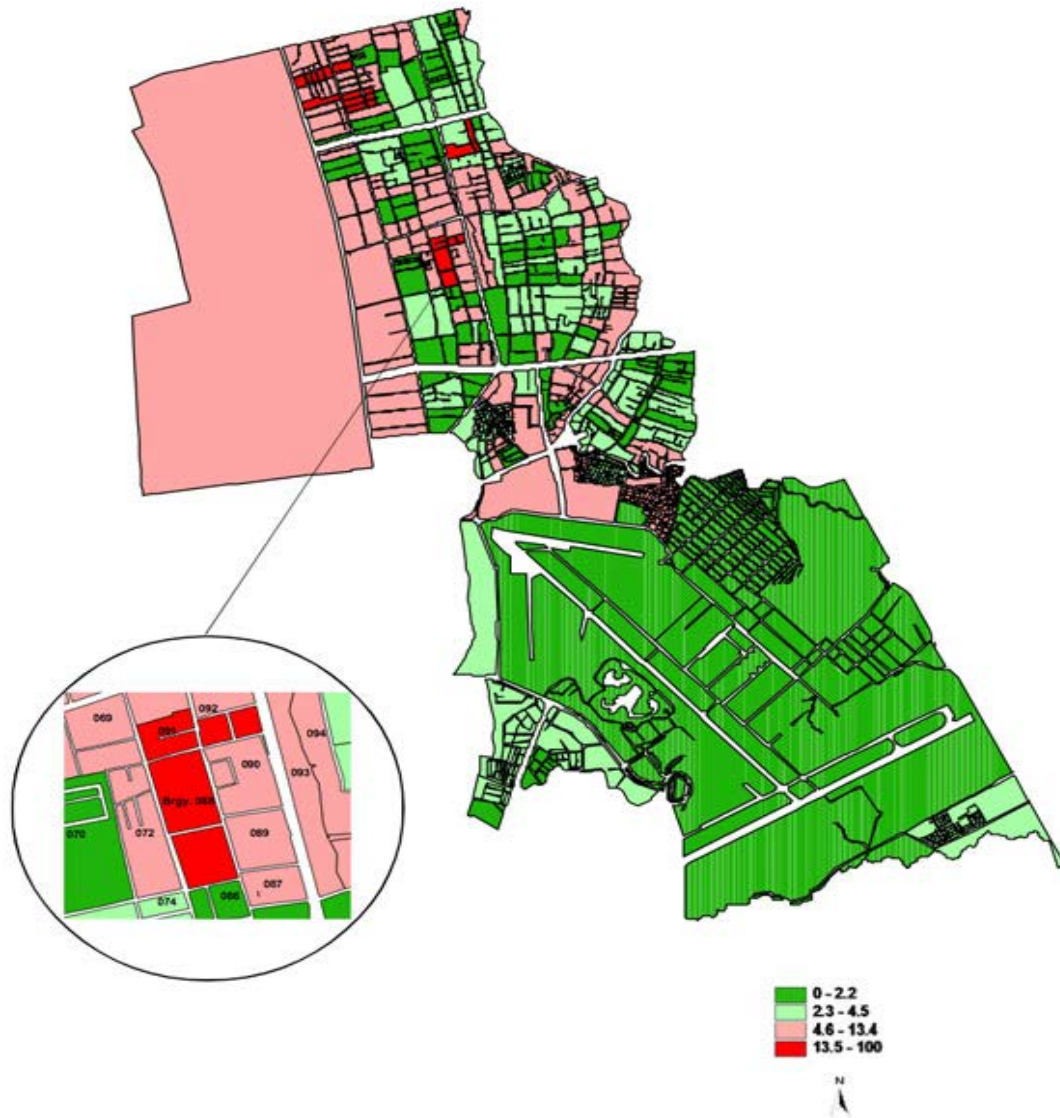
Note: The colors show the proportion of households with income below the food threshold with red indicating the highest proportion. The annual food threshold for 2008 was P18,816 and for 2009 was P19,802 for Pasay City.
Source: CBMS

Table 14: Descriptive Statistics for poor, non-poor and all households based on data used for this study

Variable	Frequency	Percent
Poor households	7,708	10.96
Non-poor households	62,618	89.04
Total	70,326	10.96
Households affected by typhoon only	6,630	9.43
Households affected by flood only	1,597	2.27
households affected by typhoon and flood	12,044	17.13
households not affected at all	50,055	71.18
Total	70,326	100.00
Poor Households affected by typhoon only	1,058	13.73
Poor Households affected by flood only	215	2.79
Poor households affected by typhoon and flood	2,266	29.40
Poor households not affected at all	4,169	54.09
Total	7,708	100.00

Note: The annual poverty threshold for 2010 was P20,151 and for 2011 was P20,856 for Pasay City.

where a_0 is the intercept, a_1 to a_8 are coefficients, e_i is the error term and the variables are as defined below (Table 15). The above equations show the natural logarithm for INCOME as the dependent variable where INCOME is measured as household annual income in pesos divided by the number of household members. The independent socioeconomic and demographic variables are either the natural logarithms or dummies for SEX, AGE, STATUS, EDUCATION, SIZE, OFW, and PROGRAM whose individual measurements are also explained below. In addition, there are two independent natural disaster variables individually considered in the estimation. The first is the dummy for CALAMITY which represents the occurrence of the household being affected or not by typhoon and/or flood and CALAMITY1 which represents the frequency or number of times the household is being affected by typhoon and/or flood (Note that CALAMITY1 is set to a ceiling value of 3 when number of calamities is greater than or equal to 3.). The choice of income as the dependent variable is based on the framework presented earlier in Figure 2. According to de la Fuente et al. (2009), consumption is the preferred welfare measure employed by poverty studies. However, consumption is not used here due to lack of appropriate data from the CBMS survey.

Table 15: Description of variables used in the estimation

Variable	Definitions
INCOME	Household per capita income (total household annual income in pesos/number of household members)
SEX	Sex of household head (1 if male, 0 if female)
AGE	Age of household head (years)
STATUS	Civil status of household head (1 if married, 0 otherwise)
EDUCATION	Educational attainment of household head (years of schooling)
SIZE	Household size (number of individuals)
OFW	Overseas Filipino Worker (OFW) cash remittance (1 if received OFW cash remittance, 0 otherwise)
PROGRAM	Recipient of a government program (1 if household is recipient of a government program, 0 otherwise)[a]
CALAMITY	Calamity (1 if household was affected by typhoon or flood during the past twelve months, 0 otherwise)
CALAMITY1	Discrete index of disaster frequency (0 if household was not affected by typhoon or flood during the past twelve months, 1 if affected once by typhoon or flood, 2 if affected twice by typhoon and/or flood, 3 if affected more than twice by typhoon and/or flood

Note: The government programs are: Pantawid Pamilyang Pilipino Program; NFA Rice; Comprehensive Agrarian Reform Program; Food for School; Food for Work; Self Employment Assistance – Kaunlaran; Day Care; Philhealth; and Others.

The descriptive statistics of the variables considered in the estimation are provided below (Table 16).The average annual income of the households covered by the estimation was P96,509.34; 76 percent of the household heads were male; the average age of the household heads was 42.88 years; 51 percent of the household heads were married; the average number of years of schooling of the household heads was 10.93 years; the average household size was 3.85 members; 3 percent of the households received OFW cash remittance; 49 percent of the households were recipients of a government program; and 29 percent of the households were affected by typhoon and/or flood in the last twelve months. Furthermore, of the households, 71 percent were not affected by typhoon and/or flood; 5 percent were affected once by typhoon and/or flood; 7 percent were affected twice by typhoon and/or flood; and 17 percent were affected more than twice by typhoon and/or flood.

Table 16: Descriptive statistics of variables used in the estimation

Variable	Mean	Standard Deviation
INCOME	96,509.34	57,009.30
SEX	0.76	0.42
AGE	42.88	14.46
STATUS	0.51	0.50
EDUCATION	10.93	2.76
SIZE	3.85	2.03
OFW	0.03	0.18
PROGRAM	0.49	0.50
CALAMITY	0.29	0.45

Note: The number of household observations is 70,326.

In the estimation, the coefficient of SEX is expected to be positive and significant indicating that households with male heads have higher per capita incomes; the coefficient of AGE is expected positive and significant indicating that households with older heads have higher per capita incomes; the coefficient of STATUS is expected to be positive and significant indicating that households with married heads have higher per capita incomes; the coefficient of EDUCATION is expected to be positive and significant indicating that households with higher education heads have higher per capita incomes; the coefficient of SIZE is expected to be negative and significant indicating that households with larger sizes have lower per capita incomes; the coefficient of OFW is expected to be positive and significant indicating that households that received OFW cash remittance have higher per capita incomes; the coefficient of PROGRAM is expected to be positive and significant indicating that households that were recipients of a government program have higher per capita incomes; the coefficient of CALAMITY is expected to be negative and significant indicating that households that were affected by typhoon and/or flood in the last twelve months have lower per capita incomes than those that were not; and finally, the coefficient of CALAMITY1 is expected to be negative and significant indicating that the households that were affected by typhoon and/or flood more often in the last twelve months have lower per capita incomes than those that were not or less often affected.

5.1.7 Results of estimation

The regression results using CALAMITY as the natural disaster variable are presented below (Table 17, first three columns). All the coefficients of the independent variables are of the expected signs and levels of significance, except that for SEX (Contrary to what is expected, the coefficient for SEX is negative and significant. A possible explanation for this is that male-headed households have larger household sizes compared to female-headed households and therefore have lower per capita incomes). The adjusted R-squared is 0.178 which is low but is expected in cross-section data. In particular, the results of the regression for the natural disaster variable CALAMITY indicates that the households that were affected by typhoon/flood in the

last twelve months will tend to have annual per capita incomes which are significantly lower (by 6.72%) than those households which were not affected.

Table 17: Regression Results Using OLS and Hubert-White Estimator (with CALAMITY as Independent Variable)

Independent Variables	Coefficient, OLS	t-value, OLS	Prob > t, OLS	t-value, robust	Prob > t, Robust
SEX	-0.0413	-4.42**	0.0000	-4.18**	0.0000
Ln AGE	0.4346	38.67**	0.0000	37.29**	0.0000
STATUS	0.1044	12.31**	0.0000	12.22**	0.0000
Ln EDUCATION	0.6499	55.7**	0.0000	42.80**	0.0000
Ln SIZE	-0.6435	-98.29**	0.0000	-90.41**	0.0000
OFW	0.3975	19.71**	0.0000	22.98**	0.0000
PROGRAM	0.2121	29.55**	0.0000	29.80**	0.0000
CALAMITY	-0.0672	-8.67**	0.0000	-9.01**	0.0000
Constant	8.2707	151.62**	0.0000	135.04**	0.0000

Note: Prob > F = 0.00; N^o observations = 70,326; adjusted R-squared is 0.178; Cook-Weisberg test of heteroscedasticity yields Prob > χ^2 = 0.00; t-value significance at 5% level is denoted by *; significance at 1% level denoted by **.

Furthermore, given that the cross-section nature of the data, one may suspect that homoscedasticity of the error term need not hold. The Cook-Weisberg test rejects the null of homoscedastic error term at 1% significance level. Therefore, standard errors were re-estimated with the same coefficient values applying the Hubert-White correction. The t-values consistent with the robust standard errors are reported in Table 5 (last two columns). The corrected t-values remain statistically significant at low probability thresholds for α.

The regression results using CALAMITY1 as the natural disaster variable are presented below (Table 18). Results are similar to those obtained in Table 17 using CALAMITY as the natural disaster variable. In particular, CALAMITY1 also has the expected sign and is statistically significant, even with robust standard error (which is preferred as homoscedasticity is rejected at 5% level of significance). The coefficient value implies that each increment in the CALAMITY1 index reduces per capita household income by about 2.18%. In general, the results indicate that the households that were affected more often by typhoon/flood in the last twelve months will tend to have annual per capita incomes which are significantly lower than those households which were less often affected or not affected at all.

Table 18: Regression Results Using OLS and Hubert-White Estimator (with CALAMITY1 as Independent Variable)

Independent Variables	Coefficient, OLS	t-value, OLS	Prob > t, OLS	t-value, robust	Prob > t, Robust
SEX	-0.0417	-4.46[**]	0.000	-4.22[**]	0.000
Ln AGE	0.4342	38.63[**]	0.000	37.24[**]	0.000
STATUS	0.1046	12.33[**]	0.000	12.24[**]	0.000
Ln EDUCATION	0.6500	55.69[**]	0.000	42.81[**]	0.000
Ln SIZE	-0.6442	-98.39[**]	0.000	-90.49[**]	0.000
OFW	0.3972	19.69[**]	0.000	22.97[**]	0.000
PROGRAM	0.2118	29.51[**]	0.000	29.76[**]	0.000
CALAMITY1	-0.0218	-7.21[**]	0.000	-7.89[**]	0.000
Constant	8.2689	151.55[**]	0.000	135.04[**]	0.000

Note: Prob > F = 0.00; N^o observations = 70,326; adjusted R-squared is 0.178; Cook-Weisberg test of heteroscedasticity yields Prob > χ^2 = 0.00; t-value significance at 5% level is denoted by [*]; significance at 1% level denoted by [**].

5.2 Natural disasters and coping strategies

The 2011 CBMS household survey asked questions on whether or not the households moved out/left their previous dwelling because of any calamity during the past three years and whether they have a disaster preparedness kit. Responses to these questions could have been useful in an analysis of coping strategies employed by households in Pasay City in response to natural disasters. The actual households that responded to the questions, however, were minimal in number and thus, an analysis of the coping mechanisms was not conducted for this study. This limitation is considered not important since there are already a good number of studies in the Philippines on coping mechanisms.

VI. Summary, Conclusion and Recommendations

6.1 Summary and Conclusion

This study investigated the interactions between natural disasters and household poverty and reviewed the coping strategies used by households in response to natural disasters in the Philippines. It used data from the 2011 CBMS Household Profile Survey for Pasay City, Metro Manila and past studies already done on these issues in the Philippines. The study found that a) there are existing analytical frameworks for the study of the interactions between natural disasters, household poverty and household coping strategies; b) some empirical studies have been done in the Philippines analyzing the aforementioned interactions; c) relevant past studies generally point to the negative effect of natural disasters on household income and subsequently on household poverty; and d) past studies also showed that households practice several coping mechanisms to address the effects of natural disasters. Furthermore, based on own estimation

done, the study found that the occurrence and frequency of typhoons and/or floods in Pasay City, Metro Manila have significant and negative effects on household per capita income. Based on these results and findings, the study concludes that for Pasay City and other similarly situated urban areas in the country, natural disasters particularly typhoons and floods have a negative impact on household income and consequently worsen poverty among poor households. This conclusion supports the findings of previous works which were reviewed earlier by the study.

6.2 Recommendations

A major limitation of the study is that it is only a case study using cross-section data of households in Pasay City. If and when permission for the use of additional CBMS data can be had from the CBMS and concerned local governments, comparative studies between households in different sites (e.g. urban and rural areas) and other types of households (e.g. informal settlers versus other settlers, agricultural households versus other households, etc.) can be conducted. In the medium term, a combined cross-section and time-series analysis study can also be conducted when enough data and information are available from CBMS or other sources. Furthemore, an analysis of the reverse impact of household poverty on the occurrence and intensity of natural disasters can be done.

Outside of CBMS, the collection of natural disaster-related data and information by the standard national household surveys in the Philippines, particular FIES and APIS, should be seriously considered by concerned agencies. This move would greatly facilitate the conduct of future studies on the impact of natural disasters on households and provide a more complete understanding of the financial, economic, social, demographic and other household relevant effects of these disasters. Another alternative data source in the future is to conduct a household survey in natural disaster-affected areas to collect primary data for an analysis of the impact of natural disasters on household poverty.

In addition, it should be emphasized that the use in this study of household income as the variable of interest affected by natural disasters is necessitated by available data. In future studies, when appropriate data and information are already available, other poverty-related variables can be examined including household consumption, education, health and nutrition-related variables. Last but not least, future studies can be done that will relate natural disasters not just on household poverty per se but on other poverty-related issues such as household food sufficiency and household food security as well as gender and indigenous people-related concerns. These topics are starting to gain interest in natural disaster research but actual work has been very limited so far. A research shift towards these issues would enhance the interests not just of households in in general but of disadvantaged households groups in the Philippines in particular.

References

Antilla-Hughes and S. M. Shiang. 2013. Destruction, Investment, and Death: Economic and Human Losses Following Environmental Disaster. Columbia University, School of International and Public Affairs and Princeton University, Woodrow Wilson School of Public and International Affairs. 102 p.
http://cega.berkeley.edu/assets/cega_events/49/Session_4E_Natural_Disasters.pdf

Bankoff, G. 2007. Living with Risks; Coping with Disasters: Hazard as a Frequent Life Experience in the Philippines. In *Education about Asia*, Volume 12, Number 2, Fall 2007. pp. 27-29.
http://www2.hull.ac.uk/fass/pdf/LivingWithRisk.pdf

Bankoff, G. No Date. Vulnerability and Flooding in Metro Manila. World Bank Institute Distance Learning, Natural Disaster Risk Management Program. 3 p.
http://worldbank.mrooms.net/file.php/461/2525/reading_-_vulnerability_and_flooding_in_metro_manilanew.pdf

Brooks, N. 2003. Vulnerability, Risk and Adaptation: A Conceptual Framework. Working Paper 38, Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, NR4 &TJ. 16 p.
http://www.eird.org/cd/on-better-terms/docs/Brooks-N-Vulnerability-risk-and-adaptation-a-conceptual-framework.pdf

Community-Based Monitoring System International Network. 2012. Food Related Coping Strategies First Line of Defense of Sendong Devastated Households. In *CBMS Network Updates*, Volume X, Number 1, December 2012. 7 p.
http://www.pep-net.org/fileadmin/medias/pdf/promotionnal_material/CBMS/December2012.pdf

Francisco, H. A., C.D. Predo, A. Manasboonphempool, P. Tran, R. Jarungrattanapong, B.D. The, L. Peñalba, N.P. Tuyen, T.H. Tuan, D. Elazegui, Y. Shen, and Z. Zhu. 2011. Determinants of Household Decisions on Adaptation to Extreme Climate Events in Southeast Asia. Research Report No. 2011-RR5, Economy and Environment Program for Southeast Asia, Singapore. 19 p.
http://www.eepsea.net/pub/rr/2011-RR5%20(By%20Hermi%20et%20al).pdf

Ghorpade, Y. 2012. Coping Strategies in Natural Disasters and under Conflict: A Review of Household Responses and Notes for Public Policy. HiCN Working Paper 136, Households in Conflict Network, Institute of Development Studies, University of Sussex, United Kingdom. 17 p.
http://www.hicn.org/wordpress/wp-content/uploads/2012/06/HiCN-WP-136.pdf

Helgeson, J., S. Dietz and S. Hochrainer-Stigler. 2012. Vulnerability to Weather Disasters: The Choice of Coping Strategies in Rural Uganda. Working Paper No. 107, Center for Climate Change Economics and Policy, University of Leeds and London School of Economics and Political Science, United Kingdom. 24 p.

http://www.lse.ac.uk/GranthamInstitute/publications/WorkingPapers/Papers/90-99/WP91-vulnerability-to-weather-disasters-coping-strategies-in-uganda.pdf

Government of the Philippines. 2013. Emergency Food Security, Nutrition and Livelihoods Assessment for Typhoon Bopha (Pablo), Philippines Key Findings. 4 p. http://philippines.humanitarianresponse.info/system/files/documents/files/Bopha%20Assessment%20Key%20Findings%20Feb%202013.pdf

_____. 2009a. Typhoons Ondoy and Pepeng: Post Disaster Needs Assessment. Joint initiative of the Government of the Republic of the Philippines, Representatives of the Private Sector and Civil Society Organizations, Multilateral Development Partners, and Bilateral Development Partners, 62 p.
http://www.pdrf.org/pdf/POPJAVolume1.pdf

_____.2009b. Typhoons Ondoy and Pepeng: Post Disaster Needs Assessment Sector Reports. Joint initiative of the Government of the Republic of the Philippines, Representatives of the Private Sector and Civil Society Organizations, Multilateral Development Partners, and Bilateral Development Partners, 156 p.
http://www.pdrf.org/pdf/POPJAVolume2.pdf

Israel, D. C. 2012. Typhoons, Floods, and Droughts: Regional Occurrence and Value of Damages to Rice Farming in the Philippines. PIDS Policy Notes No. 2012-15, Philippine Institute for Development Studies, NEDA sa Makati Bldg., Makati, Metro Manila. 6 p.
http://dirp4.pids.gov.ph/ris/pn/pidspn1215.pdf

Lindell, M. K. and C. S. Prater. 2003. Assessing Community Impacts of Natural Disasters. In *Natural Hazards Review*, Vol. 4, No. 4.
http://www.tc.umn.edu/~blume013/Lindell_Prater2003.pdf

Mechler, R. 2004. Natural Disaster Risk Management and Financing Disaster Losses in Developing Countries. Karlsruhe, Verlag Fuer, Versicherungswissenschaft.
http://books.google.com.ph/books?id=onaqFvzPKzoC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Mias-Mamonong, M. A. and R. M. Flores. No Date. Vulnerability and Adaptation Assessment Report: Sorsogon City, Philippines. 74 p.
http://www.unhabitat.org/downloads/docs/10377_1_594134.pdf

National Disaster Risk Reduction & Management Council (2011). National Disaster Risk Reduction and Management Framework.
http://www.google.com.ph/url?sa=t&rct=j&q=national+disaster+risk+reduction+management+framework&source=web&cd=1&ved=0CEsQFjAA&url=http%3A%2F%2Fwww.ndrrmc.gov.ph%2Fattachments%2Farticle%2F227%2FNDRRMFramework.pdf&ei=mxToT7rMBsKoiAe88cVY&usg=AFQjCNH4JCygdtAvqT0VAuUiGqZt_c6iSg

National Statistics Office. 2011. Provincial Profile of Pasay City.

http://nsoncr6.ph/special%20release/Pasay%20Profile.pdf

Pasay City Government. No Date. Comprehensive Land Use Plan of Pasay City. http://www.pasay.gov.ph/Pdf/socio-eco/popLandUse3.pdf

Patnaik, U. and K. Narayanan. 2010. Vulnerability and Coping to Disasters. A Study of Household Behavior in Flood Prone Region of India. MPRA Paper No. 21992. http://www.mse.ac.in/Frontier/t20%20UP-KN.pdf

Penalba, L. and D. Elazequi. 2011. Adaptive Capacity of Households, Community Organizations and Institutions for Extreme Climate Events in the Philippines. Economy and Environment Program for Southeast Asia (EEPSEA) Research Report No. 2011-RR3. 56 p. http://www.eepsea.net/index.php?option=com_k2&view=item&id=390:adaptive-capacity-of-households-community-organizations-and-institutions-for-extreme-climate-events-in-the-philippines&Itemid=192

Porio, E. 2011. Enhancing Adaptation to Climate Change by Integrating Climate Risk into Long-Term Development Plans and Disaster Management: The Case of Manila, Philippines. ARCP2010-09NSY-Patankar-Final Report. http://www.apn-gcr.org/resources/.../06516ed9ac5850386cdd0d5d73f7033f.pdf

Predo, C. 2010. Adaptation of Community and Households to Climate-Related Disaster the Case of Storm Surge and Flooding Experience in Ormoc and Cabalian Bay, Philippines. Climate Change Technical Report, Economy and Environment Program for Southeast Asia, Singapore. 27 p. http://idl-bnc.idrc.ca/dspace/bitstream/10625/45444/1/131905.pdf

Reyes, C. M. No Date. Community-Based Monitoring System in the Philippines: Tool for Impact Monitoring and Evaluation. Powerpoint. http://siteresources.worldbank.org/PGLP/Resources/Session17.pdf

Rodriguez-Oreggia, E., A. de la Fuente and R. de la Torre. 2008. The Impact of Natural Disasters on Human Development and Poverty at the Municipal Level in Mexico. Document prepared for the ISDR/RBLAC Research Project on Disaster Risk and Poverty. United Nations Development and Programme Regional Bureau for Latin America and the Caribbean. http://www.preventionweb.net/english/hyogo/gar/background-papers/documents/Chap3/LAC-overview/Mexico/Mexico.pdf

Sawada, Y., J. P. Estudillo, N. Fuwa, and K. Kajisa. 2009. How do People Cope with a Natural Disaster? The Case of Super Typhoon Milenyo in the Philippines. Working Paper No. 2009-11, CEM Working Paper Series, College of Economics and Management, University of the Philippines Los Banos, College, Laguna, Philippines. 44 p. http://www.h.chiba-u.jp/mkt/2009-11%20Sawada.pdf

Schwarzer R. and C. Schwarzer, 1996. A Critical Survey of Coping Instruments. In M. Zeidner and S. Endler (Eds.). *Handbook of Coping:and Applications*, New York: Wiley, pp. 107-132.
http://userpage.fu-berlin.de/~gesund/publicat/copchap6.htm

Tibig, L. V. 2003. Local Coping Strategies and Technologies for Adaptation in the Philippines. Powerpoint.
http://unfccc.int/files/meetings/workshops/other_meetings/application/pdf/tibig.pdf

World Food Programme. 2009. *Philippines Luzon Typhoons and Floods Emergency Food Security Assessment,* In collaboration with the DSWD, Government of Philippines, FAO, UNICEF, Save the Children, OXFAM, World Vision, ADRA, Christian Aid and CFSI, 35 p.
http://home.wfp.org/stellent/groups/public/documents/newsroom/wfp229085.pdf

Zoleta-Nantes, D. B. 2000, 'Flood Hazards in Metro Manila: Recognizing Commonalities, Differences, and Courses of Action', in *SOCIAL SCIENCE DILIMAN* (January-June 2000) 1:1, pp. 60-105
http://www.journals.upd.edu.ph/index.php/socialsciencediliman/article/viewFile/36/7

-End-