FLASH FLOOD AND LANDSLIDE DISASTERS IN THE PHILIPPINES: REDUCING VULNERABILITY AND IMPROVING COMMUNITY RESILIENCE

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DECLARATION

This work contains no material which has been accepted for the award of any degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

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Signature: ………………………………………..   Date: 23 December 2008 ……………………………..

DEDICATION

I dedicate this humble work to the memory of my father,

Rodolfo Salcedo Ollet

and to my loving mother,

Magdalena Nolasco Jaucian

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LIST OF ABBREVIATIONS

ADPC – Asian Disaster Preparedness Center
am – ante-meridian (morning)
AS/NZS – Australian Standard/New Zealand Standard
AUMDP – Asian Urban Mitigation and Disaster Preparedness
BDCC – Barangay Disaster Coordinating Council
CRED – Centre for Research Epidemiology of Disasters
km^3 – cubic kilometre
CVP – Community Vulnerability Profile
DA – Department of Agriculture
DENR – Department of Environment and Natural Resources
DILG – Department of the Interior and Local Government
DOST – Department of Science and Technology
DPWH – Department of Public Works and Highways
E - East
EMA – Emergency Management Australia
FEMA – Federal Emergency Management Agency
GDP – Gross Domestic Product
HREC – Human Research Ethics Committee (The University of Newcastle)
IDNDR – International Decade for Natural Disaster Reduction (1990-1999)
IFRC - International Federation of Red Crosses and Crescents
ISDR – International Strategy of Disaster Reduction
ITCZ – Inter-Tropical Convergence Zone
JICA – Japan International Cooperation Agency
km – kilometre
km/hr – kilometre per hour
LCEs –Local Chief Executives
LGUs – Local Government Units
MBB – Model's Building Block
MGB – Mines and Geosciences Bureau
MDCC – Municipal Disaster Coordinating Council
NDCC – National Disaster Coordinating Council
m – metre
m/sec – metre per second
m^2– square metre
mi/hr – miles per hour
mm - millimetre
mm/hr – millimetre per hour
mm/day – millimetre per day
nn –noontime
N – North
NEDA – National Economic and Development Authority
NRCP - National Research Council of the Philippines
OCD – Office of Civil Defence
PADR – Participatory Assessment of Disaster Risk

PAGASA – Philippine Atmospheric, Geophysical, Astronomical Administration Services
PDCC – Provincial Disaster Coordinating Council
PCIERD - Philippine Council for Industrial Energy Research and Development
PHIVOLCS – Philippine Institute of Volcanology and Seismology
PNRC – Philippines National Red Cross
PD – Presidential Decree
pm – post-meridian (afternoon)
PSWS – Public Storm Warning Signal
RDCC – Regional Disaster Coordinating Council
REINA – Real, Infanta, and Nakar (municipalities of Quezon Province)
S – South
SOLERT - Southern Leyte Emergency Response Team
TAP - Technology of Assessment and Participation
UNDP – United Nations Development Programme
W – West
WB – World Bank

GLOSSARY

The following terms are defined to help the reader understand this study. They have been adapted from the 2003 World Disaster Reduction Campaign information kit, journals on natural hazards and emergency management, and local experts' presentations to the Philippines' National Disaster Coordinating Council/Cabinet Meetings:

Climate Change – refers to a statistically significant variation in either the mean state of the climate or its variability, persisting for an extended period (typically decades or longer).

Community – a social entity or group of people that has a number of things in common generally defined by location, but which may include such things as shared experience, culture, heritage, language, ethnicity.

Disaster – a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope, using its own resources. A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.

Disaster risk reduction (disaster reduction) – a holistic framework of elements considered to have the potential to minimize vulnerabilities and disaster risks throughout a community or society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Early warning – the provision of timely and effective information, through identified institutions, that allow individuals exposed to a hazard, to take action to avoid or reduce risk and prepare for effective response. Early warning systems include three primary elements: (1) forecasting of impending events; (2) processing and dissemination of warnings to political authorities and population; and (3) undertaking appropriate and timely actions.

El Nino-Southern Oscillation (ENSO) – refers to an irregularly occurring pattern of abnormal warming of the surface coastal waters off Ecuador, Peru and Chile. This coupled atmosphere-ocean phenomenon is associated with the fluctuation of inter-tropical surface pressure pattern and circulation in the Indian and Pacific oceans, called the Southern Oscillation. A La Nina is the opposite of an El Nino event, during which waters in the west Pacific are warmer than normal and trade winds are stronger.

Environmental degradation **–** means the reduction of the capacity of the environment to meet social objectives and needs. Some examples include: land degradation, deforestation, desertification, wildfires, loss of biodiversity, land, water and air pollution, climate change, sea level rises, ozone depletion.

Flash-flood – is a sudden, unusually large volume of water, usually carrying a lot of sediments and floating debris, mostly trees and plants, which deposits its load at the valley mouth. A flash-flood commonly occurs after long duration heavy rain that induces landslides whose deposits can form dams across constricted segments of a river valley and impound runoff upstream. The failure of relatively large landslide dams causes the release of their impounded water as flash-floods. Flash-floods are also generated by lake breakout, reservoir dam failure and log jam breaching.

Hazard **–** a potentially damaging physical event, phenomenon and/or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can include latent conditions that may represent future threats and can have different origins; natural (geological, hydro-meteorological and biological) and/or induced by human processes (environmental degradation and technological hazards).

Hydro-meteorological hazards – natural processes or phenomena of atmospheric, hydrological or oceanographic nature, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Examples are: floods, debris and mud floods; tropical cyclones, storm surges, thunder/hail storms, rain and wind storms, blizzards and other severe storms; drought, desertification, wildfires, temperature extremes, sand or dust storms, and snow or ice avalanches.

Lahar - is an Indonesian term that describes a hot or cold mixture of water and rock fragments flowing down the slopes of a volcano and (or) river valleys.

Landslides – defined as downward-moving earth materials aided by gravity, types of which are **slide** *(movement parallel to planes of weakness and occasionally parallel to slope)*, **fall** *(material free fall)*, **topple** *(the end-over-end motion of rock down a slope)*, **flow** *(viscous to fluid-like motion of debris)*, **slump** *(complex movement of materials on a slope; includes rotational slump)*, and **creep** *(gradual movement of slope materials)*.

Lifelines – refers to systems or networks that provide for the movement of people, goods, services, and information upon which the health, safety, comforts and economic activity of a community depends.

Mitigation **–** structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Preparedness **–** activities and measures taken in advance to ensure effective response to the impact of hazards, including the release of timely and effective early warnings and the temporary removal of people and property from a threatened location.

Prevention **–** activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.

Public awareness **–** the processes of informing the general population, increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster. Public awareness activities support changes in behavior leading towards a culture of prevention. This involves public information, dissemination, education, radio or television broadcasts and the use of printed media, as well as the establishment of information centers and networks.

Resilience - the ability of systems to absorb change and to either bounce back, or to shift to new points of stability. For disaster risk reduction, this means focusing more effort on reducing the vulnerability of a community to 'extraordinary' events. It also requires more emphasis on planning for, and undertaking, post-event recovery in order to make communities less vulnerable to future events.

Risk – the probability of harmful consequences, or expected losses (death, injuries, property loss, livelihoods' loss, economic activity disrupted or environment damaged) resulting from interactions between natural or human induced hazards and vulnerable conditions.

Sustainable development – refers to development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It is based on socio-cultural development, political stability, economic growth and ecosystem protection, which all relate to disaster risk reduction.

Vulnerability – a set of conditions and processes resulting from physical, social, economic, and environmental factors, which increase the susceptibility of a community to the impact of hazards.

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ABSTRACT

Recent flash floods and landslides in the Philippines have caused many fatalities, loss of livelihoods; destroyed infrastructures, damaged natural resources and displaced several communities. Investigation of five disaster cases of flash floods and landslides from 1991 to 2006 was undertaken to gain an understanding of the causes, behaviour, distribution and biophysical impacts of these recurrent natural hazards. Sustaining healthy and resilient communities and protecting the ecosystem from natural disasters is a key development goal. Therefore, communities at risk need to adequately prepare for, respond to, and recover from the impacts of these natural disasters. A theory model on community resilience called the Landslip-Disaster Quadrant Model was developed to examine the capacity for resilience and the vulnerability of threatened communities. Six building blocks comprise this Model. A community study of the February 17, 2006 landslides in St. Bernard, Southern Leyte, was conducted to test and refine this Model.

Major findings of the study have revealed that flash floods and landslides have been frequent due to changing climatic patterns and greater interaction of natural processes. Extreme weather conditions have resulted in intense rainfall that seeps through fractures and cracks in the ground. Rains saturate and loosen soil particles, weaken slope resistance, triggering landslides that formed natural dams. Failure of these natural dams or log jams caused flash floods and debris flows. The rapidity and destructiveness of these hazards were influenced by the angular position of sliding materials, slope resistance, type of cascading materials caught in the flow, river channel configuration, and human structures that obstruct and/or intensify overflow. These were the physical conditions of vulnerability to disasters in the five cases of natural disaster investigated.

Rural livelihoods and the economic base of the local people in Saint Bernard, Southern Leyte, were limited and subsistent. Though the local people have a high literacy rate, they have inadequate understanding of the natural processes associated with landslides. Natural observations such as receding water levels in the river, fractures and cracks in the ground on the mountain, excessive rains and landslides in nearby communities could have been used as early warnings by the local people and authorities for safe evacuation. Many lives in Guinsaugon village could have thus been saved from the deadly landslides of 17 February 2006. Political interests have affected progress of resettlement housing and development projects that obliged many local people to extend the period spent living in the evacuation centres. However, the local people were expressive of their faith and hope to rise from the tragedy. These 'bouncing back' attitudes of the local people were indicative of their strong cultural values that formed the core of their coping capacity for natural disasters. The results of the community study tested and refined the Landslip-Disaster Quadrant Model. Among the six blocks for building a disaster-resilient community, cultural values and local norms ranked first. This is followed by ecological security, then livelihood sufficiency and economic base, and further by human health and wellness. The last two blocks were structural networks and institutional arrangements, and political will and priorities.

This Model could form the framework for a Comprehensive Landslide and Flash Flood Disaster Risk Assessment in the Philippines. The community assessment toolkit developed in this study could be expanded further into policy and planning guidelines of the National Disaster Coordinating Council of the Philippines.

CHAPTER 1

OVERVIEW AND STUDY OBJECTIVES

Introduction

This chapter presents the bird's eye view of the whole study. It outlines the background and importance of the study as well as the various considerations shaping its logic. First, the chapter discusses the global trend in disaster losses, vulnerability and how disaster risks should be assessed. It cites sample cases, issues and previous studies conducted in the Philippines. Second, it reports the geographic features and disaster profile of the Philippines as a basis for selecting the natural disaster type in the theory model development. Third, the statement of the problem, and the significance and benefits of the study are presented. Lastly, it outlines the objectives of the study and thesis chapters.

As defined by the UN International Strategy for Disaster Reduction (ISDR, 2003:9), a **disaster** is a function of risk process which results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk. Hence, the equation **Disaster (*risk*) = Hazard x Vulnerability / Capacity for Resilience** may apply. This is used in this study.

1. Disaster Losses Trend and Risk Reduction Paradigm Shift

This worldwide pattern of disaster losses due to natural disasters situates many countries with regard to their development priorities and initiatives. The challenge to reduce adverse impacts, decrease exposure to hazards and vulnerability, and reinforce capacity for resilience becomes a major driver in development paradigm shift. The Philippines has its own share of challenges in addressing key issues on disaster risk and vulnerability reduction.

1.1 Natural disaster losses and vulnerability are increasing. Many nations experience fatalities and injuries, property damage, and economic and social disruption as a result of natural disasters. Hurricanes or typhoons, floods, drought, earthquakes, volcanic eruptions, storm surges, tsunamis, landslides, tornadoes, etc. repeatedly devastate many parts of the world. Global losses to natural disasters are enormous. World Disasters Report (IFRCC, 2004) estimated disaster losses from 1994 to 2003 at US$684 billion. This averages more than US$65 billion per year. The estimated number of people reported killed is 579,539 and averages more than 57,000 annual deaths. These losses resulted from a total of 3,055 reported natural disasters in this decade (1998-2008). Hurricane Katrina in August 2005 alone is estimated to have cost more than US$18 billion of damages in the USA (Lloyd, 2007).

A World Bank study (2003) reported that the Philippines have incurred damages of US$275.229 million due to natural disasters over the past 20 years. Also, NDCC (2004) records, from 1970 to 2002, showed an average of 500 people killed each year and about US$140 million lost due to typhoons. Other hazards associated with typhoons such as flash floods, landslides, storm surges and [1]lahars are as deadly and damaging to many Filipinos. Due to Mount Pinatubo's 1991 eruption, fallout affected a total area of 340,000 km^2 (PHIVOLCS, 1991). The impact of the eruption was exacerbated by Typhoon 'Diding', which occurred immediately after the eruption, scattering water-soaked ash over a very large area and causing massive mudflows. Some 80,000 hectares of agricultural lands were buried by ash and lahars. Direct damage resulting from Pinatubo's eruption was

[1] Lahar is an Indonesian term that describes a hot or cold mixture of water and rock fragments flowing down the slopes of a volcano and (or) river valleys.

equivalent to 1.2% of the country's Gross Domestic Product (GDP). The 1990 Central Luzon earthquake was 0.9% of the GDP. Damage from typhoons averaged 0.5% of the GDP every year between 1970-2000, implying far greater cumulative losses (World Bank, 2003). The Philippines has a population of more than 76 million as of the 2000 census. It has a population density of 255 persons per square kilometer. The poverty incidence rating was about 28.4% in 2000. Poverty is largely a rural characteristic in the Philippines that contributes to vulnerability (World Bank, 2003). Disaster losses will continue to roll back development gains of many countries, particularly developing economies like the Philippines.

The worldwide trend for disaster losses are escalating. This means global vulnerability to natural disasters is also increasing. This may come from the severity and frequency of natural hazards or social vulnerability. Unsafe human conditions are aggravated by a growing population, built environment and emerging threats. When more people migrate to hazard-prone areas for livelihood subsistence and economic reasons, vulnerability is driven more by social than natural forces. Vulnerability may be induced also by people's lack of knowledge application or underuse of lessons learned. Assessment of these social vulnerabilities in the past had some level of success. For example, the Department for International Development (DFID), UK had been using developed methods for assessing vulnerabilities, capacities and hazards as policy development tools for humanitarian donors (Cannon et al., 2003). Case studies of risk mapping, local capacities and disaster lessons from Mexico and Central America were used to explain vulnerability analysis methods. These are conventional techniques for most service institutions involved in short-term relief and humanitarian aid. Usually, a people-centred approach to disaster risk reduction in this league focuses on mapping community weaknesses (vulnerability) and meeting people's needs (aid). This is how they match, or 'assess' vulnerabilities at the community level with the ‘made available’ resources sourced from their sponsors or donors (international, national or local). Development planning recognizes this compensatory strategy of addressing short-term needs for relief and emergency response to disasters. This may not bring out the positive change or desired behaviour such as the self-reliance from the local people essential in overcoming vulnerability to disasters.

1.2 Disaster risk reduction assessment starts first from the community's capacity for resilience. Affected communities of recent natural disasters seem to indicate that local people need more than vulnerability and needs assessment. Good as they may be, however, prospective goals that sustain benefits brought by longer-term development initiatives thrive and are nurtured within or from the capacity of communities. These are the resilient coping mechanisms embedded within every community. The only way local people can speak out about what is going on in their mind, how they feel about being helped, what they prefer in terms of meeting their needs or how should they be helped in disaster situations is to conduct a survey of disaster-affected communities along this `grid’ of assessment. Other than regular meetings where only a few people with official functions can attend, common residents have no other way of expressing their views, perceptions and suggestions. These are basic social mapping techniques that only independent fieldwork research can perform. Giving local people the right conditions in which to freely express their opinions via informal interviews and home-based discussions may elicit capacity for resilience. This context is illustrative of the need to propose an integrated and comprehensive framework for modelling disaster-resilient communities. The conduct of this research will not only fill this gap in disaster risk reduction studies regarding community assessment but will also provide a strong basis for the Philippines’ National Disaster Coordinating Council to take action to reinforce community initiatives. This will strengthen various local disaster coordinating councils at all political and administrative levels to implement holistic disaster preparedness and mitigation activities. With international and national service providers empowering them, not subverting them, these councils, with local communities at the forefront, are more proactive and developmental in approach.

2. Natural Disaster Context for Development of the Model Theory and Community Assessment.

The question now is which of the natural disasters can best provide the context for modelling resilient community disaster risk assessment? We will consider important geographic features and disaster information in relation to the high exposure of the Philippine islands to natural hazards.

2.1 Geophysical location of the Philippine Islands. The Philippines, as shown in Figure 1-1, is an archipelago of 7,102 islands. It is situated in the so-called Circum-Pacific Belt ` Ring of Fire'. This zone is characterized by seismic and volcanic activities due to active faults and trenches (PHIVOLCS, 2004). Exposure to natural hazards is very high. The archipelago is the product of accretion wedges and volcanic eruptions. These result from the collision of the Philippine Sea, Pacific and Eurasian plates, as well as smaller platelets (Sulu, Celebes Sea), being forced northward by the large India-Australia plate. The plate motions are accompanied by earthquakes and volcanism. Due to this geological exposure, the country experiences on average 887 earthquakes every year. Some have proved to be very destructive such as the 1976 Mindanao event which killed approximately 6,000 and caused damage estimated at US$400 million. The 1990 Central Luzon earthquake killed over 1,000 and damage estimated at US$500 million (NDCC, 2006).

The vast ocean basin of the Circum-Pacific Belt is where strong tropical cyclones are usually formed. About seven out of 20 to 22 tropical cyclones which affect the Philippine islands become super typhoons with wind speeds of more than 220 km/hr (PAGASA, 2004). Based on the ranking of fatalities caused by natural disasters in the 20th century (NDCC, 2006), typhoon is first with 28,812 people killed and damage estimated at US$5.653 billion. Second is earthquake with 9,572 people killed and damage estimated at US$517 million. Volcanic eruption is third with 6,331 people killed and damage estimated at US$228 million. Floods rank fourth with 2,545 people killed and estimated damage US$431 million.

However, the same NDCC (2006) report has placed human casualties and damage under the classification of major natural hazards such as typhoons, earthquakes, volcanic eruptions and floods. Other natural processes associated with typhoons and monsoon rains are most likely obscured by this type of classification of major and minor disasters.

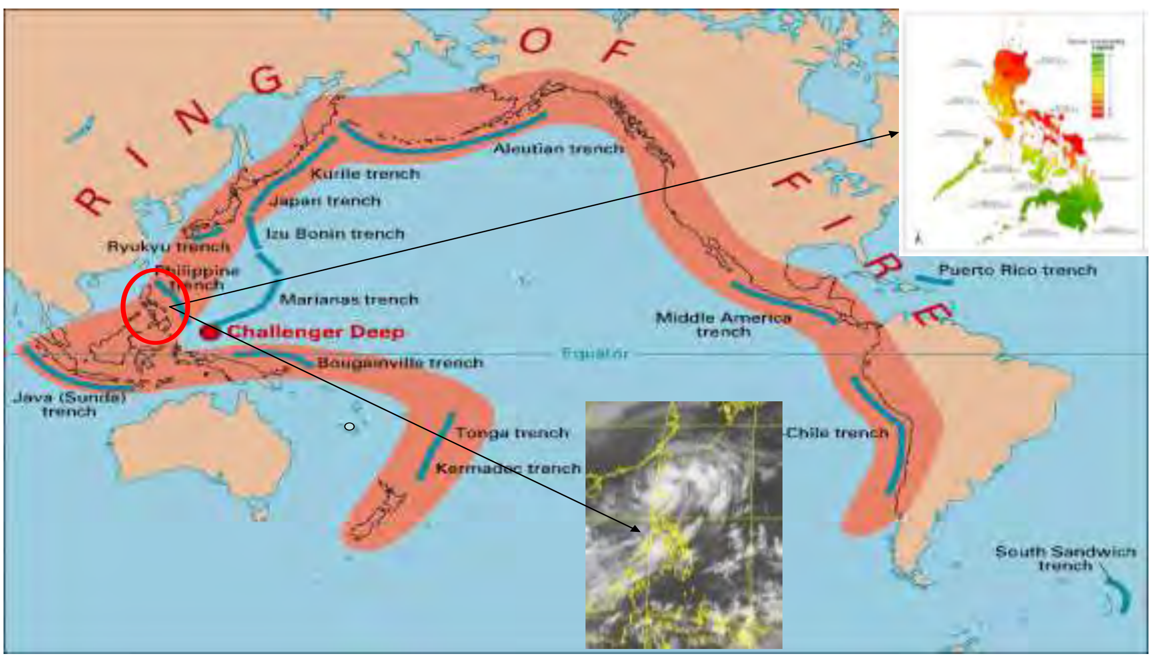

Figure 1-1. Geographical map of the Philippines situated in the west Pacific Rim of Fire: Seismic and volcanic generators and Tropical Cyclone Belt (Source: NDCC, 2007)

2.2 Flash flood and landslide events and their dynamics. Typhoons usually bring strong winds and heavy rains to many threatened communities. However, it is the ‘obscured’ landslide and flash flood events that have killed many people and wrought damage to properties and livelihoods. Out of the total 28,812 typhoon fatalities in the Philippines, over 6,000 people were killed by a single flash flood event in Ormoc City. This resulted from the landfall caused by heavy rains brought by the 1991 Typhoon 'Uring'. Another example is Typhoon 'Olga' which killed 109 people in 1991. The deaths of 58 of those people were concentrated in one small housing estate, the Cherry Hills subdivision in Antipolo City. The trigger was a compound slide comprising a slump and a rotational component that occurred on the night of August 3, 1999, burying houses and people. For the three days preceding the landslide, rainfall levels had reached 500 mm (Morales et al., 2001). These flash flood and landslide events are now referred to as 'disasters waiting to happen'. The dynamics of the triggering factors can depend on the intensity of rainfall, steepness of slope, soil characteristics, and ground fractures, to name a few.

In recent years, tropical cyclones and monsoon rains have triggered debris *avalanches* and landslides in constricted waterways, creating natural dams in the Philippines (Tungol, 1996). Related findings from Costa et al. (1988) also revealed that natural dams may cause upstream flooding as the lake rises and downstream flooding as a result of the failure of the dam. Out of the 73 documented landslide-dam failures sampled, 27% of these dams failed less than one day after formation. About 50% failed within 10 days. Over-topping is the most common cause of dam failure. Once the water-holding capacity of these natural dams is exceeded, mass movements and debris flows (Erskine, 2005), called *`flash floods'* in the Philippines (Punongbayan, 2004), rush downstream onto flood-plain communities with no warning, killing people and animals, and destroying any properties, infrastructure and agriculture in their path. According to Daag et al. (2006), the threshold rainfall to trigger landslides in the Philippines is site specific. The critical rainfall level per day before a landslide is triggered is about 150 mm which is higher than the 100 mm/day global critical threshold value. Many of these landslides have significant antecedent rain for at least three days prior to the event. A similar study on the relationship between the probability of landslide occurrence and rainfall was conducted by Fell et al. (2000) for Hong Kong landslides. Rainfall of 1–12 hours duration is important in predicting the number of landslides. Antecedent rainfall also has some influence. Rainfall for a 1 in 100 year event over a 10 year period is calculated and utilized in the prediction of the number of landslides caused by a storm over Hong Kong Island.

These contexts justify the investigation of various natural disasters associated with flash floods and landslides in the Philippines.

3. Problem Statement, Significance and Benefits of the Study

Much information concerning the impact of the various flash-flood and landslide hazards in the Philippines have been gathered during and after these natural disasters. These are contained in many government reports and complementary literature of non-government organizations. However, questions continue to arise such as, why are they recurring? What makes them so dangerous? Why do they cause so many fatalities and so much damage? How can the people mitigate adverse impacts? What can the people do to predict their occurrence? If they are rapid onset disasters, how can people protect themselves or secure their lives quickly? These are key questions which require an assessment tool formulation to collect sets of information that will explain these natural disasters. Once analyzed and systematically sorted, the outcome could provide a better understanding of the causes, behaviour, distribution and biophysical impacts of the various natural hazards that result in flash floods and landslides.

Since sustaining healthy and resilient communities and ecosystems is a major development challenge for a hazard-prone country like the Philippines, framing a holistic community-focused theory model is equally important. This model will integrate all aspects of disaster risk management such as preparedness, response, rehabilitation and mitigation. Once a model is developed, it can be tested by the formulated disaster risk assessment tool through fieldwork survey and community interviews.

Rural communities that were affected by flash floods and landslides over the past fifteen years can provide the source of selection criteria for study communities. Out of the ten major events ranked according to number of casualties and damage magnitude (NDCC, 2006), five cases of natural disasters were examined. These are the following: 1991 Ormoc City; 2001 Camiguin Island; 2003, Panaon Island; 2004 REINA, Quezon, and 2006 Saint Bernard, Southern Leyte. A fieldwork survey and interviews with local officials was conducted in Saint Bernard for the community studies. An investigation of these five cases of flash-flood and landslide disasters in the Philippines have the potential to yield important information in order to better understand the causes, behaviour, distribution and biophysical impacts of these natural hazards on humans, livelihoods, infrastructure and the environment.

The outcome of this study could lead to the identification of which issues or conditions of vulnerability need to be addressed by the local people and the service providers. Action steps could be suggested as to how each issue should be addressed. A grid could be devised to help show the convergence of the actions required from the community, local service providers and national agencies. These could be translated into a higher-level activity recommendation for the National Disaster Coordinating Council to undertake such as Guidelines or a Manual of Assessment as part of a National Flash Flood and Landslide Disaster Risk Mitigation Program.

4. Objectives of the Study and Chapters Outlines

Based on the background analysis and availability of literature about natural disasters caused by flash-floods and landslides, the study objectives and outlines of the chapters are presented in this section.

4.1 Thesis objectives. Table 1.1 shows the aims of this study. The main objective of this thesis is to gain an understanding of the causes, behaviour, distribution and biophysical impacts of various natural hazards for the five disaster cases. It is hoped that such an examination will explain the dynamics behind the formation of flash flood and landslides in the Philippines. An exposition of the natural and human forcing factors that place affected communities at risk is featured in each case study. This could help to identify conditions of vulnerability of local people, as well as their capacity for disaster resilience. The study will also review and assess the extent of the remediation measures implemented in the affected communities and develop a disaster risk reduction theory model and community assessment toolkit. This theory model and assessment toolkit will be tested and refined via a community survey and interviews with local officials and service providers. The community studies will be undertaken in the 2006 Guinsaugon landslides of Saint Bernard, Southern Leyte.

Table 1.1. Objectives, research questions and directions of the research work.

Objectives	***Guide Questions of analysis***	**Sources of information, findings and analysis**
1. To gain an understanding of the causes, behaviour, distribution and biophysical impacts of the various natural hazards resulting in flash floods and landslides.	1. What are the natural and human 'forcing factors' that affect community vulnerability and capacity for resilience to disasters	1. Reconstituted data, satellite images, geo-hazard maps and vulnerability assessment reports before and after the disaster.
2. To examine the physical, biological, and socio-economic attributes of the communities under investigation.	2. What is the capacity and vulnerability profile of these communities before and after the disaster?	2. Documented reports and photos of the response, preparedness and mitigation measures adopted before and after the disaster.
3. To review recommendations and remediation measures implemented for affected communities by institutions and service providers.	3. Were the recommendations been implemented?	3. Gap analyses, inventories and checklists of projects, capacity vulnerability assessments and directions for improvement.
4. To recommend disaster risk reduction strategies and a model for disaster-resilient community assessment 4.1 To develop a disaster risk reduction theory model and community assessment toolkit 4.2 To test and refine the theory model	4. What are the root causes and underlying issues of the natural and human vulnerabilities to disasters	4. In-depth interviews, fieldwork assessments and questionnaire survey of study communities

4.2 Outline of the thesis. There are seven chapters. Chapter 1 – Overview and Study Objectives – presents the rationale and importance of the study and states the study goals, objectives and direction. Chapter 2 – Literature Review on Disaster Risk Reduction and Vulnerability Assessment - discusses various philosophical views, current trends and emerging threats, three theory models and vulnerability assessment tools. It presents and explains a new theory model called Landslip-Disaster Quadrant Model. Chapter 3 – Research Design and Methodology - discusses the research design and study path. It explains the sources of data and information, how they were collected and the analysis methods that have been employed. Chapter 4 – Case Studies of Recent Flash Flood and Landslide Disasters in the Philippines - discusses the physical aspects of natural disasters such as climate, typhoons, rainfall, floods and landslides. A synthesis of each physical aspect is also presented. This chapter reports the impact of the disaster on people and communities. Chapter 5 – Results of the Community Studies - presents the results from the community surveys and interviews with officials and service providers. It also describes the techniques applied for analyzing information and data. Chapter 6 – Discussion and Implications of the Study - explains the results of the five natural disasters and community studies using the six building blocks of the Model as discussion points. It discusses the testing and refinement of the Model, after which a modified Model is presented. Chapter 7 – Conclusions and Recommendations - summarizes the whole study. It presents the major findings of the study, the limitations and suggestions for further study. Action steps are recommended for the use of the Model by the Philippines National Disaster Coordinating Council.

Conclusion

In this chapter the overview of the thesis is presented. It includes discussion of the current trend in disaster losses worldwide. It briefly explains how these natural disasters shape development planning and what assessment guidelines are being used to determine vulnerability. The geographic location and disaster risk profile of the Philippines is presented. Natural disasters such as typhoons, flash floods and landslides are discussed complemented with data on casualties, damage and sampled events. High casualty rate, destructiveness and recurrence of flash flood and landslide disasters are the main reasons for the conduction of this research work. The statement of the problem, significance and benefits of the study is also presented. Lastly, it outlines the objectives of the study and the structure of the thesis chapters.

An extensive review of the literature on disaster risk reduction and vulnerability assessment will be presented in the next chapter. Discussion of other chapters will follow as outlined above.

CHAPTER 2

LITERATURE REVIEW OF DISASTER RISK REDUCTION AND CAPACITY AND VULNERABILITY ASSESSMENT

Introduction

This chapter discusses the different views, theories and models, and previous works on reducing natural disaster risk and assessing vulnerability. First, it discusses retrospective views about hazards and vulnerability, and the pitfalls of a compartmentalized approach. Second, it presents current trends in disaster risk reduction. Trends are shaped by changing terrain in hazard risk and vulnerability and the link dynamics between development and disaster risk. Third, it explains related disaster theory models, the Disaster Link Theory, the Disaster Crunch and Release Model, and the Disaster Adaptation Cycle Theory. Fourth, it presents related studies on social empowerment and recent scientific works on flash floods and landslides. Lastly, it introduces and explains a new model for assessing community resilience, called the Landslip-Disaster Quadrant Theory Model adapted for this study on flash-flood and landslide disasters in the Philippines.

This author's model is comprised of the following six building blocks: ecological resilience; human health and wellness; economic base and livelihood sufficiency; cultural values and local norms; structural networks and institutional arrangements, and political will and priorities. A mini-scenario case analysis of Hurricane 'Katrina' is discussed to explain workability of this new model as a training toolkit. This model will be tested and refined in this study via five existing case studies of natural disasters and a survey of communities affected by flash floods and landslides in the Philippines. Saint Bernard, Southern Leyte, which was affected by the February 17, 2006 Guinsaugon landslide is selected as the survey site.

1. Retrospective Views of Disaster Risk

There are two major views of disaster risk in this discussion section. One school of thought tends to view disaster risk as a result of *`force majeure'.* The other view places emphasis on human action or non-action dynamics with the natural environment as causes of disaster risk. Flaws in the compartmentalized approach to hazards and vulnerability are also explained in this section.

1.1 The `catastrophic view'. This idea emphasizes that physical forces of nature are the main causes of threats to people and ecosystems. These are hazards resulting from the changing patterns in the natural environment such as air, land and water (Beer, 2003). Earthquakes, volcanic eruptions, typhoons, floods, droughts and landslides are some examples of these natural hazards. It puts forward the notion that 'force majeure' cannot be avoided or is too strong to control. 'Uncontrolled' natural hazards can impact the geographic location and built environment of some communities more than others. Exposure to such impact is of course determined by where people choose to live, build their habitation and make their living. Communities located near rivers, coasts and low-lying plains are susceptible to storm surges, tsunamis and floods. People dwelling on the slopes of a volcano are more vulnerable to ash falls, lava flows, lahars and landslides. Houses built out of lighter materials such as bamboo, wood or hemp are more vulnerable than those made of concrete, steel and galvanized iron.

1.2 The `conservationist view'. This idea presupposes threat or stress being imposed on the life-supporting capacity of the environment as a result of human-induced activity (Rapport, 1998). Important ecological processes — the foundations of natural resource systems like hydrological cycles, soils and nutrient cycle, climate processes, etc. are affected by deforestation, unsustainable farming systems, poor resource management, exploitation and marginal livelihoods (Darkoh, 2003). As stressed ecosystems have become highly degraded, they have also become incapable of supplying services to the same level as in the past. The capacity of the environment to sustain economic activity (Costanza, 1997) and human health (McMichael, 1997) is, therefore, reduced. How people treat, interact with their surroundings and utilize natural resources may also reflect prevailing value systems and aspirations that an individual and the community share. These can be the human or social forces that exacerbate vulnerability to natural disasters.

1.3 The 'physical' versus the 'social' approach. The aforementioned views see these two - *hazards and vulnerability* - as separate arenas. Compartmentalization may lead to each having its own specialists. The flaw in this approach is the extreme situation in which those who specialize in dealing with hazards tend not to deal with vulnerability missing their interfacing dynamics or confluence. At some point, hazard specialists also tend to deal in one type of hazard, and to be rooted in a physical science where knowledge of (or even interest in) the social sciences is minimal. To some extent, natural hazards are being differentiated and losing the interconnectedness between and among them. One example is the causation or association of a typhoon with rainfall intensity, the rainfall to landslide, and the landslide to flash flood. Another fallacy of 'event-centric' approach is the technocratic measures or solutions it offers for disaster risk problems. This can contribute to a neglect of social issues. An example of this is the choice of the Philippine Government to construct in 1991 a vast lahars dike construction program. According to Leone et al. (1999), this technical solution was implemented to the detriment of socio-economic problems that persisted among evacuees. Such a structural solution certainly gives the impression of visible action in addressing the lahars problem. But these actions were not satisfying from the point of view of the numerous evacuees awaiting employment. Evacuees were mostly displaced people that have lost their farms and livelihoods due to volcanic eruption and lahars. Some evacuees have managed to work in nearby towns but have to walk many kilometers to return back to their families in the evacuation centres. Public transportations were rerouted due to damaged roads and bridges. This explains the difficulty of commuting workers. Resettlement centres that hold evacuated residents need sufficient investments for livelihood and alternative income source. This is a case of choice between the short-term structural (dike construction) measure and the long-term non-structural (evacuees' livelihood) measure. However, it was discovered later that a balanced decision-making process was actually employed by the government in choosing dyke construction. Early in 1998, there remained 9,227 families to be protected from lahars (MPC, 1998). Thus, the protection of more people who were outside evacuation centers that needed the anti-lahars dikes justified why institutions implemented the structural solution over socio-economic options.

2. Current Trends in Disaster Risk Reduction

Recent occurrences of natural disasters have had global consequences that expose the wider implications for sustainable development. Reducing disaster risk and vulnerability has now become a priority in most inter-disciplinary platforms and economic development planning. Though not exhaustive, the following discussions underscore the need for reframing development strategies and reinventing adaptations to mitigate the impacts of natural disasters

2.1 Changing terrain of hazard risk and vulnerability. A mean increase in temperature worldwide of 2˚C above 1990-2000 levels would exacerbate current climate and weather conditions. Global scientists reported in the Fourth Assessment Report of the

Intergovernmental Panel on Climate Change (Solomon et al., 2007) that various extreme events are very likely to change in magnitude and/or frequency and location with global warming. Tropical cyclones, including hurricanes and typhoons, are likely to become more intense with sea surface temperature increases. Emmanuel (2005) has documented that tropical cyclone intensities have already increased since the 1970s far more rapidly in all major ocean basins where tropical cyclones occur. It is the more intense storms that have by far the greatest impacts and constitute a key vulnerability. The combination of rising sea levels and more intense coastal storms, especially tropical cyclones, would cause more frequent and intense storm surges, with damage exacerbated by more intense inland rainfall and stronger winds. Added to this, is the increase of the occurrences of flash floods and landslides in high risk regions due to intense rainfall or water from melting ice or glaciers.

The same report stressed that the increase in coastal populations is proportionate to increased exposure to natural hazards. Coastal communities have been reported to have lost more than 70% of inhabitants during the December 26, 2004 Tsunami in the Indian Ocean. Significant environmental losses of mangroves, coral reefs, wetlands, marshes, forests, dunes and rocks, including plants and animals, were evident in the aftermath of the tsunami. This was caused by an earthquake that shook Banda Aceh and Western Indonesia. Scientific findings of Lay et al. (2005) recorded a magnitude of 9.1 to 9.3 for this Great Sumatra-Andaman Earthquake. Thirteen countries suffered enormous human, physical and ecological losses from this natural disaster unprecedented in global history (BBC, 2005).

The impacts of these natural hazards are assessed by scientists in terms of key vulnerabilities to exposed communities and ecosystems. High risk communities include those living on coasts, riversides, slopes of mountains and floodplains. Increasing exposure occurs as human settlements increase. Many adaptation measures exist today that could reduce vulnerability or exposure to extreme events. Among them are structural-related measures. These include dams to provide flood protection and water supply, dykes, coastal restoration for protection against coastal surges, and improved construction standards. According to the report on climate change (Solomon et al., 2007), significant climate changes can further increase intensity of typhoons and storms with impacts exceeding infrastructure design and built environment criteria. A case in point is the failure of the New Orleans flood-control dykes during the Hurricane 'Katrina' disaster in August 2005.

Non-structural measures include land-use planning, disaster preparedness, improved warning systems and evacuation procedures, and broader availability of insurance and emergency relief. However, it was argued by White et al. (2001) that, despite considerable advances in knowledge regarding weather extremes, the relevant adaptation measures are underused, partly for reasons of cost, especially in developing countries. This study attempts to address this issue and explain why local people fail to anticipate and respond better to natural disasters despite available public warnings and information about typhoon and flooding in the Philippines. Is this information misconstrued, not understood or underused? Which information and means of communication do they listen to, believe most, and why? In what ways can local people better mitigate the impact of rapid onset disasters?

2.2 Natural disasters and sustainable development. Disasters caused by natural hazards can set back development gains. World Bank (2004) reported that the series of disasters experienced in the 1990's contributed to poor performance on the part of the

Philippine economy. Among these is the 7.8 magnitude Luzon earthquake which caused economic setbacks that resulted in an adjustment to the country's Gross Domestic Product (GDP) growth forecasts from 4.8% to 3.8% in 1990, and 5.5% to 5.2% in 1991. However, further natural disasters dampened the country's hopes of recovery. This included the eruption of Mount Pinatubo in June 1991, the severe typhoon 'Trining' in October 1991, and the Ormoc flash floods in November 1991. These disasters contributed to negative GDP growth rates of 0.6% year-on-year. This in turn manifested in lower growth in Central Luzon and the Metro Manila region, which was compounded by the tight monetary and fiscal policy as the Philippine Government strove to meet pre-determined IMF economic targets.

About 75 percent of the world's population live in areas affected at least once between 1980 and 2000 by earthquake, tropical cyclone, flood or drought, according to the UNDP Report (2004). As a result of disasters triggered by these natural hazards, more than 184 deaths per day were recorded in different parts of the world. Deaths indicate only the tip of the iceberg in terms of losses in the quality of life, livelihoods and economic development, and these losses are unevenly distributed around the world. While only 11 percent of the people exposed to natural hazards live in low human development countries, they account for more than 53 percent of total recorded deaths. Development status and disaster risk are clearly closely linked. Appropriate development policies that reduce disaster risk can therefore make an important contribution toward the achievement of the Millennium Development Goals (UNDP, 2004) by reducing losses and protecting existing development gains, as well as avoiding the generation of new risks.

Disaster losses may cause setbacks for social investments which are aimed at alleviating poverty and hunger, providing access to education, health services, safe housing, drinking water and sanitation, or protecting the environment, as well as for economic investments that provide employment and income. At the same time, it has been clearly demonstrated how disaster risk accumulates historically through inappropriate development interventions. Every health centre or school that collapses in an earthquake and every road or bridge that is washed away in a flood began as a development activity. Urbanisation and the concentration of people in hazard prone areas and unsafe buildings, increases the poverty that reduces the human capacity to absorb and recover from the impact of a hazard and the environmental degradation that magnifies hazards such as floods and droughts, are only a few examples of how development can lead to disaster risk.

Disasters are still usually perceived as exceptional natural events that interrupt normal human development and require humanitarian action to mitigate losses. Emergency relief is considered a short-term social activity. However, approaches in doing so must be empowering so as not to 'victimize' people already traumatized by disasters. Unsuitable crisis response may contribute to existing vulnerabilities in social systems. These can result from misguided reconstruction and recovery solutions imposed by technocrats and political sponsors that undermine community culture. Also, displaced people, particularly those in the evacuation centres, may experience a state of uncertainty. According to Gilbert (1995), disaster in this sense is tightly tied into the impossibility of defining real or supposed dangers, especially after the disturbance of the mental frameworks we use to know and understand reality. How individuals and the community cope with day-to-day living during disaster recovery can define the empowering interventions they need from service providers. Matching suitability of services and interventions with community needs can reduce vulnerability, improve capacity-building and sustain development gains.

In their report, UNDP (2004) acknowledges the increasing impact of natural disasters on development. However, focus shifts now to how development itself shapes disaster risk. Countries with similar patterns of natural hazard have widely varying levels of disaster risk and these risks have been shaped through development paths and processes. Hence, UNDP concluded that disaster risk can be managed and reduced through appropriate development policy and actions. This is another area this study attempts to address by finding out which development interventions have induced disaster risk? Which have reduced the impacts of disasters? What socio-economic and cultural conditions differentiate an individual or a community as more vulnerable than others? What local capacities need to be considered such that disaster risk interventions sustain development profits?

3. Disaster Risk Reduction Theory Models

Although natural disasters threaten to derail development, the International Federation of Red Crosses and Crescents' World Disaster Report (2004) stressed the human aspect of development as fundamental to disaster risk. It proposes that natural disasters are not 'natural' but in fact socially driven. Unequal opportunities and misguided development are responsible for turning natural hazard events such as floods and landslides into disaster situations. John Twigg (World Disasters Report, 2004:111) emphasizes social systems in disaster mitigation saying, "to understand what makes people vulnerable, we have to move away from the hazard itself to look at a much wider, and a much diverse set of influences, the whole range of economic, social, cultural, institutional, political and even psychological factors that shape people's lives and create the environment they live in…vulnerability is socially constructed."

Three theory models on disaster risk reduction and vulnerability assessment can be used to explain John Twigg's people-centered concept. The Disaster Link, the Crunch and Release, and the Disaster Adaptation Cycle will be used as model guides in framing this study.

These theory models were developed for inherently different purposes and for use in different contexts. The Disaster Link Model is set in the context of sustainable development. The Crunch and Release Model is set in the spiritual context or community 'spirit' setting. The Disaster Adaptation Cycle Model is set in the context of disaster risk transfer and financing.

3.1 The Disaster Link Model

Figure 2-1 shows the Disaster Link Model. This model was adopted as an assessment manual by the Asian Development Bank for disaster cases in Asia and the Pacific (Carter, 1992). Set in the context of sustainable development, in this theory, a disaster can result from the interactions of physical forces, human nature and the built environment. The link between inevitable occurrences of hazards and consequent disasters if left unbroken can lead to significant loss of lives, properties, livelihoods, habitation and health. An occurrence of a natural event can be hazardous to people and the ecosystem. What convert a hazard event into a disaster situation are the significant losses it inflicts on people and the ecosystem. An example of this is a tropical cyclone or typhoon. One community can be more vulnerable than others because of geographic location and built environment. Communities found in the path of seasonal typhoons are more exposed to greater risks and consequent losses. Added to this, if residences are built near coasts, rivers and floodplains, the danger level is higher and losses can escalate. However, if people build their houses stronger and away from harm's way, they can withstand the impact of typhoons. If people or communities can break the link between hazards and disasters, the aim of significantly reducing or avoiding losses is achieved. We can call communities that attain this ‘achieved’ capacity disaster-resilient communities. To do this, interventions to improve a community’s preparedness, response, rehabilitation and mitigation to disasters must be undertaken at a local level. It is important to recognize that local capacities to cope with natural disasters do exist.

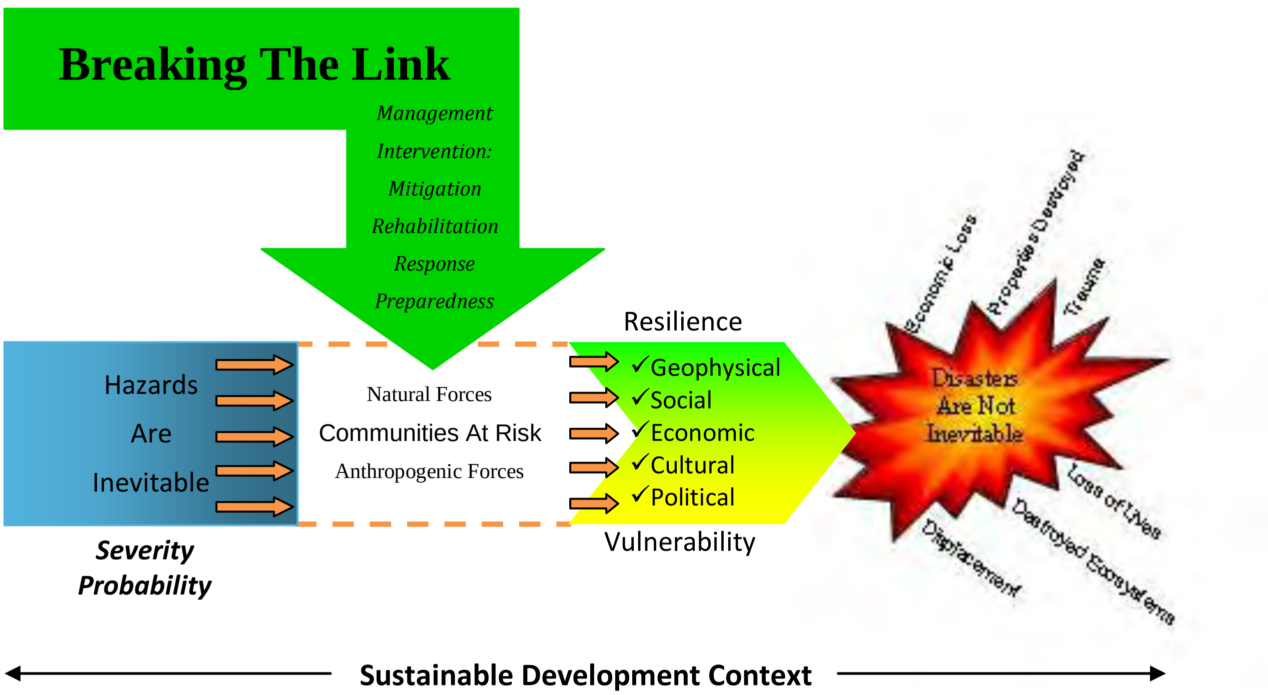

Figure 2-1. The Disaster Link Theory.
Note. Adapted from Carter (1992).

Arrows in the Model indicate `link’ processes and structures existing in the development and functional capacity of human societies or communities. These community capacities may have their own strengths (resilience) and weaknesses (vulnerability). To make local people adequately prepare, overcome and recover from disasters, these interventions are mainstreamed or integrated into the wider development processes and initiatives of the community by national and international service providers. In this way, the local people themselves can own up to their responsibility of ‘action’ or ‘inaction’ on how they treat and interact with ecosystems they live in and how they utilize available natural resources. At the same time, service providers can harness local capacity to ensure equity and optimization of aid resources. Development gains are sustained if disaster risks are reduced. Development planning and programming recognize both compensatory and prospective goals of natural disaster risk reduction. Compensatory goals address the short-term needs of relief and response to disasters, while prospective goals sustain the benefits of medium and long-term development initiatives.

The Asian Urban Disaster Mitigation Program (AUDMP) is a 10-year (1995-2005) program of the Asian Disaster Preparedness Center (ADPC, 2005) which has adapted a strategy similar to the Disaster Link Model. This program is aimed at reducing disaster vulnerability of urban populations, infrastructure, critical facilities and shelter in 10 targeted countries in Asia. The Philippines is one of these with pilot programs in Naga City and Dagupan City for flooding and Baguio City for landslide hazards.

3.2 The Disaster ‘Crunch’ and Release Model

Figure 2-2 shows the Crunch Model. This model was used in Bihar, India, as Participatory Assessment for Disaster Risk (PADR) by Tear Fund UK (Oxley, 2005). In this theory, a disaster happens only if a hazard meets a vulnerable situation. A hazard is an event that can expose elements at risk to danger, loss or injury of elements at risk. These elements include people, houses, water supplies, social groups and networks, crops, livestock, savings, jobs and the natural environment. If these elements are vulnerable, the hazard is more likely to cause damage to them. People are vulnerable when they are unable to adequately anticipate, withstand and recover from hazards. Vulnerable conditions can be physical. An earthquake can kill many people, destroy a number of buildings, roads and bridges in one region. The same earthquake, however, may cause less devastation in another region. Reasons behind a lesser impact in this region may be because buildings are stronger, communities are better prepared or there are fewer inhabitants. Built and structural conditions such as building or house design, location of houses on an unstable slope, can increase vulnerability. Wealth inequity and economic conditions expressed in fragile livelihoods, no credit and savings facilities, exacerbate vulnerability.

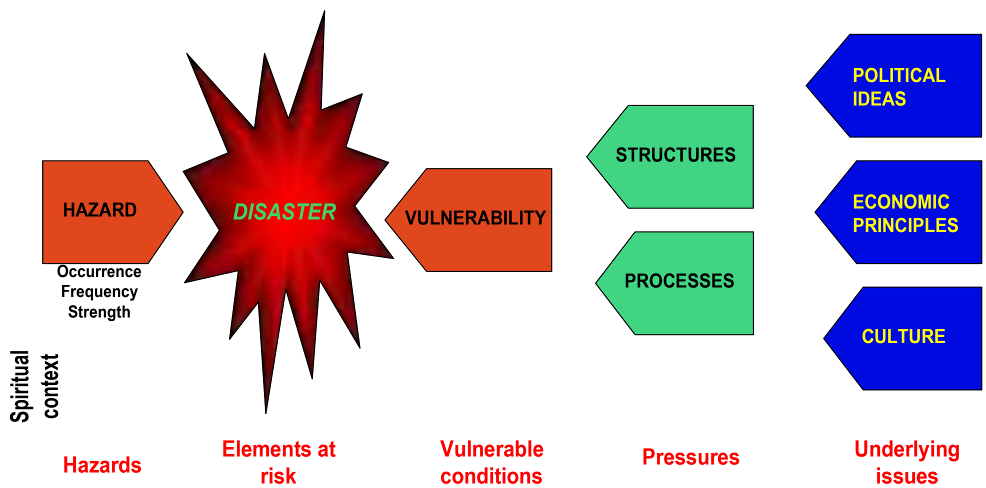

Figure 2-2. The Crunch Theory.
Note. Adapted from Blaikie et al. (1994, cited in Oxley 2005).

Vulnerability can be expressed as natural such as the dependence on very few natural resources. It can be individual or demographic conditions such as lack of skills or knowledge, lack of opportunity due to gender, being old or very young, infirmed or diseased. It can also be organizational or institutional conditions such as a disorganized or fragmented society, bad leadership. In other words, unsafe or vulnerable conditions are symptomatic expressions of social forces brought to the surface by a natural hazard occurrence (i.e. earthquake).

Social forces exert `pressures' on individuals and communities that may result and/or intensify vulnerable conditions. 'Pressures' are shaped by social structures and processes. These structures can be organizations such as local government units (LGUs), religious groups or commercial companies. They can also be individuals such as a local landowner. The processes can be policies and practices that these structures have been using in providing services which can influence community conditions. The spiritual context can shape and help rethink beliefs, principles, and philosophies behind individuals and societal groups. How we relate to God is a basic human right, which relates to people's individual spirituality and to the presence of religious institutions at the local or national level. It influences the way people act and therefore may affect vulnerability to disaster. The church is part of this spiritual context.

To reduce the risk of disaster, the factors that cause it should be addressed. This means working against all the components of the Crunch Model. Hence, it is called the Release Theory as shown in Figure 2-3. Necessary actions have to be undertaken at the local, national and even international levels. Once these actions are implemented, the desired outcomes can be achieved. One of these outcomes is reduced hazards. Ways could be found to reduce the occurrence, frequency or strength of various hazards. For example, embankments could be built to reduce flooding. Trees could be planted to help stop landslides after heavy rain. Advocacy could be used to influence policies that limit climate change, which is contributing to the frequency and severity of some natural hazards. Vulnerable groups should be encouraged to take part in decision-making to ensure that conditions do not worsen for the poorest and most vulnerable people. Another outcome is protected elements. Some elements of a community may be able to withstand the impact of hazard. For example, a tube well could have a pump on a high platform so that it is not affected by flooding. Developmental relief institutions can identify these elements, support them and replicate them.

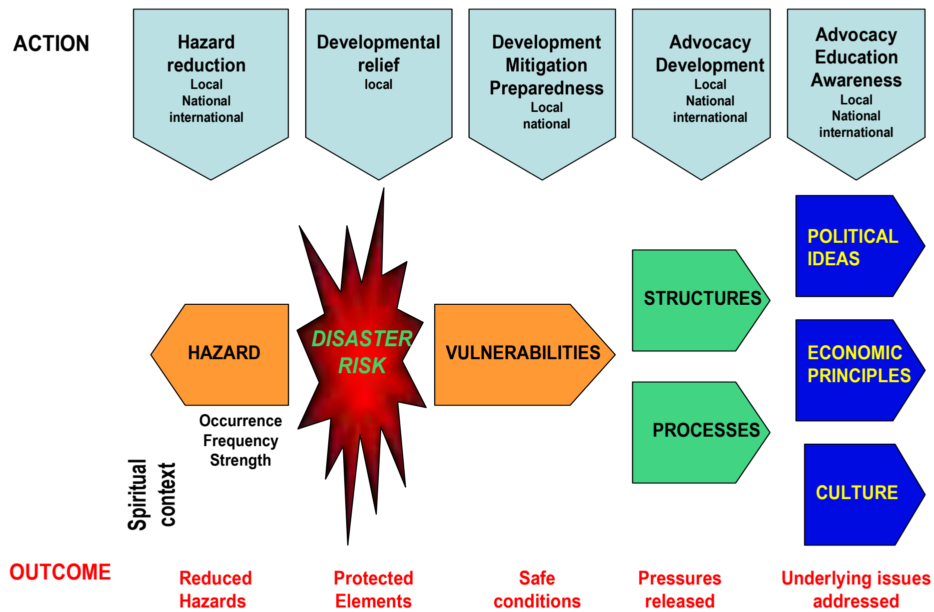

Figure 2-3. The Release Theory.
Note. Adapted from Blaikie et al. (1994, cited in Oxley 2005).

Another outcome is addressed underlying causes. Some service organizations may help to reduce the risk of disaster because their political and economic approaches and values are fair and just. To foster these positive values, advocacy can be used to influence power holders. One avenue that can influence good advocacy is local beliefs and spirituality. Prayer and an active, caring church can play an important role, especially when political institutions fail to win the trust and confidence of local people.

3.3 The Disaster Adaptation Cycle Model

Figure 2-4 shows the Disaster Adaptation Cycle Model. This model was adapted from Blaikie et al. (1994) as an analytical tool for disaster risk transfer and financing by Etkin (1999). In this theory, natural disasters occur when a natural event such as an earthquake or a storm triggers social vulnerability. Resultant damages to the physical and social systems may exceed the ability of the affected local community to cope. Outside assistance, either from national and/or international sources may be needed for recovery.

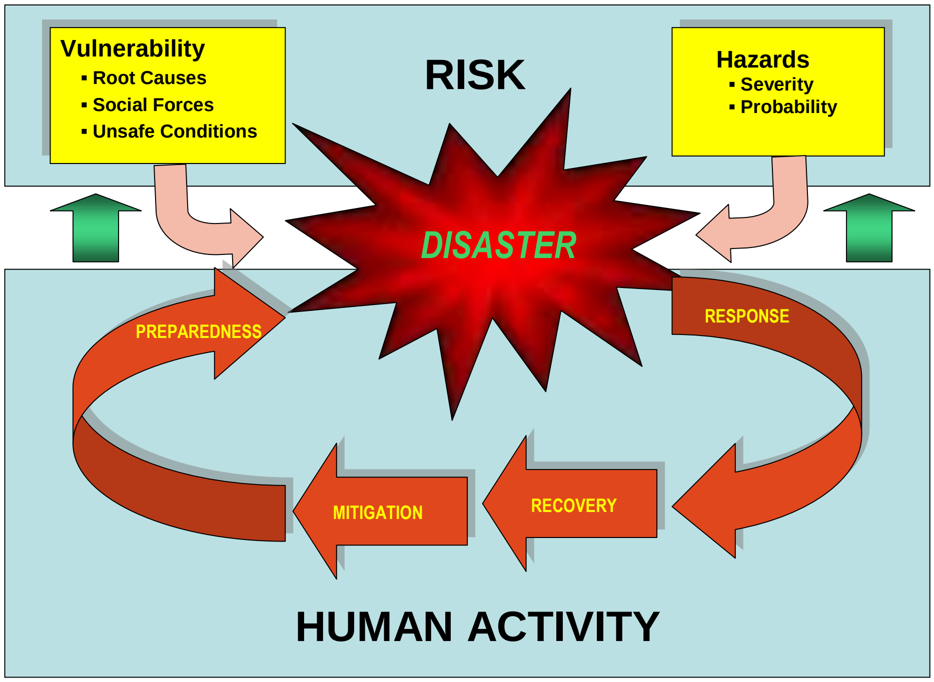

Figure 2-4. The Disaster Adaptation Cycle Theory.
Note. Adapted from Etkin (1999).

Society responds to a disaster by means of four overlapping activities such as response, recovery, mitigation and preparedness. These activities alter future vulnerability. In turn, this alters formation of future disasters. Risk is reduced if these activities are carried out wisely, or not, if they are carried out otherwise. Berke et al. (1997:2), for example, note that `*disaster responses in the form of emergency relief often do not support sustainable development and, worse, sometimes subvert it*" – perhaps reducing self-reliance by encouraging 'victim' mentalities. The relationships shown in Figure 2-4 depict a dynamic, interactive system, composed of both natural and social forces. People use a variety of mechanisms or adjustments to reduce exposure to natural hazards (Burton et al., 1993). Many of these, such as dams and levees, are structural in nature, and are designed to keep natural hazards `at bay'. Building codes designed to withstand unusual loads from snow, wind or ground shaking is an important component of hazard mitigation. Other measures, such as restricting development in flood prone areas, are non-structural. Yet other approaches involve sharing the risk and impacts of disasters, through insurance, non-government organizations such as the Red Cross, or government disaster assistance programs. The past few decades have seen increasing global costs as a result of natural disasters as shown in Figure 2-5, and increasing loss of life in many developing countries (Hewitt, 1997; Burton et al., 1993).

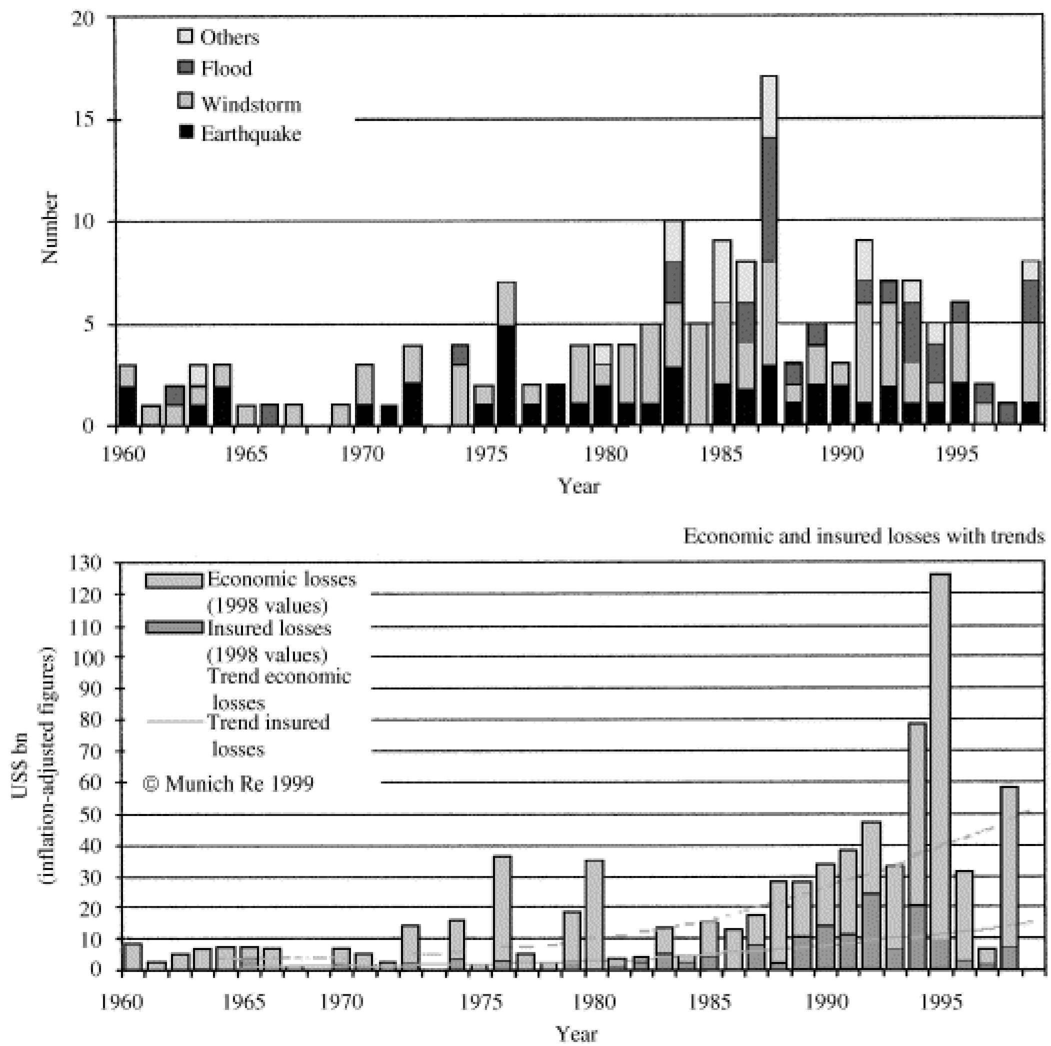

Figure 2-5. The cost of natural disasters.
Source: Munich Re (1999).

These trends have occurred in spite of the stated goal of the United Nations International Decade for Natural Disaster Reduction (IDNDR) that the costs of natural disasters are cut in half by the year 2000. They seem particularly curious because much of the world has put large and increasing resources into mitigating natural hazards. What explains these trends? The answer is complex and – though more frequent extreme events in nature may play a role – a large part of the answer certainly lies in the realm of increased social vulnerability.

4. Modelling Disaster Resilient Communities

Theory Models of disaster risk are evolving because natural disasters are changing. Disaster losses are increasing because vulnerability is increasing. Vulnerability is driven by growing population, growing built environment, growing threats, insufficient application of knowledge and lessons learned, and more by social than by natural factors. Therefore, an assessment approach to vulnerability must include long-term thinking, human responses to changing perceptions of risk, concepts of sustainable development, systems that are both resilient and resistant, and a holistic recognition of interdependence between man and nature, protection of environment, and human action in mitigation efforts.

Mitigation has two types – resistance and resilience. Resistance may refer to the capacity of a community to withstand external forces without any change. On the other hand, resilience is the capacity to 'bounce back' to a pre-disaster condition or willingness of the community to change to a better state. Due to recent global occurrences of natural disasters, many scientists, development experts, disaster practitioners and social workers recognize that not all disasters can be prevented. Some events are also so unpredictable that they cannot even be planned for, although most of them can be diminished and some can be prevented. The key to successful disaster preparedness and mitigation exists at the community level.

Recent flash flood and landslide disasters in the Philippines can provide fresh impetus in reframing disaster risk theory models. Perhaps because these types of natural disasters were less frequent in past decades, they were obscured as ‘disasters waiting to happen’. However, recurrences in recent years have changed their profile. Given that many people have been killed and significant losses have been incurred in recent events, flash floods and landslides are now becoming serious threats to mostly unaware rural communities. It may be true that that there has been insufficient application of knowledge and lessons learned from disaster experiences of previously affected areas. This may explain why other communities who have not experienced flash floods and landslides in their lifetime often underestimate the danger these ‘disasters waiting to happen’ can inflict on them and the impacts are much worse than they could have imagined. One way to verify these human responses to changing perceptions of risk is to conduct an investigation in this area using a test community model. Development of an assessment toolkit will validate this test community model. As preliminary background to this research agendum, it is of benefit to review works on social empowerment, as well as significant studies on flash floods and landslides.

4.1 Humanizing disasters can turn vulnerability into resilience. Extensive studies conducted by Lord (1997) about self-empowerment of vulnerable groups reveal that dis-empowering situations in life catalyze both awareness of powerlessness, and sense of empowerment in an on-going process. He explained that empowerment process is influenced by reflection factors identified by the participants which acted as a catalyst and resulted in two vital changes. Firstly, individuals became aware of their capacities and alternatives to the experience of powerlessness. Secondly, they began to develop new directions for themselves. Individuals are best empowered in the context of relationships. This empowerment process can lead to community-focused entry programs of service institutions to disaster-affected communities.

Cases in point are the Filipino communities affected by the Mount Pinatubo eruption in Central Luzon. Vulnerable psycho-social and economic conditions seem to persist among local people in the aftermath of natural disasters. However, a study by Gaillard (1999) found that local people exhibited a 'bouncing back' attitude to cope with subsistent livelihoods, as well as contend with the threat of lahars. Some engaged in small business, retail merchandise, cultivation, smuggling, etc. Local farmers tried adapting alternative agricultural techniques to overcome limited or non-productivity due to the seasonal threat. They planted quick growing crops such as tomatoes, peanuts, and sweet potatoes instead of the traditional annual yielding produce such as rice or sugar cane. Service organizations such as the Technology and Livelihood Resource Center, Department of Agriculture, Department of Social Welfare and Development and the Philippine National Red Cross, to name a few, reframed their interventions according to the 'bouncing back' attitude of local people. Rather than initiating a top-down mode of empowerment, these organizations worked with local people to tap their own abilities, assets and networks of relationships so as to improve their vulnerable conditions. Complementary activities such as livelihood training, employment skills development and productivity lease schemes were provided to the local people. Priority was offered to those who volunteered among the local people. In this manner the self-reliant values of local communities were harnessed and utilized by service providers to improve their quality of life.

4.2 Recent studies on flash floods and landslides. Initiation mechanisms for natural damming in upstream lakes and river systems that can lead to flash floods are usually involving landslides. Costa et al. (1988) conducted extensive studies on natural processes associated with natural dam formation as components of landslide risk management. They investigated hazards associated with natural dam formation using information from 225 case reports and sampled 73 documented dam-failures. Results show 27% of the landslide dams failed less than 1 day after formation, and about 50% failed within 10 days, and over-topping was by far the most common cause of failure. In a related work, Fell et al. (2000) studied the relationship between the probability of landslide occurrence and rainfall in Hong Kong. They found that rainfall of 1–12 hours duration is important in predicting the number of landslides, and that antecedent rainfall also has some influence. Rainfall for a 1 in 100 year event is calculated and utilized in the prediction of the number of landslides caused by a storm event over the area of Hong Kong Island.

Filipino experts and local scientists also conducted studies on the critical rainfall thresholds for landslides and flash floods. One of these was the recent study undertaken by Daag et al. (2006) in Panaon Island, Southern Leyte and Surigao City relative to the December 19, 2003 events of landslides and flash floods. Their findings show that the daily critical rainfall threshold value of Philippine landslides and flash flood events is between 150 to 200mm of rainfall/day. This is higher than the worldwide critical threshold value of 100mm/day which may be true for some isolated small landslides in the Philippines. Based on 6-hourly rainfall records, the landslides in Surigao and Leyte occurred with intensities of 16 to 20mm/hr, after a sustained rainfall duration of 6 hours. They stressed the importance of antecedent rainfall as most of the historical landslides had significant rainfall days before the actual event, as shown in Figure 2-6.

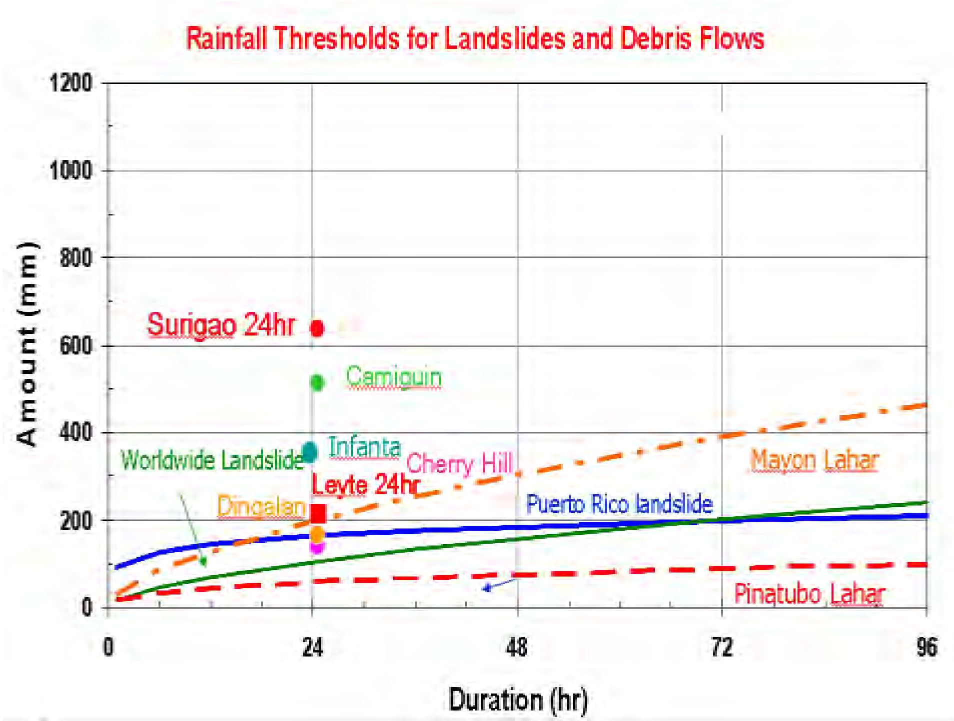

Figure 2-6. Collections of rainfall thresholds from various landslides.
Source: Daag et al. (2006).

5. The Landslip-Disaster Quadrant Model

Combining salient features of the aforementioned theory models, concepts and approaches, it is possible to reframe a holistic assessment tool for flash floods and landslides. As a process, it can determine which of the physical and/or social factors contribute most to community vulnerability, the end goal of which is to build safer communities more resilient to disasters.

5.1 Six building blocks of community resilience. This study proposes and adopts a ***Landslip-Disaster Quadrant Model*** as a holistic conceptual framework for reducing vulnerability and improving community resilience to flash floods and landslides. In this theory, vulnerability is the inverse of resilience. The assessment technique is comprised of the following building blocks after Salter (1997), Cannon (2000) and Buckle (2000):

1. ***Ecological Security*** **–** refers to biophysical resources available in the community which may expose a community to potential hazard risk. Geophysical tangibles like land, climate, environment, infrastructure, lifelines, physical technologies, housing, etc. with their perceived risks can be defined by the knowledge-base of an individual or household living or working in a hazardous habitat like the side of a steep mountain or near a river channel. Historical data of disaster events can provide trends, emerging issues and suitable interventions for mitigating ecological hazards.

2. ***Human Wellness*** – defined by health condition, literacy, self-sufficiency, skills, and psychological conditions of an individual before and after a disaster event. It also includes emotional and mental coping mechanisms for recovery in the wake of a disaster. A person's resilience may relate to a predisposition to self-reliance and survival capability.

3. ***Cultural Values and Norms*** **–** encompass sense of purpose, self-reliance, local preparedness, risk awareness, goals and aspirations of the people, common interests, religion, informal and formal groups, '*community spirit*' or social capital, and gendered roles which can influence the decisions, actions and capacity of people in preparing for, responding to and recovering from disasters.

4. ***Social Structures and institutional Arrangements*** **–** refers to established networks, support systems, partners and stakeholders, and organizational linkages committed to initiate protection and recovery from disaster risks. National and local governments, non-government organizations and locally-based initiatives comprise the capacity of communities for disaster preparedness and mitigation.

5. ***Economic Base and Livelihood Sufficiency*** **–** refers to a stable growing population, economic activity, income-generation skills, welfare benefits, and income-earning assets. It is also a measure of the capacity of an individual and/or household to recover from disaster and move towards normalcy by reinstating earnings or a livelihood pattern sufficient for an individual or household consumption on a day-to-day needs basis.

6. *Political Will and Priorities* – characterized by the power or authority structure, leadership attributes, decision-making, and policymaking processes which can influence the adoption and implementation of development and disaster risk reduction programs in a locality.

While this conceptual model may be a prototype for flash-flood and landslide events, particularly in the Philippines, related methodologies have been employed in other countries for similar types of hazards. One of these is the vulnerability assessment tool used by Durnhan (2001) in comparing results from the Murweh study (rural-single hazard-flooding) and those from the Cairns, Mackay, and Hervey Bay study (urban-multi hazard). These were part of the development and refinement of the disaster risk management process earlier formulated in the Murweh Shire study. The tool is called a community vulnerability profile (CVP) because it was framed for application to all local governments in Australia. The CVP has three major components, as follows: (**1**) Factors operating at individual/household level, (a) association with hazard prone area, and (b) coping capacity; (**2**) Factors operating at community/local government level (internal), (a) public safety service provisions, and (b) social infrastructure resilience, and (**3**) Factors operating at community/local government level (external), (a) public safety service provisions. These key factors were set against ranking values of 1 to 2 as 'less vulnerable', and 3 to 5 as 'more vulnerable'. The author claimed that this development testing was achieved, including the documentation of a disaster risk management, based on AS/NZS 4360.

In his disaster risk studies, Salter (1997) also introduced systematic risk analysis methods in reframing disaster management. He adopts the LICE neumonic to mean **L**ifelines (or infrastructure), **I**ndustry (or commerce), **C**itizens, and **E**nvironment to refer to 'elements at risk'. There are nine information sets with associated example fields which may underpin vulnerability. These are physical, emergency management, demographic, health, communication, psychological, societal or cultural and organizational. These sets of information were tested in fieldwork carried out in 1996. As a result of this application, it was suggested that this assessment tool was useful in sorting out management issues. Buckle (1999) enriched his own work of redefining community and vulnerability by using a case study method. These cases included the East Gippsland (Victoria) Floods in June 1998 and the Victorian gas disruption in October 1998. This approach lays major groundwork for identifying vulnerability or resilience in a community context. He also explained how social issues or trends can have cross-cutting implications for emergency management and sustainable development. Buckle's (2001) full methodology is now embodied in the guidelines for assessing resilience and vulnerability in the context of emergencies by Emergency Management Australia.

In the United Kingdom, related approaches and modeling were also carried out by Fordham (1999). Her work on participatory planning for flood mitigation was drawn from context and practices of developed countries such as UK, USA and Portugal. She focused on the gendered vulnerability of women structural engineers in the analysis of disasters. The factors of resilience and vulnerability used were biological, economic, social, political, cultural and environmental with variables or sets of information under each. Recent work by Cannon (2000) examined details of vulnerability in his analysis of disasters using five components. These are initial well-being of an individual, livelihood resilience, self-protection, societal protection and social capital. His comprehensive method of analysis was framed using a flood disaster situation.

As compared to Cannon's five components, the six building blocks featured in Figure 2-6 are comprised of the individual well-being, ecological status, psychological and cultural attributes, economic conditions, institutional networks and political system. Under the lens of these six blocks, communities at risk of flashfloods and landslides in the Philippines can be diagnosed comprehensively. Elements at risk such as people, communities, properties, infrastructure and social networks can be rated according to their exposure to disaster from high vulnerability (low resilience) to low vulnerability (safe or resilient).

In particular, the author's Model includes one important block which is ecological resilience or security. This block marks the deviation from the social 'extremes' that natural disasters can be prevented altogether. Given the severity and perhaps more frequent occurrences of natural disasters today, society can at best, mitigate the impacts but not totally prevent them. Structures and social practices can influence natural processes and even alter them to some degree. However, it may be futile to 'control' them. For example, is the construction of a costly mega-dike to prevent tons of lahars from flowing into low-lying communities the right choice (Leone et al. 1999)? These lahars were deposited at the slopes of Mount Pinatubo when it erupted in 1991. The dike did not stop lahars from flowing downstream especially during the rainy season. The dike protected those communities situated near where it was constructed but, lahars flowed to other communities not shielded by the mega-dike. Water flows towards the lowest point regardless of impediment. Also, political economy can colour decision-making in relation to which communities can be 'buried' and which should be protected. In view of these complex social issues, one well-respected local scientist suggested that nature be permitted to heal itself. Therefore, this block on ecological security balances the view between hazards and social vulnerability. In this block, the diagnosis and scientific explanation of the flash-flood and landslide events can provide understanding of the diverse human perceptions and behaviours in relation to disaster risk. For example, are risk perceptions of local people changing when prompted by warnings based on scientific information? If not, then where do they base their perceptions and why?

The Landslip-Disaster Quadrant Model

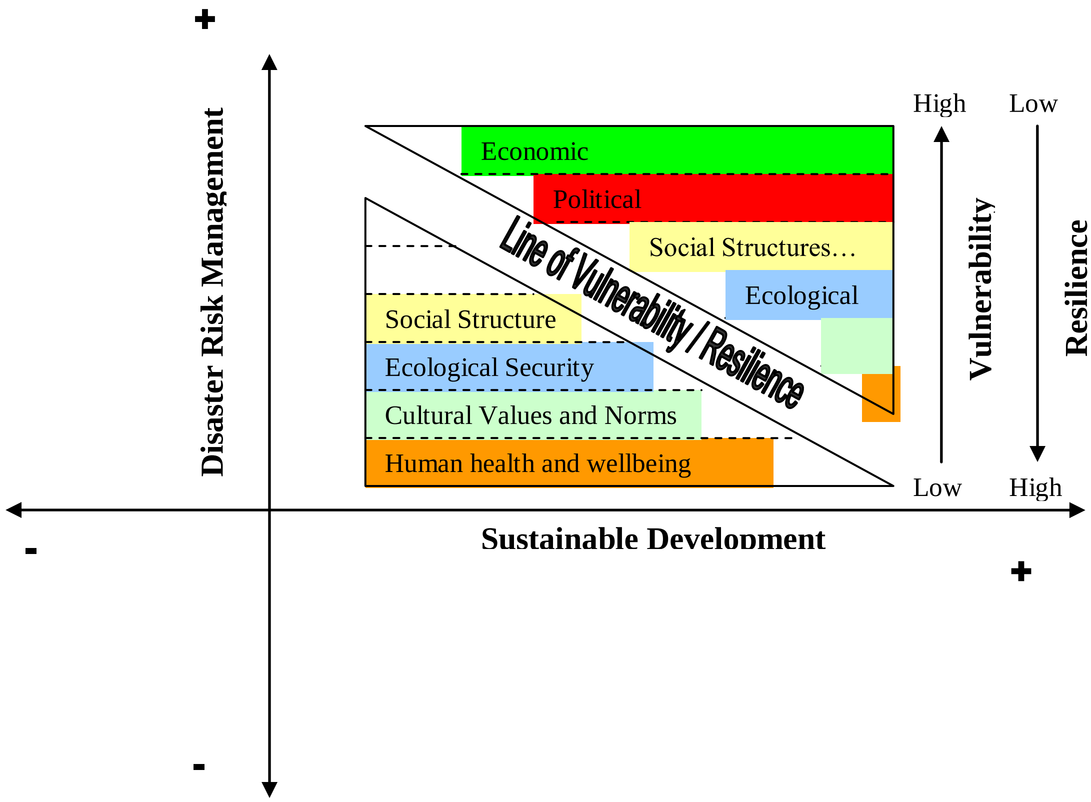

Figure 2-7. Quadrants of development as influenced by the building blocks of community resilience in the context of disaster risk reduction.

As a whole, this approach could serve as a toolkit to standardize measurements of key variables for assessing disaster risks. Through this method and management process, the coping capacity of threatened communities can be identified and contribute to the achievement of sustainable development by reducing disasters.

5.2 Vulnerability assessment tool: *How the visual model works*

The visual model in Figure 2-7 is actually a triangle folded from a square that represents the sloping side of a mountain at a 90° angle. The square represents the holistic and comprehensive approach, and each influencing factor is a building block of equal importance (equilateral and equiangular). Once unfolded into a square, it reveals the flip or `hidden side' of the triangle which captures the capacity (resilience) and vulnerability components which characterize a particular community. The vulnerability of communities at risk is embedded in their adaptive capacity (resilience) which a disaster situation triggers and exposes in the 'crisis period'. Broken lines distinguished by different colors are the influencing factors in equal proportion as they interface in the overall building of the six blocks. The colored blocks represent quantitative and qualitative descriptions of the high and low values of each of the influencing factors as they are assessed using measurable variables. Indicators will show the 'size' or 'influence strength' of a building block in the vulnerability and resilience assessment ratio. The positive and negative signs in the diagram refer to the vulnerability. Resilience is simply the inverse of vulnerability, as depicted in the diagram.

The 'trigger or threshold points' depict a cursor line of vulnerability or resilience of communities at risk as 'breached' by the cumulative effects of the various influencing factors: ecological, political, economic, cultural, social and human wellness, characterizing the flashflood and landslide disaster affected communities .

Interventions and remediation measures can be assessed too, using the signed-positive and/or negative quadrant approach to show whether an intervention reduces disaster risk and/or fosters development sustainability over a period of time. The following scenarios, though not exhaustive, attempt to amplify and explain grid application of the Landslip-Disaster Quadrant Model using Handmer's (2006) Hurricane 'Katrina' case analyses:

1st Quadrant Scenario: (+ = x-axis) Sustainable Development, (+ = y-axis) Disaster Risk Reduction

A century ago, New Orleans was America's second port, a prosperous city and an economic powerhouse, which explains the development and progress invested in the region despite its physical exposure to natural hazards associated with hurricanes and storm surges. As the emerging economic centre at that time, development progress provided employment opportunities, fostered a better quality of life and hastened commercialization in this region. However, economic vitality also attracts more people to settle in hazardous places.

Exposure of New Orleans to natural disasters is connected to the Mississippi delta where the city is built. The delta is an even more striking monument to the river's constructive work. There, at the tip of the drainage funnel, millions of years of sedimentation have spilled out across the floor of the Gulf of Mexico, forming cones of sediment that total 300 miles in radius and 30,000 square miles in area. The surface expression of the many sub-deltas is the Mississippi delta, with an area exceeding 11,000 square miles. Stretching its distributaries into the gulf, the Mississippi once delivered some 220 million tons of sediment there each year, most of it as silt (Fischetti, 2001). Today, however, much of this silt is captured behind upstream dams, causing the delta to erode and shrink in area. Compounding this problem are the many hundreds of miles of levees (walls that limit flooding) along the river's banks, which trap silt in the channel proper. This is especially damaging in the delta, where annual silt additions from flooding help to keep it from being eroded by waves.

2nd Quadrant Scenario: (- = x-axis) Sustainable Development, (+ = y-axis) Disaster Risk Reduction

Along with economic boom and expansion, the Mississippi Delta region deteriorated quickly because of human activities that dramatically increased the risk. These human-induced environmental changes were caused by river dredging and the construction of levees, navigation channels, and pipeline canals for oil development. In 1960, a study by the Louisiana State University suggested that trees provided some protection for the levee against surge. Because of this the structural measure for flood control was developed and reinforced in this region. In another study by Fischetti (2001), it was revealed that the loss of the low-lying Mississippi Delta marsh—disappearing at a rate of 25–30 square miles a year, clears the path for storm surges to wash over the delta and pour into the depression that is home to New Orleans. He added that human activities along the Mississippi River have dramatically increased the risk, and only a massive reengineering could save the city from inundation.

Months earlier, the Federal Emergency Management Agency (FEMA) had conducted a scenario paralleling the actual event in the region simulating a category 3 storm dubbed "Hurricane Pam". Neither the hurricane hitting the city nor the inability of over 100,000 people to evacuate was a surprise. The whole event down to the many details was thoroughly well predicted and rehearsed. This capability-building preparedness makes the people well aware of the threat of living below sea and river level

3rd Quadrant Scenario: (- = x-axis) Sustainable Development, (- = y-axis) Disaster Risk Reduction

It was contended that the analysis for the design level of a 1:250 flood crisis to occur was as much as could be economically justified. The dyke was basically constructed to keep the sea at bay, but not simply seawater (some water can be absorbed by a normal dyke failure for a time, which will drain away), but seawater contaminated seriously by sewage and chemicals from 31 'superfund' sites (contaminated sites identified for national priority clean-up), as well as hundreds of major additional sources of chemical and biological contamination. Failure threatens the future of the entire city and maybe the entire region of 2 million people.

In post-Hurricane Katrina investigations, reports show that the protective dykes were found to be poorly designed, built and maintained. A number of the breaches were the result of faults in design and construction. As also reported in the *Washington Post* (2005), other investigators suggested that flood-control dykes were not as strong as expected. Some sections failed even without overtopping, while other sections failed after the foundations were eroded.

Besides increased settlements in the eroding delta which exacerbated the vulnerable situation, poverty in New Orleans is pervasive and systemic. As reported by Total Community Action (2004), approximately 27% of the population lives below the federal poverty line. The percentage of disabled over the age of 65 years is 48.1% for the state of Louisiana, and for those aged 21-64 years, 22.1% In common with other US disasters, many of the poorest are renters who found themselves facing eviction in the immediate aftermath of the event (Miller et al., 1992). Those without private health insurance had very limited access to medical facilities. Many outside the city live in small French speaking Cajun communities with a partly subsistence base. Adjacent towns were not at all helpful. In short, by almost any criteria, many of the people of New Orleans are very vulnerable to disaster.

This shows the evolution of the attributes of the city's hazard risk, where development can introduce vulnerability to 'new' technological hazards. Hurricane Katrina brought these vulnerable conditions of the people and the city into the surface.

As a whole, the following are the challenges posed by the New Orleans situation: (1) very large scale evacuations; (2) the total collapse of infrastructure and unavailability of accommodation, food and water; (3) high demand for and/or difficulty in sustaining prolonged relief and rehabilitation services to include safe drinking water, food, shelter, clothing, healthcare and medicine (3) an inability to make effective decisions in a major crisis, and (4) dealing with large-scale organized criminal behaviour, and avoiding shrinkage of the local economy.

4th Quadrant Scenario: (+ = x-axis) Sustainable Development, (- = y-axis) Disaster Risk Reduction

As a major port and thriving economic hub, shipping industry in the region needed expansion where engineering infrastructure had been constructed. Evolving exposure of New Orleans to storm surges was exacerbated by a major shipping channel cut through the delta wetlands in the 1960s. The BBC (2005i) reported that the channel may have made the surge of Hurricane Katrina 20% higher and much faster. In this case, economic justification did not minimize vulnerability to disaster risk; instead it increased exposure to it.

Hours before the landfall, the majority of those at risk were evacuated in some chaos because a normally short drive took the best part of a day. However, over 100,000 people did not evacuate. Many of these people did not have the means to do so, including many tourists. Others decided to stay. This entailed a very large evacuation which exposed serious problems in the response capability at all levels of government as admitted by President Bush (BBC, 2005ii).

During the landfall, New Orleans initially seemed to have escaped the worst of the winds as Katrina's eye passed to the east of the city, but the earthen levees which separate the city from the surrounding lakes could not withstand the prolonged battering from the strong winds, heavy rain and 8.5 metre (28 foot) storm surge.

As a result 80% of the city was left under water by 31st August, after the levees were breached in several places and water flooded in from Lake Pontchartrain, which had been swollen by water surging in from the Gulf of Mexico. New Orleans sits mostly below sea level on swampland, and parts of the city were left under as much as 6 m (20 foot) of water. The levee system was built to withstand a Category 3 hurricane. Katrina was Category five, the strongest type. It produced winds of up to 225 k/hr (BBC, 2008)

Disaster risk management was not a high political priority in the state of Louisiana (Times Picayune, 2005), despite its location and opportunities for predicted and rehearsed catastrophe. Reports revealed that the performance of the police was poor and possibly counter-productive with a range of looting, violence, and allegations such as preventing the entry of relief teams and other sullies made against them (and other paramilitary forces). Some 50 officers resigned during the event and many others, maybe as many as 250, failed to report for duty. Some other services such as the local fire service and National Coast Guard appear to have worked well.

The mini-Katrina scenario analyses and application of the proposed Model suggest that it can be a toolkit both for training and research. This Model can be applicable in disaster case assessment techniques like Technology of Assessment and Participation (TAP) for use in training and brainstorming sessions.

Conclusion

Various schools of thoughts, theories, approaches and previous works on disaster risk reduction and vulnerability assessment were discussed and analyzed in this chapter. Recent social empowerment studies and research on flash floods and landslides were also reported. The literature reviewed helped to build the study framework for a community-focused vulnerability assessment of disaster risk, the result of which is a new theory model called the Landslip-Disaster Quadrant Model on community resilience. Six building blocks comprise the Model. These are ecological security, human health and wellness, economic base and livelihood sufficiency, cultural values and local norms, social structures and institutional networks, and political will and priorities. Development of a survey questionnaire and interview guidelines framed after these six building blocks was carried out to flesh out and test the model. These will be presented in the succeeding chapters

The next chapter discusses the research design, methods and study path adapted in this research work. It will also report on data collection, data analyses, survey questionnaire development, interview guideline formulation, validation and translation processes, research ethics and other strategies used for the fieldwork activities.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

Introduction

This chapter outlines the methods used to collect and analyze data on reducing vulnerability and improving community resilience in flash-flood and landslide-prone localities in the Philippines. The following four major sections are discussed in this chapter: (1) research framework and study path, (2) development of vulnerability assessment toolkit, data analysis methods and information, (3) validation and translation process for questionnaire and interview guidelines, and (4) ethics, fieldwork and post-data collection strategies. The first section covers the strategy and data collection methods and areas of data collection. The second section discusses the structure of the survey questionnaire, interview guidelines for survivors' stories and checklist guideline for discussion with officials and service providers. The third section explains the data analysis methods and information from the five natural disasters, officials and service providers, community respondents and disaster survivors. The fourth section presents the validation techniques and translation process adapted for the questionnaire and interview guidelines. The last section reports the ethics, fieldwork and post-data collection strategies undertaken in the study sites.

This study examines recurring flash-floods and landslides in the Philippines from 1991 to 2006, and aims to understand the causes, behaviour, distribution and biophysical impacts of the various natural forces and human factors which influence hazard vulnerability and community resilience to natural disasters. A community-focused model has been developed to be tested and modified by a capacity and vulnerability assessment toolkit using a survey questionnaire and interview guidelines. This is the Landslip-Disaster Quadrant Model on community resilience discussed in Chapter 2 (see Figure 2-7).

1. Research Framework and Study Path

The design adopted for this research is a combination of qualitative and quantitative methods. Schutt (1996) states that supplementing quantitative data collected in experiments and surveys with more qualitative data (Dey, 1999; Cresswell, 2003) obtained with field research techniques can clarify the meaning of particular measures and the nature of causal influences (p. 355). Field research can be quantitative or qualitative. Quantitative research provides statistical information like how many potential clients there are and what their average incomes are. Qualitative research, on the other hand, examines people's feelings and attitudes towards a product or service, and what motivates them. Often the main purpose of combining methodologies is to enhance the final quality of the data collected (Axinn et al., 1991; Massey et al., 1987). According to Babbie (1998), replication and triangulation are general solutions to problems of validity in social research. In social research, triangulation refers to looking at the research question from several viewpoints. It is similar to surveyors who place instruments on three hilltops to obtain overlapping readings of the location of the valley or plain below. When interviewing people, the researcher has to take on trust that the respondent is telling the truth. This could be a weakness in this first method and can be avoided by using a second method, like observation technique. Checking the respondent's behaviour by observing them in their everyday life and taking notes of these behaviours can verify if they actually do what they told the researcher they did. This combination of different methods gives a researcher a better picture of someone's life and behaviour. This is the concept of the triangulation method (Babbie, 1998). Figure 3-1 shows the whole design of the research work and path of the study. It includes various research techniques employed so as to achieve the thesis goals, outcomes and direction.

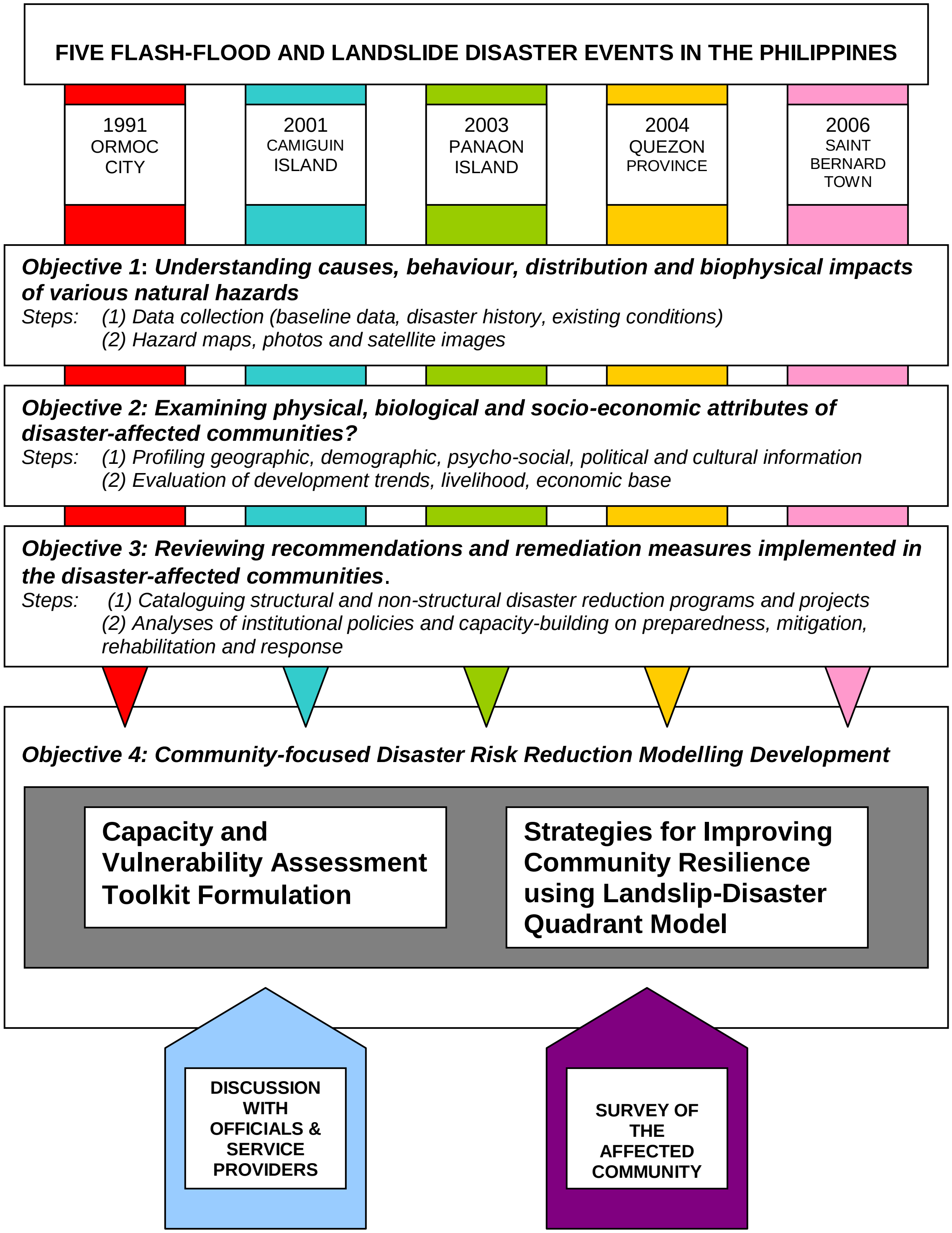

Figure 3-1. Research design and framework of the study.

1.1 Strategy and Data Collection Methods

The process for gathering information is crucial to fulfilling the study's objectives. The data collection strategy was divided into three phases, with each phase underlying the next. The first phase was analysis of relevant documents to gain a preliminary knowledge of the five flash-floods and landslides, and the disaster-affected communities. This is necessary because it gives the researcher a feel for past and present social facts and surrounding issues of the target study areas, in an unobtrusive manner (Fraenkel et al., 1996).

A non-probability, purposive sampling of readily available print media was undertaken. This method is preferred because the sampling frame or the population is so widely dispersed that cluster sampling would be too inefficient. Non-probability techniques are cheaper than probability sampling, and are often used in exploratory studies (Dey, 1993; Brown 1999). Transcripts obtained from key word searches using Philippine newspaper websites such as www.mb.co.ph, www.manilatimes.net, www.phildailyinquirer.com and www.philstar.com were included in the information gathering. Library databases were searched. Data and information from Philippines' National Disaster Coordinating Council Reports, World Bank Study, World Disaster Reports, and Science Report Series publications were also accessed. Finally, the World Wide Web was used to obtain information regarding the research project and included, but was not limited to the following websites: www.ema.gov.au; www.disasterrelief.org; www.sustainable.doe.gov; www.deh.gov.au; www.ndcc.gov.ph; www.upd.edu.ph; www.eco.ops.com; www.worldbank.org; www.cred.be, and many others.

The second phase involved intensive interviewing, according to pre-planned topics, which were asked in a consistent manner, relying primarily on open-ended or semi-structured interviews questions. One of the primary goals of intensive interviewing and discussion is to develop a comprehensive picture of the interviewee's views in his or her own terms (Schutt, 1996). An interviewing guideline has been developed to provide a list of topics to suggest lines of inquiry (Weiss, 1994).

Thirdly, the research was strengthened by the collection of quantitative and qualitative data on community studies. The survey questionnaire was the source for the quantitative data (Appendix 1). Qualitative information was drawn from the open-ended and non-prompted interviews of local respondents and the stories of seven survivors. These community respondents were recipients of disaster services and resources. Behaviours, practices, perceptions, views and suggestions regarding their coping capacity to disasters comprised this type of community study. The other group was the local officials and service providers. Self-assessment of staff competency and organizational capacity to handle crises management pressures formed part of the community study. This includes review and assessment of disaster programs and projects. The strength of the method lies in collecting large amounts of information from a relatively large number of respondents (Brace, 2004; Babbie, 1973). Such efficiency will allow for the maximization of available time and resources (Frey, 1989).

The following discussion amplifies the research design and study framework in Figure 3-1. It explains the sources, procedures and rationale for the collection of data and subsequent treatment of the information gathered.

1.2 Areas of Data Collection

The study utilized both qualitative and quantitative research methods. The qualitative interview as a data-gathering technique is a process of finding out what others feel and think about their worlds. The result is to understand the major points of their message and how it compares to the researcher’s own situation. Dey (1999) and Creswell (2003) argued that such a technique can engage the researcher more actively with selected residents or the target audience. The process involves listening to lengthy explanations concerning the respondent’s experience or perception of the issues and concerns with the disaster problem, asking follow-up questions tailored to the preceding answers, and seeking to learn about their attitudes, beliefs and value system. The stories of survivors and the answers of the participants to the open-ended and non-prompted questions of the social survey were the main sources of qualitative data. Discussions and interviews with officials and service institutions also provided qualitative data, particularly on priorities, issues and problems regarding delivery of services and goods.

Quantitative data gathering, on the other hand, involves the classification of features, counting them, and employs statistical analyses in an attempt to explain what is collected. For example, a researcher will ask questions of a participant that include words, such as how often, how many or percentages. The answers to these questions will be numerical. The results of this numerical data are analysed using statistical methods that can be displayed in tables, charts, histograms and graphs. Sources of quantitative information in this study derive from responses of local people to questions on demographic, geographic location and built environment, economic, psycho-social, and cultural conditions in their community. These also include people’s rating of the community’s counter-disaster capacity and existing institutional arrangements.

There are three areas of data collection for the study: (1) five natural disasters of flash-floods and landslides; (2) formal interviews and informal discussions with officials and service providers about institutional and capacity-building programs, and (3) surveys of the landslide-affected communities. The following discussion also includes the procedures employed, their advantages, collection strategy and data analysis.

1.2.1 Five natural disasters. Natural disasters in the Philippines, which include typhoons, floods, earthquakes, volcanic eruptions, droughts, lahars, flash floods, and landslides, have killed about 34,000 people from 1971 to 2000 according to the United Nations Environment Programme (Falk, 2004). The Philippine National Red Cross (2001) has estimated 35 million people nationwide were "severely affected by natural disasters" from 1990 to 2000. Typhoons accounted for 85 per cent of those affected.

However, in recent years, many people have been killed by frequent flash floods and landslides in various areas across the country. This fact seemed to be obscured in most records of the National Disaster Coordinating Council because these impacts on people and communities were subsumed under the category of primary-causing natural disasters such as typhoons, earthquakes or volcanic eruptions. This provides the premise for this investigation in understanding the causes, frequency, distribution and biophysical impacts of natural disasters on the communities at risk. A 15-year time period, 1991-2006, was chosen in which to examine such events. Based on the data of the Philippines' National Disaster Coordinating Council (2006), at least eight to ten major occurrences of natural disasters related to flash floods and landslides were recorded in this period.

The Philippines is divided into a hierarchy of local government units (LGUs) with the province as the primary unit. It is headed by a Governor. As of 2007, there are 81 provinces in the country. Provinces are further subdivided into cities and municipalities. A mayor heads a city or municipality. A city or municipality is composed of barangays. The barangay is the smallest local government unit. It is headed by a Barangay Captain. The term of office for all local elective officials is three years, starting from noon of June 30 of an election year. The May 14, 2007 national and local elections in the Philippines coincided with this research and fieldwork carried out between April and June 2007.

All provinces are grouped into 17 regions for administrative convenience. Most national government agencies establish regional offices in these administrative divisions to serve the constituent provinces. The regions themselves do not possess a separate local government, with the exception of the Muslim Mindanao region, which is autonomous.

Selection of disaster events is based on the following geographic distribution and regional classification of the three-island groups in the Philippines, as shown in Table 3.1.

Table 3.1. Geographic distribution of natural disaster case studies in the Philippines.

Island Group	***Region***	***Province***	***Communities Case study***	***Natural Disaster***	***Year of Event***
Luzon	4-A	Quezon	Real, Infanta, Nakar (REINA)	Typhoons "Unding", "Violeta", "Winnie" and "Yoyong",	2004
Visayas *(Eastern)*	8	Leyte	Ormoc City	Typhoon "Uring"	1991
		Southern Leyte	Panaon Island	Inter-Tropical Convergence Zone	2003
		Southern Leyte	Saint Bernard	La Nina episode	2006
Mindanao *(Northern)*	10	Camiguin	Camiguin Island	Typhoon "Nanang"	2001

Source: National Disaster Coordinating Council (2007)

The sampled communities do not only provide a geographic representation of the country's problem in relation to natural disasters but, importantly, are more suitable for a case study approach. According to Yin (2003), a case study approach is an empirical inquiry that investigates a phenomenon within its real-life context. Case study research, either single or multiple, can include quantitative evidence, rely on multiple sources of evidence and benefit from the prior development of theoretical propositions on a problem.

He notes that case studies should not be confused with qualitative research and points out that they can be based on any mix of quantitative and qualitative evidence. Rather than using large samples and following a rigid protocol to examine a limited number of variables, case study methods involve an in-depth and detailed examination of a single event. They provide a systematic way of looking at events, collecting data, analyzing information, and reporting the results (Yin, 2003). As a result, the researcher may gain a better understanding of why the disaster happened, and what is important to examine in future research.

Gap analysis was also employed in the assessment of the level of implementation of recommendations made by previous studies in the target areas. A gap analysis process involves determining, documenting and taking note of the difference between basic requirements and current capabilities. It answers the basic questions, where are we now and where are we going? Such process has provided some guidance and direction in the development of the interview guidelines to be used in the discussion with the officials of institutions and service providers. Also, the survey of the community relied on the quality and type of questions formulated based on effective gap assessment and directional analyses of previous research and unpublished reports. The outcome of which was a vulnerability assessment toolkit for the conduct of community studies.

1.2.2 Interviews and discussions with officials and service providers.

Information about institutional and capability-building activities for community preparedness and disaster mitigation are sourced from informal discussions with officials and service providers during tours and on-site inspections of projects sites or coffee breaks during committee meetings. Some are sourced from formal interviews when allowed to conduct an appointed one-to-one talk about disaster programs and activities being implemented or fully carried out. A checklist guideline was designed to elicit critical information from the participants (see Table 3.7). A program-based review and assessment technique was used to analyse the information gathered from the key participants.

Twenty (20) key officials and service providers were selected for interviews and/or informal discussions. Replication is not the same as repeated measurements of the same item. Measurements are dealt with differently in statistical experimental design and data analysis (Lewis-Beck, 1995). A replication technique based on qualitative data analysis (QDA) was employed in this study group. QDA or qualitative research is the analysis of non-numerical data, for example, words, photographs, observations, etc. In this study group, replication was not based strictly on the number of participants but more on the functional roles and responsibility they discharge in a disaster, as well as in development committees (see Figure 5-16, Chapter 5). The idea was to focus on the `holders' of power or authority behind disaster services or programs at their level of governance or administration. Table 3.2 shows a "power locator" matrix for these selected participants. In some way, this can address the issue of replication. More importantly, it can also provide necessary input to the Model's building block on political will and priorities (Figure 2-7, Chapter 2).

These participants are power-holders and perform functional roles in both development and disaster coordination committees. Personal views, attitudes and beliefs can also be elicited from these officials that may influence the governance, priorities and political economy towards disaster-affected communities. Their perceptions can also be used to verify and compare with the results from the community survey.

Table 3.2. "Power locator" matrix of selected officials and service providers.

Local Government Structure			Portfolio Characteristic	Level of Governance
Province	*City/Municipal*	*Barangay*		
(1) Governor	(1) Mayor	(4) Captains (4) SK	Elective government position	Level 1
(1) PDO (1) BO (1) CDDO	(1) PDO (1) SWDO (1) AO (1) HO (1) CDDO (1) Engineer		Appointive government position	Level 2
(1) PNRC Administrator			Non-government position	Level 1

Legend: PDO = Planning and Development Officer
BO = Budget Officer
CDDC = Civil Defense Deputized Officer
SWDO = Social Welfare and Development Officer
AO = Agricultural Officer
HO = Health Officer
SK = [2]*Sangguniang Kabataan*

1.2.3 Survey of the Community. Information from the community was collected using a survey questionnaire and interview guidelines.

1.2.3.1. Survey questionnaire. The proposed research involved the collection of quantitative survey data. The strength of the method lies in collecting large amounts of information from a relatively large number of respondents (Brace, 2004; Babbie, 1973). Such efficiency will allow for the maximization of available time and resources (Frey, 1989). The community studies using survey questionnaire were approved by the University of Newcastle's Human Research Ethics Committee (Approval No. 365-0207 and Safety Clearance No. 136/2006). The questionnaire survey consisted of questions relevant to the building blocks of the Landslip-Disaster Quadrant Model (see Figure 2-7, Chapter 2). The survey also contained questions (Appendix 1) clearly defining physical, social, economic, cultural, institutional and political conditions of the study community. Response rates (Frey, 1989) were maximised by identifying potential respondents through the Barangay Captain

[2] *Sangguniang Kabataan* refers to the elected officers of the *Katipunan ng Kabataan*. *Kabataan* is a Filipino term for youth, *katipunan* means organization, *sanggunian* means council.

or village chieftain. An orientation about the study was discussed with leaders of the village in their regular weekly meeting before asking volunteer participants to complete the survey questionnaire.

***1.2.3.2 Selection of study communities**.* The recent landslide disaster in Guinsaugon, Saint Bernard, Southern Leyte was a fitting case study for community surveys. How the local people responded to this natural disaster and coped with its consequences can indicate the importance of community preparedness and how to improve resilience to disasters. Basically, four *Barangays* of the municipality of Saint Bernard were selected as the study community because of their proximity to the disaster site as shown in Figure 3-2.

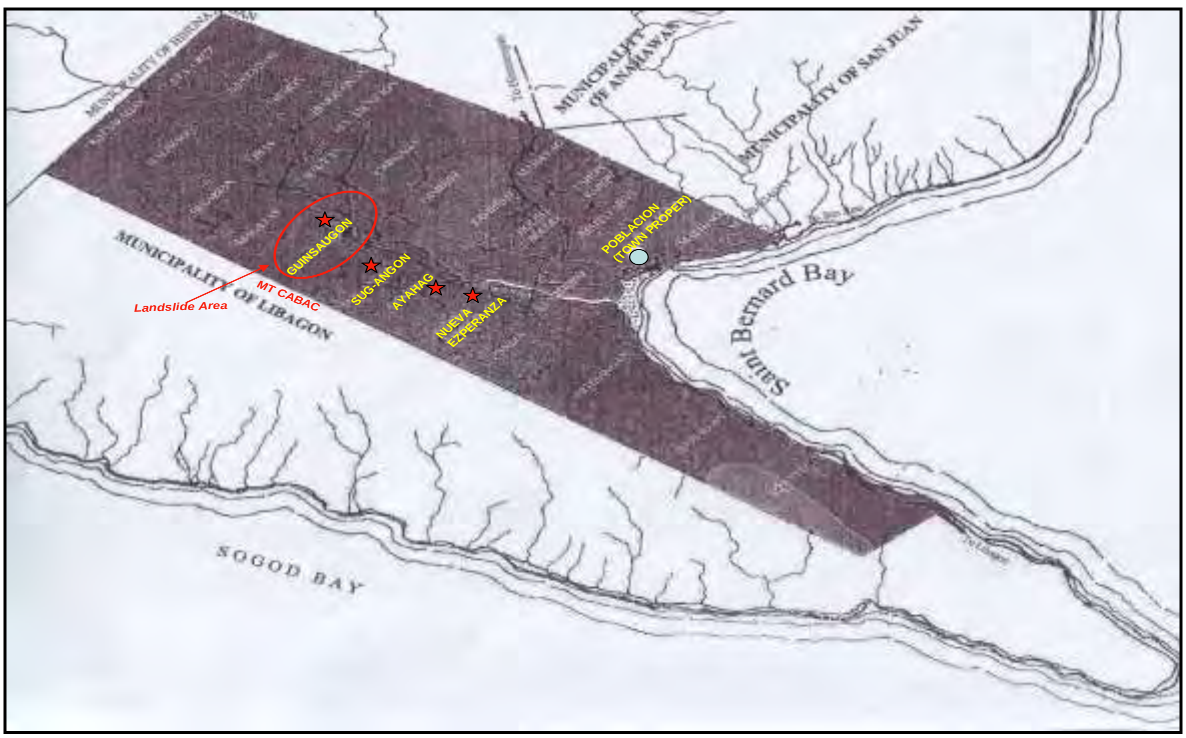

Figure 3-2. Location map of four barangays of Saint Bernard municipality in Southern Leyte selected as community study. Source: Municipal Profile, Municipal Planning and Development Office (2007).

As for the fieldwork, households identified as at high-risk of repeated landslides by the local government were transferred into evacuation centres. These evacuees were temporarily sheltered near the public schools at the town proper or poblacion. Relocation site development and housing projects were underway for Barangays Sug-angon, Ayahag and Nueva Ezperanza. However, hardest-hit *Barangay Guinsaugon* was prioritized by the government to have their relocation houses completed ahead of the other villages. Remnants of the old Barangay Guinsaugon transferred from the evacuation centres to their permanent resettlement houses called New Guinsaugon Village on February 2007.

The following criteria and descriptions in Table 3.3 were used as a guide in the selection of the study community. Selecting the last three communities was relevant as a sampling strategy to keep a balance in gathering comparative and contrasting views, issues and suggestions of improvements to community resilience, so as to avoid the unrepresentative results that would have occurred if information was taken only from the hardest-hit Guinsaugon community.

Table 3.3. Criteria for the selection of study communities.

Criteria	**Study Community or *Barangay***			
	Guinsaugon	**Sug-angon**	**Ayahag**	**Nueva Ezperanza**
Total Population	1,857	384	1,220	445
Distance to the town proper or poblacion	9 kms	7.2 kms	4.6 kms	3.0 kms
Number of households in evacuation centres	330	121	224	104
Approximate distance from the landslide site (Guinsaugon)	0	1.0 km	1.5 kms	2.0 kms

Source: Municipal Profile, Saint Bernard Municipal Planning and Development Office (2007)

1.2.3.3 Sample. Saturation sampling is a type of non-probability sampling where every person from a given population is selected as a sampling unit (Simon, 1985). Table 3.4 shows the combined population of the target *barangays* in Saint Bernard that are to be relocated to new community sites by the government, which is less than 3,000 residents.

Table 3.4. Sampling strategy and population targets employed in the Saint Bernard's community survey.

Target Community	Total Population	Households for Relocation	Number of Surveyed Participants
Barangay Guinsaugon	795	330	***31***
Barangay Ayahag	984	224	***33***
Barangay Nueva Ezperanza	396	104	***34***
Barangay Sug-angon	342	81	***34***
Total	2,517	639	**132**

Source: Southern Leyte Master Plan for the Rehabilitation of Disaster Affected Areas, NDCC (2006).

2. Development of Capacity and Vulnerability Assessment Toolkit

The testing and refinement of the Landslip-Disaster Quadrant Theory Model (see Figure 2-7, Chapter 2) would rely on the information and data to be collected via the survey questionnaire and interview guidelines. The formulation process is discussed in this section.

2.1 Preparation of the draft questionnaire and interview guidelines. In this research, the *Flash-flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience Questionnaire* (Appendix 1) was used as the principal means of data collection for the community study. Survey questionnaire is considered the most effective method for collecting information from a large number of subjects, and can be done simultaneously and efficiently (Brace, 2004; Babbie, 1973). An interview guideline was also used in the execution of in-depth interviews with survivors (see Table 3.6) to complement the survey questionnaire. In qualitative research, semi-structured interviews are commonly used. A list of questions is designed to obtain certain information which can be compared and contrasted with information from other interviews. Similarly, in-depth interviews involve not only asking questions, but also the systematic recording and documenting of responses coupled with intense probing for deeper meaning and understanding of the responses. This interviewing process often requires repeated interview sessions with the target audience. Unlike focus group interviews, in-depth interviews occur with one individual at a time to provide a more intimate experience.

For the interview of officials and service providers, a checklist guideline (see Table 3.7) was also developed. These are questions about the status of disaster management programs and activities being implemented by their institutions in the disaster-affected communities.

The use of questionnaire survey can also have weaknesses. According to Aday (1996), characteristics of the participants, like their knowledge, experience, motivation and personality can affect the data being gathered. Moreover, participants may not entirely report their views and attitudes accurately. Usually, surveys have a potential for a low response rate and for failure of participants to complete all questions. Pilot-testing was employed to address this problem. Also, the context, meaning and validity of the questions derived through a proper translation process helps to ensure clarity and common understanding of concepts, meanings and views for the participants. Another strategy to ensure the participants were motivated to answer the survey questionnaire seriously was to first explain the study to the community officials in one of their regular meetings. In turn, the community officials themselves could help explain the importance of the study and encourage local people to participate.

The questionnaire was tested with both Filipino- and Cebuano-speaking respondents in Australia to ensure that the expression was intelligible. It was also tested on local residents in the Philippines to ascertain common understanding and for easy comprehension. Two panels of volunteer experts from Australia and the Philippines were arranged to critique the questionnaire (Table 3.5).

Table 3.5 Critique panels for the two versions of the questionnaire.

Filipino Version Panel	Cebuano Dialect Panel
Two Filipino-speaking Australian Citizens	Two Cebuano-speaking Australian Citizens
Two Filipino Instructors in the Philippines	Two Cebuano-speaking Instructors in the Philippines
One Filipino-speaking Training Specialist	One Cebuano-speaking Training Specialist

The respondents were not required to give their names to assure anonymity. Respondents may not give truthful views and answers if not given the assurance of anonymity (Robson, 1996; Aday, 1996). However, in this study, the participants were given the option to choose whether or not to sign once they had completed the questionnaire.

Items used in a questionnaire can either be closed or open-ended (Aday, 1996). Black (1999) indicates that if both question types are used judiciously, the strength of one can offset the limitations of the other. In this study, the researcher employed both types of questions since combining closed and open-ended questions can help obtain wider responses in an unobtrusive manner. According to Black (1999), the advantage of open-ended questions provide the participants the freedom to express themselves rather than being constrained by yes/no questions. The following combination is suggested by Vaus (1991:87) for a good questionnaire:

1. a closed question to see if the respondent has thought about or is aware of the issue;
2. an open question to obtain general feelings on the matter;
3. a closed question to get at specific aspects of the issues;
4. open or closed questions to find out respondents' reasons for their opinions, and;
5. a closed question to find out the strength of the opinion.

A variation of Vaus' combination technique was employed in this study to suit the local people's understanding of the information being asked of them. For example, aside from the *yes* or *no* options, there were questions that required single or multiple choice answers. Another is the use of the interval or Likert (1932) scale to elicit the depth or intensity of agreement or belief in a strategy, practice, or remedy, particularly in relation to disaster risk reduction and environmental issues.

A number of highlighted items in the survey questionnaire have been italicized to indicate "non-prompted', because they require participants to write rather than tick correct options. These were used to further test or measure the respondent's knowledge and range of experience, as well as to qualify their suggested improvements for community resilience.

A range of demographic data was also gathered. According to Aday (1996), though these data may not be central to the study, they may help to interpret the study findings, given that personal and environmental characteristics can frequently be linked with behavioural and attitudinal patterns. The demographic data were used in the first section of the questionnaire and were obtained by asking participants about age, gender, educational attainment, and the like.

2.2 The structure of the questionnaire re-"*Flash-flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience".* The questionnaire (Appendix 1) comprises three major components: (1) demographic information; (2) socio-economic profile, and (3) capability/strategies for disaster risk reduction. In this study, the third component constitutes views, attitudes, practices and suggestions for improvement by the community participants using the interval or Likert scale. Perceptive understanding of disaster,

disaster experiences, early warning and communication systems, community preparedness, evacuation and gender roles, recovery and risk mitigation, primarily depend on an ordinal response scale. The participants indicate the level of importance they assign to statements. They were asked to circle the number which best indicated their opinion. The Likert approach to developing questions and summary scales is used frequently in surveys (Aday, 1996). Aday points out that Likert scales can measure people's attitudes by determining the strength with which the attitudes are held. This is measured through scales for rating the order of people's preferences for different attitudinal statements about a subject matter.

The views, attitudes, practices and suggestions of the respondents are expressed on a Likert-type scale from 1 to 6. In the Philippines, '6' indicates the strongest level of opinion, therefore, all Likert-type scales are ranked by the participants from strongly agree/believe ('6') to don't know ('1'). The neutral category was included in this questionnaire. Aldridge et al. (2001) indicate that forcing people into either the pro- or anti-camp is artificial, and can be extremely annoying to people who are genuinely neutral on an issue. To further verify their preference, participants are afforded an opportunity at the end of each section to express themselves in a comments section.

The following discussion presents the purpose of each component as it relates to the building blocks of the *Landslip-Disaster Quadrant Model on Community Resilience* (see Figure 2-7, Chapter 2).

2.2.1 Demographic characteristics (Component 1). The first section (Items 1-4) asked for demographic information from the community participants about gender, age, and highest educational attainment, number of dependents, age and years of residence in the community. These data are required to determine differences in knowledge, views, attitudes and practices between and among different demographic or community groups. Also, such information provides input to the Model's building block (*MBB*) on human wellness, socio-institutional arrangements, economic and cultural values.

2.2.2 Geographic location and built environment (Component 2). Information (Items 5-9) about housing type, housing materials, location and house ownership from the participants may reveal indicators of vulnerability to natural hazards. The way people build their houses relates to their perception of hazard risk or past disaster experience. This component is an input to MBB on ecological security.

2.2.3 Livelihood and economic base (Component 3). Respondents' information (Items 10-12) about sources of income means of livelihood, other economic activity, and land tenure arrangement is recorded in this component. This can indicate socio-economic weaknesses of the local people that had been worsened by the impact of natural disaster. An open-ended question asks the respondents if household income was sufficient or not, and the reasons why. This component builds on the MBB for livelihood and economic base, human wellness, socio-institutional arrangements, and politics.

2.2.4 Psycho-social and cultural attributes (Component 4). This component (Items 13-16) yields community characteristics about household survival, emergency skills and fears of the family. An open ended question asks the respondents to describe their `values system in life' in the aftermath of the disaster. This relates to valuing material possessions and human life. It falls under the *MBB* of human wellness, culture, and socio-institutional arrangements.

2.2.5 Counter-disaster capacity (Component 5). Central to this study is the assessment of vulnerability and resilience of communities to disaster risk. A Likert-type scale was employed to elicit a wide range and depth of responses, experiential learning, suggestions and practical views from the community respondents about reducing vulnerability and disaster risks. The following sections constitute this component which cut-across the various building blocks of the Model *or MBB.*

2.2.5.1 Section 1 focuses on what disasters meant to the respondents, what are the causes of disasters and what disasters they have experienced in the past three years. Differences in perception can reveal knowledge discrepancy between scientific and indigenous or traditional viewpoints critical for enhancing capability-building programs at the community level. An open-ended question asks the respondents to suggest a subject or topic they want most in their community seminars or training. This section (Items 17-19) contributes to the *MBB* on ecological security and human wellness.

2.2.5.2 Section 2 highlights early warning and communication systems. People can be familiar with the advisory system for usual typhoon and seasonal flooding in their locality, but not with consequent and deadly natural disasters such as flash floods and landslides. Responses from the local people may disclose certain explanations as to why they have reacted differently or uniformly to a certain type of hazard but not to another. An open-ended question asks the respondents to suggest how to improve the community's warning and communications system. This section (Items 20-22) contributes to the *MBB* on ecological security, cultural norms, socio-institutional arrangements and politics.

2.2.5.3 Section 3 deals with community and household preparedness. The level of readiness for calamitous events may differ from individual to individual and from household to household. Prioritizing activities in anticipation of a natural calamity may enhance community resilience and effect an efficient response to disasters. An open-ended question asks the respondents to suggest how to improve household and community preparedness. This section (Item 23) yields inputs to the *MBB* for cultural norms, socio-institutional arrangements, politics, ecological security and economic base.

2.2.5.4 Section 4 covers evacuation and gender roles. Living conditions in the evacuation centres can undermine the coping capacity of a family or household. Families not only have to contend with exposure to potential health problems families. Disruption to social relationships can affect familism when fathers have to leave their families to work or earn a living in distant towns. This usually happens when relief supply runs out in the evacuation centres. Gendered roles are important aspects in managing psycho-social stress and trauma of affected survivors at the household level. This is necessary in creating the transition environment for rehabilitation and resettlement which can revive the resolve of the surviving family members to start a new life again. An open-ended question asks the respondents to suggest how to improve evacuation centres. This section (Items 24-27) relates to the *MBB* for cultural norms, socio-institutional arrangements, human wellness and politics.

2.2.5.5 Section 5 addresses losses and recovery measures adopted by the community to survive disaster impacts. It also includes alternative livelihoods and other economic activities that the households resorted to in order to meet their daily needs after the disaster. First-hand experience and suggestions can be articulated by the participants in this section to improve rehabilitation programs being introduced by service providers. An open-ended question asks the respondents to suggest how to facilitate rehabilitation or recovery from disaster losses. This section (Item 28-29) provides information for the *MBB* on ecological security, human wellness, economic base, cultural norms and socio-institutional arrangements.

2.2.5.6 Section 6 focuses on disaster risk mitigation activities for improving community resilience. This pertains to medium-term and long-term development activities which local respondents think best or alternative ways to reduce disaster impact. It covers important measures for disaster preparedness, response, rehabilitation and mitigation at the community level. An open-ended question asks the respondents to suggest priority mitigation and development strategies for reducing disaster impact. This section (Item 30) contains information that builds on ecological security, human wellness, cultural norms, economic base, socio-institutional and politics of the *MBB*.

2.3 The structure of the interview guidelines for survivors' stories. This part of the research is a key process to draw first-hand narratives from the survivors of the disaster. Using qualitative interviews, this part of the social studies on human vulnerability and coping capacity, was designed to understand participants' lived experience "from their point of view," as they struggled to reduce personal powerlessness and dependency (Lord and Farlow, 1990; Lord, 1990; Lord and Hutchison, 1993). Some interviews have been tape recorded with the interviewees' permission. Others allowed the researcher to take notes while the participant told his/her story (Brace, 2004). Other participants opted to write their own stories. In this phase, the approach was to get as many volunteers to participate in the in-depth interview. There were seven first-hand stories collected. Five of them were victims buried alive and extricated from the mudslides by rescuers and two had missed the disaster by leaving the site a few hours before it occurred.

An interview guideline was used in interviewing potential respondents for the survivors' stories as shown in Table 3.6. Three major questions are asked of the survivors that elicit information about their situation and actions before, during and after the disaster. Each question leads to responses that have implications for the MBB.

Table 3.6. Interview guidelines for survivors' stories and analyses employed.

Three Major Questions	***Empowerment Process (Modified from Lord's Method)***	***Implication for the Model's Building Block or MBB***
1. Before the disaster struck, can you tell what were you doing? What about the people around you? Did you notice anything unusual in your surroundings at that time?	Pre-Disaster Condition: √ *Normal Lifestyles and Daily Needs* √ *Warning and Precursors' Observation* √ *Near-Event Physical Sign*	• Human Health and Wellness • Ecological Security • Social Structures & Institutional Arrangements • Cultural Values and Norms • Economic Base & Livelihood Sufficiency • Political Will & Priorities
2. How did you respond to the situation when the emergency arose? 2.1 *Describe emotions, mindset and psycho-social stressors.* 2.2 *How did the people around you react to the sudden impact?* 2.3 *Have you manifested any survival skills during crises while saving yourself? What attitude/s have you demonstrated at that time towards others?*	Disaster Impact: √*Powerlessness or Defenselessness* √*Awareness* √*Survival Traits* Post-Disaster Transition: √*Learning and Connecting* √*Access to Valued Resources* √*Participation*	
3. Looking back now, what lessons have you learned? What suggestions would you share with others to prevent such an ordeal, and be more proactive,		

2.4 The structure of the interview guidelines for officials and service providers. As shown in Table 3.7, a checklist guideline was used to structure the interviews and discussions with selected officials and service providers. Information from these respondents was used to assess the level of implementation and monitoring of programs and activities on disaster preparedness and mitigation. Interviews have included self-assessment by the respondents on how disaster committees of which they were members have handled disaster situations and crises problems. Issues and suggestions were elicited from these respondents on how to improve management of disaster situations and facilitate recovery of communities affected by disasters.

Table 3.7. Checklist guideline for interviews and discussions with local officials and service providers.

Disaster Phases	Projects or Activities	Status of Implementation		
		Planned	*On-going*	*Completed*
Pre-	● Counter-disaster or contingency plans ● Early warning and communications network ● Evacuation and community drills ● Stockpiled resources ● Hazard risk assessments and mapping ● Funding and resource allocation system			
During	● Emergency transport ● Survival skills ● Basic life support systems and medicines ● Disaster operations centre			
Post-	● Rehabilitation and reconstruction plans ● Evacuation centres and resources ● Relocation development plans ● Development projects i.e. structural and non-structural remediation			

3. Data Analysis Methods and Information

Quantitative and qualitative analyses are employed in this study. Each area of data collection utilized a certain type of analysis to conform to the desired outcome of the study objectives. The following is a discussion of analysis process and procedures.

3.1. Analysis process of five natural disasters. A comparative analysis of meteorological conditions, typhoon movement, peak rainfall, antecedent rain, biophysical impacts, flash flood and landslide characteristics were used for the five disaster case studies.

3.2. Analysis process of information from discussions with officials and service providers. Results from the discussion with officials and service providers were analysed using the program-based review and assessment technique based on the checklist guideline (Table 3.7). Four major components of disaster management, such as preparedness, response, rehabilitation and mitigation, were used as key points for the assessment process.

3.3 Analysis process of data from questionnaire. Quantitative data drawn from the survey questionnaire was analyzed using descriptive statistics with SPSS version 15 Statistical Package for Windows.

3.4 Analysis process of information from non-prompted and open-ended interviews. To make sense of information collected via qualitative methods, data were analyzed using content analysis which is a useful approach to managing qualitative data (Berg, 1989). This process of analysis was used to reduce the volume of information and identify significant patterns for presenting the outcomes of the research. The process of content analysis, suggested by Aday (1996), Berg (1989) and Parahoo (1997), was used as analytical strategic guidelines for analyzing data from open-ended interviews. This process of analyzing qualitative data is as follows:

- Data identification: identification indexing codes and numbers were applied to all participants, and an abbreviation of Community Participant, "CP", was used with a number to identify the local respondent;
- Data alignment: all responses given to the open-ended items were rearranged by placing together the answers responding to the same question from all participants;
- Identification of themes and categories were performed using the following strategies:
    - All answers to the questionnaires were read several times in order to become thoroughly familiar with the responses;
    - Codes were written and attached to the statements;
    - Codes were examined, classified and colour marked;

– All responses were cut and pasted into relevant coded sections;

– The cut sections were collated and pasted onto a large sheet of paper according to the codes and colours marked; and

– Codes were classified into major themes and sub-themes and categories.

- All themes, categories and subcategories were submitted to the thesis supervisor and agreement reached regarding the classification.
- The classification process was converted into an assessment matrix, adapted from Anderson et al. (1989), simulating the MBB on community resilience as shown in Table 3.8.

Table 3.8. The capacity (resilience) and vulnerability assessment matrix of a community.

Aspects	Vulnerabilities	Capacities
Physical/ Material	•What are the ways the community may be physically vulnerable? (e.g., land, climate, environment, people's health, skills and labour, infrastructure, food housing, capital, physical technologies)	•What are the resources available in the community? (e.g., land, climate, environment, people's health, skills and labour, infrastructure, food, housing, capital, physical technologies)
Social/ Organizational	•What social structures in the community are vulnerable? •What formal and informal systems are vulnerable? •How can decisions making be improved? •How can leadership be improved? •How can social and economic activities be improved? •How can conflicts/ divisions within the society (racial, class, religious, ethnic) be reduced?	•What social structures in the community are existing? •What formal and informal systems exist? •How are decisions made? •How is leadership established? •How are social and economic activities organized? •Are there conflicts/divisions within the society (racial, class, religious, ethnic)?
Attitudinal/ Motivational	•How does the community view itself and its ability to deal with the physical, social and political environment? •Do the people feel they have the ability to shape lives? •Do people feel victimized, fatalistic, and dependent?	•Do people share a sense of purpose, a feeling of empowerment, awareness that they are agents of change for improving the community? •Are the people open to change

Source: Anderson et al. (1989)

3.5 Analysis process of information from survivors' stories. According to Berg (1989), content analysis is very useful for data contained in narratives and first-account stories. The procedures of personal empowerment, as suggested by de Boer (1992) and Lord (1991) were used as a guide to develop a modified technique in analyzing information from the in-depth interviews of survivors. According to Lord (1991), the elements of the personal empowerment process are powerlessness experienced by victims, gaining awareness of their potential abilities, and learning new roles in their recovery or healing process, initiating and participating in social activities, and contributing to collective goals. These were modified in the context of disaster management using the three phases of ante-disaster situation, disaster impact, and post-disaster transition (see Table 3.6). Such a technique involves clear description of disempowering conditions or behaviours in responding to disaster situations by the survivors. Processing this information is vital for empowering individuals to build positive behaviours or action steps for safety and survival. Key words and/or groups of words are identified and clustered for determination of issues of vulnerability or resilience. This can build the MBB on community resilience.

4. Validation and Translation Process for Questionnaire and Interview Guidelines

The draft questionnaire and interview guidelines for the survey of the community underwent proper validation and translation process. This was to ensure the meaning of words used in the questionnaire and guidelines when translated from English into a local dialect met a standard equivalence of meaning.

4.1 Validation techniques. Validity is defined as "the degree to which a test measures what it claims, or purports, to be measuring" (Brown, 1996: 231). There are three types of validation that need to be considered: content, criterion and construct validity. Content validity or face validity refers to the adequacy of sampling of items representing the concepts being studied. This type of validation is based on expert judgment (Vaus, 1991).

Criterion validation is the 'relationship between one measure and another of the same phenomenon' (Woods, 1998: 253). Construct validation determines the degree of the relationships between the concept that is being measured and other concepts (Talbot, 1995). The issue around validation of the research tools, such as the questionnaire and interview guidelines used in this study, focused on all three elements. On the other hand, reliability is defined as 'the consistency of an instrument in measuring what it proposes to measure' (Krathwohl et al., 1993: 206). A reliable instrument measures the same concept over time and across different methods of gathering data (Aday, 1996). In this study, the method of data collection, the questionnaire and translation were used to enhance and confirm the reliability of findings. This was achieved through a refinement process first, through expert judgment by a critique panel, then back translation technique and finally, pilot-testing with ten local respondents.

4.2 Translation process. This is necessary when a survey questionnaire is developed for use across multiple sites. This is particularly important in preserving the conceptual equivalence of whole sentences and paragraphs across languages. A renowned method is the back translation technique (Brislin, 1970). This technique is the translation of a survey instrument that has already been translated into a foreign language back to the original language. Usually, the back translation is done by a different translator than the one who did the forward translation. After the back translation, the original and back translated instruments are compared and points of divergence are noted. The translation is then corrected to more accurately reflect the intent of the wording in the original language.

One technique most commonly applied in sociological, clinical, and medical studies is Vallerand's (1989) translation method. It involves three stages: back translation, bilingual committee, and statistical procedures. However, Vijver (1997) states that the back translation technique can produce a number of errors. For example, the method relies on literal translations, and such translations do not approach the naturalness of the context in the original version. Furthermore, the back translation technique pays more attention to the words and less to connotations, more appropriate context and comprehensibility. Vijver (1997) recommends avoiding these errors by using a bilingual committee and statistical procedures, such as those described by Vallerand (1989). These procedures have been shown to be useful in establishing language equivalent instruments and in providing checks on translation accuracy. Vallerand's (1989) method has been found to be a rigorous translation technique that is applicable in cross-cultural studies. For example, Banville et al. (2000) draw heavily on Vallerand's work in the translation of an American instrument for use amongst French-speaking Canadians. According to Banville et al. (2000), the Vallerand (1989) translation method provides a rigorous process that highlights weaknesses in survey instruments that other methods may not identify. Wongsri et al. (2003) report Vallerand's (1989) technique to be a rigorous procedure in translation from English to Thai language.

4.2.1 Vallerand's translation technique*.* Banville et al. (2000: 377) translate Vallerand's (1989) seven translation steps into English:

1. preparation of preliminary versions of questionnaire;
2. evaluation of preliminary version and preparation of an experimental version;
3. pre-test of the experimental version;
4. evaluation of the content validity;
5. evaluation of reliability;
6. evaluation of the construct validity, and
7. establishment of norms.

A modified translation process was used in this study as adapted from Vallerand's seven steps (Figure 3-3).

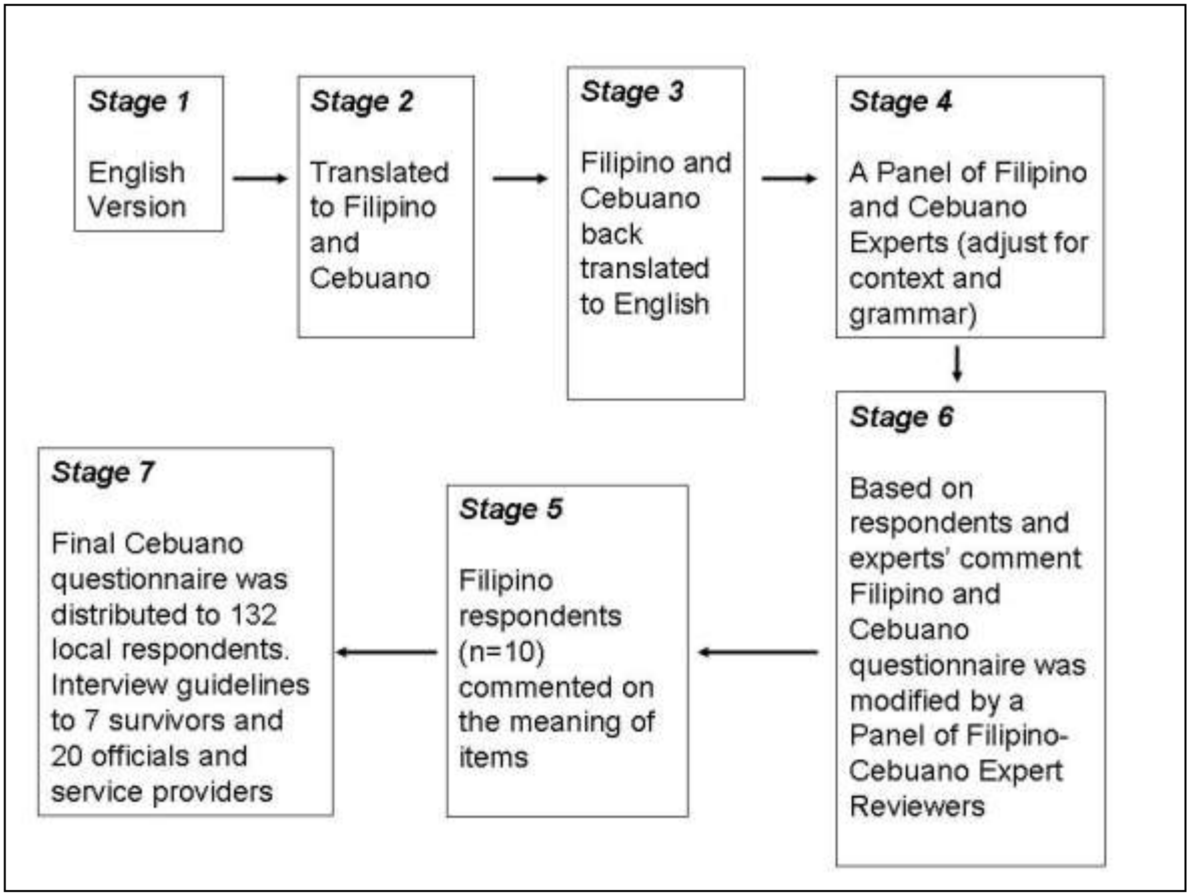

Figure 3-3. Translation technique and validation process adapted in this study.
Note. Adapted from Vallerand, 1989.

Step 7 on the establishment of norms by Vallerand (1989) was anticipated and addressed beforehand in this study. During the formulation of the preliminary survey questionnaire, other questionnaires that have established norms and been used in previous disaster studies were referenced. In particular, these were the community surveys carried out in the following natural disaster studies to include the 1991 Ormoc City event (DevMan, 1993), the 2001 Camiguin Island event (JICA-DPWH, 2002), and the 2003 Panaon Island event (World Bank, 2004). These were used as primary references in selecting concepts, views, meanings and norms adapted to the local respondents in the target study area, Saint Bernard municipality in Southern Leyte. Information being asked in the survey questionnaire was formulated a closely structured and related way to previous questionnaires, except for the design and objectives of such studies. Another important reason why there were established norms already in the preliminary questionnaire development is that Ormoc City and Panaon communities belong to the same Leyte and Southern Leyte Provinces. Local norms and cultural views in these areas are more or less homogenous.

4.2.2 Explanation of the translation stages and validation process for the questionnaire. The following discussions explain the stages of translation and validation employed in the refinement of the questionnaire and interview guidelines for this study.

4.2.2.1 Stage 1: English version. In this stage, the English version of the questionnaire was assessed by asking ten English-speaking postgraduate students for their comments on the appropriateness, comprehensiveness and acceptability of the 62 draft items. There was no intention to test the validity at this stage. Questions were originally drafted using multiple choice and interval scale. However, based on the comments of the students and those of the supervisors, changes were made to reduce the 62 original items to 30 items, considering time limitation and rural background of the target participants in the Philippines. Open-ended questions were also included to illicit spontaneous information from local respondents. This was suggested by the supervisors to enrich information gathering, as well as to make the questionnaire clearer and easier to follow.

4.2.2.2 Stage 2: Translation to Filipino and Cebuano. In this stage, the questionnaire and interview guideline for survivors' stories were translated by a training staff member, who can write and speak Cebuano fluently, in the Office of Civil Defense based in Region 8, which services the study area. The researcher is a fluent Filipino-speaking citizen who translated the English version into the national language. The technique recommended by Vallerand (1989) requires two different bilingual translators for the process of translating from the original English version to the target Filipino/Cebuano version. The purpose in having two persons to do the translation is to avoid the errors and bias that may occur with one person. Streiner et al. (1995) argue that the translation processors should be fluent in both English and the target language. They should also be knowledgeable about the content area with an attendant awareness of the intent of each item, and of the scale as a whole. To cover these requirements, four bilingual translators-reviewers were recruited for Stage 2.

For the Filipino version, one translator is a postgraduate student at the University of Newcastle, who is a resident of Manila, the capital city of the Philippines. The other translator-reviewer is a Filipino-major professor in the Southern Philippines, who is also studying towards a Masters degree in Educational Studies (Pedagogy) at the University of Newcastle.

For the Cebuano version, one translator-reviewer is the Regional Director of the Office of Civil Defense based in Region 8 who speaks the dialect fluently. He is also a trainer in community-based disaster management seminars in the study sites. The other translator-reviewer is a Filipino postgraduate student of Educational Studies (Leadership and Management) in the Faculty of Education and Arts, University of Newcastle, who was born in Cebu, Philippines with an excellent command of the local dialect. None of the translators had seen the original English version of the questionnaire.

The translators were first asked to individually back translate the questionnaires from Filipino and Cebuano into English. Then, they were asked to compare each item on the original English version with each item on the back-translated English version. While 12 items did not have major differences in meaning, 2 items had differences in grammar and context (see Figure 4.1). These 14 items were addressed in the next stage.

4.2.2.3 Stage 4: Filipino expert reviewers. In this stage, differences between the two English versions were addressed and then the Filipino/Cebuano versions were modified accordingly. For this stage, a panel of Filipino expert reviewers was sought to examine the 14 discrepant items identified in the previous stage. The expert reviewers included the Chief Trainer and the Chief Information and Media Officer in the national headquarters of the Office of Civil Defense. The experts approach was designed to prevent individual bias in interpretation and to ensure uniformity across translated versions of the questionnaire (Vallerand, 1989).

For the 14 discrepant items, the experts were first asked to compare the original English version of the questionnaire with the back-translated English version. Contextual and grammatical differences for those 14 items were resolved by discussion.

Table 3.9. Fourteen items reviewed and amended by the Filipino-Cebuano expert.

Twelve Items Adjusted For Filipino-Cebuano Grammar
Section1 Demographic Information
Item 5, Option 3: Between 4 to 6 years
Item 5, Option 4: Between 6 to 8 years
Item 5, Option 5: Between 8 to 10 years
Section 2 Geographic Location and Built environment
Item 7: How many floor levels does your housing unit have?

Section 3 Economic and Livelihood Base Psycho-Social
Item 11: What are your other sources of income?

Section 4 Psycho-Social and Cultural Attributes
Item 13: What household (HH) assets do you currently own?
Item 14: What animals do you currently owned?
Item 16: Loss of housing, Loss of job

Section 5 Counter-Disaster Capability/Capacity
Item 17, Option b: Disaster means causing damage, danger
Item 26, Option c: Worried about thieves, house, children
Item 27, Option a: Worried about things left in the house
Item 29: What measures were undertaken to recover the losses?

Two Items Adjusted for Grammar and Context in Filipino-Cebuano

Section 5 Counter-Disaster Capacity

Item 23, Option b: Inserted the phrase, *(means stockpiled firewood or cooking gas, drinking water, medicines, first-aid kits, flashlight, batteries, ropes, cash on hand)*

Item 23, Option f: Inserted the phrase, *(refers to psycho-social preparedness skills or required behavior or household coping mechanism to an impending threat)*

4.2.2.4 Stage 5: Filipino-Cebuano respondents' comments. In this stage, there was an examination of the meaning and clarity of the new Filipino-Cebuano versions of the questionnaire, particularly items 23, options b and f. Two trainers from the Southern Leyte Provincial Disaster Coordinating Council and five local people in Southern Leyte were asked to carefully read each item of the questionnaire, taking particular note of the expression, and any item of concern. They were then invited to write their comments and suggestions next to each item identified as unclear. In this process, some items were identified by the selected respondents as ambiguous. The decision has to be made as to whether the English words are retained so as not to lose the context and precise meaning or expression. This is discussed by a panel of reviewers in the next stage.

4.2.2.5 Stage 6: Filipino-Cebuano panel review. In this stage, the Expert Reviewers' Panel examined items of concern raised in the previous stage. Subsequent amendments were done to achieve a more appropriate Filipino-Cebuano expression. Table 4.2 shows the English words that were retained in Filipino and/or Cebuano versions as more acceptable, contextualized, and easily understood by local respondents.

Table 3.10. English items retained in the Filipino-Cebuano and Cebuano versions by the expert reviewers' panel.

14 items in which English words were retained in both Filipino and Cebuano versions

Section 1 Demographic Information
Item 3, Option 3: High School

Section 2 Geographic Location and Built Environment
Item 6, Option 3: Bungalow
Item 6, Option 4: Apartment

Section 3 Economic and Livelihood Base
Item 11, Option 8: Catering

Section 5 Counter-Disaster Capacity
Item 13, Option 7: Cell/mobile phones
Item 13, Option 8: Handheld radio
Item 13, Option 11: Computer
Item 13, Option 12: Internet connection
Item 13, Option 14: Flashlight
Item 13, Option 16: Life jacket
Item 13, Option 18: Megaphone
Item 15, Option 3: First-Aid
Item 20, Option d: Weather Bureau; PAGASA
Item 22, Option i: Red Cross

18 Items in which English words were retained in the Cebuano version other than those listed above

Section1 Demographic Information

Item 3, Option 4: Vocational
Item 3, Option 5: Some college
Item 3, Option 6: College Graduate

Section 3 Economic and Livelihood Base
Item 11, Option 10: Laundrywoman
Item 11, Option 11: Motorela operator
Item 11, Option 12: Carpentry
Item 11, Option 13: Agricultural Labor

Section 4 Psycho-Social and Cultural Attributes
Item 15, Option 5: Driving Vehicle
Item 15, Option 6: Mobilizing people
Item 15, Option 7: Public speaking

Section 5 Community Counter-Disaster Capacity Assessment
Item 28, Option 2: …farm implements
Item 29, Option 4: Engaged in alternative income
Item 30, Option c: …raise environmental awareness
Item 30, Option e:…value formation activities
Item 30, Option i: Sustainable farming & cropping system
Item 30, Option k: …flood control dikes
Item 30, Option l: …evacuation centers
Item 30, Option p: …Barangay Disaster Coordinating Council

4.2.2.6 Stage 7: Final version of Filipino-Cebuano questionnaire and interview guidelines. In this stage, the questionnaire and interview guidelines were finalized and made ready for distribution to potential respondents in the study area or communities in Saint Bernard, Southern Leyte. There were one hundred and thirty-two community respondents for the survey questionnaires, seven interviewees for survivors' stories, and twenty-five interviewees for the discussion with officials and service providers.

5. Ethics, Fieldwork and Post-Data Collection

The conduct of fieldwork research which includes the implementation of the survey questionnaire and interview guidelines to the study communities, the following ethical considerations and strategies were observed to ensure efficiency and higher response rates from the local participants.

5.1 Ethical considerations. In keeping with the rules and guidelines of the University's Human Research and Ethics Committee, information letters and consent forms were distributed to potential respondents for their consideration and approval to participate in the study. The consent forms and information letters gave full details of the purpose, methodology and significance of the study, and an estimated time of completion of the study. The following basic ethical considerations were adhered to in the conduct of this community survey.

5.1.1 Respect for the participants rights. The researcher was aware of the conflict between recognition of the rights of human beings and the wish to advance professional knowledge (Parahoo, 1997). Potential participants were given information about the purpose of the research and exactly what they were being asked to do in the study. This includes the amount of time taken to fill in the questionnaire and details about the conduct of the study and the means of reporting the results. This information allowed participants to decide whether or not to participate. They were assured that refusal to fill in the questionnaire would have no adverse effects for them whatsoever.

5.1.2 Anonymity. In this research, the anonymity of participants was protected by giving each subject a code number; their names did not appear on the completed questionnaire. The only reason for coding the questionnaire was for the purpose of sending reminder letters. All information obtained in this study is strictly confidential and an assurance to this effect is given in the letter to participants.

5.1.3 Benefits. The research project should benefit the participating individual and community in general. The benefits of this study for the communities at risk are improvements in disaster reduction, local empowerment, and sustainable development. Study findings can yield important issues and concerns of the local people that can guide institutions and service providers to better implement programs and interventions in disaster-affected communities. It is anticipated that information in this study will raise community awareness of the causes, behaviour, distribution and biophysical impacts of flash-flood and landslide occurrences. It will also assist the policymakers and service providers in the development of appropriate support programs and policies on disaster risk reduction and sustainable development. Finally, it is expected that the information will assist the development of suitable strategies for mitigating disasters and building capacities of communities at risk. There were no immediate rewards in filling in the questionnaire, and there were no risks involved in voluntarily completing this survey.

5.2 Strategy for data collection and fieldwork

Important administrative support and facility were sought in the fieldwork research and data collection. This was to secure efficiency in generating government reports and participation from the local communities through the disaster coordinating council networks. It included the employment of research assistants who the local people trust and who could properly translate the local meaning of written answers from the open ended and non prompted interviews.

5.2.1 Strategy for entry into research sites. As authorized by the University of Newcastle, Australia per HREC No. 365-0207 and Safety No. 136/2006 (Appendix 2), the fieldwork commenced in the Philippines on 09 January, 2007. A letter from the principal supervisor (Appendix 3) was secured to endorse the study to the Administrator of the Office of the Civil Defense (OCD) of the Philippines for possible administrative support. As concurrent Executive Officer of the Philippines' National Disaster Coordinating Council

(NDCC), the Civil Defense Administrator oversees disaster programs and activities of the various disaster coordinating councils (DCC) in the country. The DCC network is the most effective and expedient way to introduce the research to the administrative-political authorities in the Philippines. A courtesy call and study presentation was made by the researcher to the OCD Administrator, who gave his approval and support to the study, making it official and adopting it as an agency activity (Appendix 4). A memorandum and official letters (Appendix 5) to the targeted disaster coordinating councils and officials were issued by the Administrator to support data collection for the study, and extend assistance and security to the researcher while conducting fieldwork.

5.2.2 Fieldwork and post-data collection. Data collection commenced on 09 January, 2007. Following a fieldwork calendar, the first two months were devoted to gathering unpublished reports, maps, pictures and information about the five flash-floods and landslides from the national government agencies and regional offices. This was to reconstruct the geo-hazard assessment of the study areas, and consolidate the historical account and anatomy of the disaster.

The discussion with officials and service providers was conducted during the survey of the community in the study areas. The interviews and survey questionnaire were administered between March and June 2007 with the information sheets and consent forms disseminated and completed by the respondents (Appendix 6). A courtesy call to the municipal mayor was made which facilitated the conduct of the study in the target communities. A municipal staff member was assigned by the mayor to assist and provide security to the researcher while conducting the study in their locality. The researcher was permitted to attend the meetings, as observer and guest of the municipal disaster coordinating council chaired by the mayor. Participation in the meeting by the researcher gave him more access to important information as well as issues regarding rehabilitation and development projects for disaster-affected communities in Saint Bernard, Southern Leyte. More importantly, informal discussions with the mayor and other local government officials were provided via this meeting. Reports and officials documents were shared with the researcher with the blessing of Saint Bernard's mayor (Appendix 7).

A home visit to each of the village chieftains (Barangay Captain) was carried out to schedule the session or batches of volunteers to complete the questionnaire. A community meeting was called for by the Barangay Captains of Barangay Guinsaugon, Ayahag, Sug-angon and Nueva Ezperanza to inform the local people and identify volunteers. The participants were asked to nominate a convenient time, and scheduling by batches was done. The answering of the survey questionnaire was undertaken in the barangay hall by the researcher with the municipal staff explaining in local dialect the instructions, and also answering questions from the participants. This was to ensure full participation and motivation to write their insights and suggestions without political intimidation, as well as to eliminate repetitive answers. The participants were given the lee way to answer the survey instruments in Filipino, the national language, or in Cebuano, the local dialect. In the end, all of the community participants agreed to use the Cebuano questionnaire.

After every batch, the survey questionnaires were assessed by the researcher and the Cebuano-speaking research aide from the municipal government. Questionnaires were sorted, those with local dialect answers (Cebuano) and those that were not. Translation in Filipino or English was inserted in every answer written in Cebuano. The researcher can speak and understand English and Filipino very well, but not Cebuano. The municipal research aide was well versed in all three languages which assured reliability in the translation of Cebuano answers. To further check proper Cebuano translation, a Christian

Pastor in the locality who speaks fluent English, Filipino and Cebuano was sought by the researcher to review the answers written in Cebuano together with the translation done by the municipal staff. The selection of a lay minister is in keeping with local values and community norms particularly for the in-depth interviews of survivors (Appendix 8). Being a non-government individual, he provided a non-partisan perspective in reviewing the Cebuano translation of the participants' answers.

Additional information was also gathered from on-site inspection of the resettlement areas, through informal interaction and conversation with the local people. Also, discussion with officials in the study sites was undertaken to verify and compare information earlier collected. Official reports from the local disaster coordinating councils were requested by the researcher on a voluntary basis.

Following six months of data collection, a local statistician was sought to guide the treatment of the results from questionnaire, open-ended interviews, survivors' stories and possible analysis of other information and data collected.

Conclusion

This chapter outlines the research design, sources of information, data collection strategies, and analysis methods used to investigate the causes, behaviour, distribution and biophysical impacts of flash-floods and landslides in the Philippines. It also explains the formulation of the study's vulnerability assessment toolkit for the survey of the community. Selection criteria for the study communities and sampling target respondents are presented. Details of the development and structure of the questionnaire and interview guidelines are also different stages of translation and validation methods adapted to finalize the questionnaire and interview guidelines are presented. Lastly, ethical standards, fieldwork and post-data collection strategies employed in the study areas are reported.

In the next chapter, the five cases of natural disasters will be reported as groundwork for the study. A comparative analysis of the physical aspects of vulnerability and the impacts on the people and communities of the five natural disasters will also be discussed.

CHAPTER 4

CASE STUDIES OF RECENT FLASH FLOOD AND LANDSLIDE DISASTERS IN THE PHILIPPINES

Introduction

The purpose of this chapter is to present the physical aspects of natural disasters. It also discusses the impacts on the local communities of five flash flood and landslide disasters in the Philippines for which there is some reliable information contained in various government reports. Disasters can be seen as the interaction between harmful natural hazards and vulnerable communities within a given space and time.

Five natural disaster events that happened in Ormoc City (1991), Camiguin Island (2001), Panaon Island (2003), the REINA (Real, Infanta and Nakar) municipalities of Quezon (2004) and Saint Bernard, Southern Leyte (2006) were selected for this study as shown in Figure 4.1. They occurred during a fifteen-year period from 1991 to 2006. These disasters had natural causes and occurred in places that had previously been identified as highly vulnerable. However, such disasters now occur in places that were not previously considered vulnerable. The objectives of this chapter are to test and modify the six building blocks of the Model on Community Resilience proposed in Chapter 2 (see Figure 2-7).

This chapter describes the atmospheric/weather conditions, rainfall, floods and landslides of the five disaster case studies. It also includes the impacts on the people and the infrastructure. The data and information used to explain the physical vulnerability of the five disaster events in this study were confined to municipalities or communities where many people were killed. At the end of each section, a synthesis of the five cases is presented to summarise the above aspects.

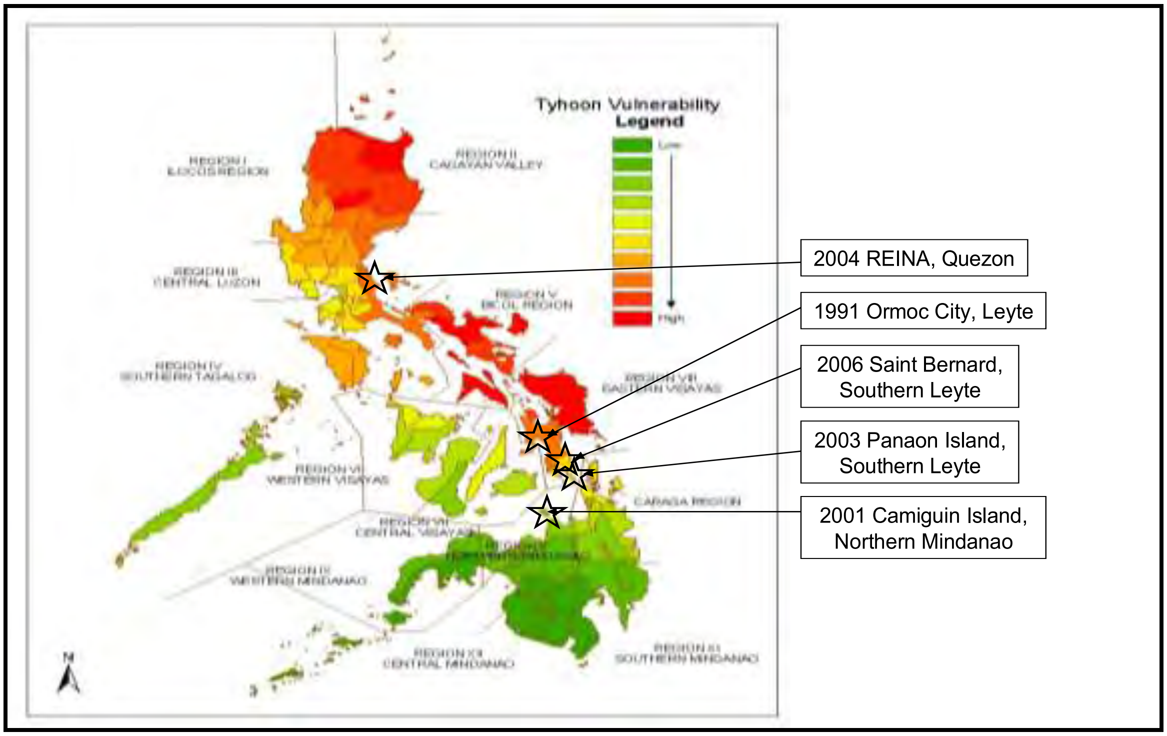

Figure 4-1. Location of the five natural disasters investigated in the Philippines. **Source: NDCC (2007).**

1. Atmospheric/Weather Conditions

1.1 Climate and Rainfall Distribution

The climate of the Philippines is characterized as relatively high temperature (mean annual temperature: 26.6°C), high humidity (average 70-85%), and high annual rainfall (1,000-4,000 mm or average of 2,360 mm). Such climatic conditions are mainly influenced by the northeast monsoon, southwest monsoon, tropical cyclones or typhoons, the Inter-Tropical Convergence Zone (ITCZ) and topography (PAGASA, 2007).

Rainfall distribution is used to classify the four distinct climate types in the Philippines as shown in Table 4.1. Under these climate conditions, heavy rainfall results from typhoons, pressure depressions (such as ITCZ) and local storms.

Table 4.1. Climate types and monthly rainfall in the Philippines.

Type	Description
1	Two pronounced seasons; dry from November to April, wet during the rest of the year. The western side of the country characterized by this climate type is largely influenced by the southeast monsoon and there is generally a maximum rain period from June to September, which is caused by the tropical typhoons occurring especially during this period.
2	No dry season with a very pronounced maximum rainfall from November to January. The eastern side of the country characterised by this climate type is generally along or very near to the eastern coast, which is open to the northeast monsoon.
3	Seasons not very pronounced, being relatively dry from November to April and wet during the rest of the year. This type is intermediate between Types 1 and 2, but closely resembles Type 1. Areas characterised by this climate are partly shielded from the influence of the southwest monsoon but influenced by the rainfall caused by tropical cyclones.
4	Rainfall more or less evenly distributed throughout the year. This type is also intermediate between Types 1 and 2, but more closely resembles Type 2. Areas characterised by this climate are partly shielded from the influence of the northeast monsoon.

Source: Philippine Atmospheric, Geophysical and Astronomical Service Administration (2007)

Table 4.2 shows the maximum rainfall that was recorded in the study areas. Among the five cases, Saint Bernard recorded the highest with 802.6 mm for six days of heavy rain. It was followed by Panaon Island with 793 mm. It can be noted that the rains in these two study cases were not typhoon related but resulted from ITCZ and a La Nina episode. In terms of the duration of the rainfall, Panaon Island had the longest with eight days, followed by Saint Bernard with six days. The same two cases did not result from typhoons. These cases indicate that ITCZ and La Nina episodes brought more rain than the typhoons and can be considered more harmful now than the strong winds. On the other hand, the rains of Ormoc City are the highest among the typhoon-caused disasters with 580.5 mm, followed by Camiguin Island with 517 mm and lastly by REINA with 450 mm.

ITCZ is a belt of low pressure formed by warm and moist air that girdles the earth at the equator. Equatorial countries close to oceans have increased rainfall due to ITCZ. La Nina episode, on the other hand, is characterized by unusually cold ocean temperatures in the eastern equatorial Pacific. This anomaly in the sea surface temperature increases formation of storms that can intensify rainfall over an area.

Table 4.2. Rainfall data of the five natural disasters.

Study Areas	Climate Type	Maximum Event Rainfall	Maximum Daily Rainfall	Station	Event Duration	Event
1991 Ormoc City	4	580.5 mm (3-day)	150 mm (Nov 5)	Campsite, Tongonan	4 days	Typhoon "Uring"
2001 Camiguin Island	4	517.0 mm (3-day)	166 mm (Nov 7)	Hubangon, Mahinog	3 days	Typhoon "Nanang" and Orographic Effect
2003 Panaon Island	2	793.0 mm (3-day)	300 mm (Dec 19)	Maasin, Southern Leyte	8 days	ITCZ
2004 REINA, Quezon	2	450.0 mm (3-day)	370 mm (Nov 29)	Infanta, Quezon	3 days ("Winnie')	Typhoons "Unding", "Violeta", "Winnie", "and "Yoyong"
2006 Saint Bernard, Southern Leyte	2	802.6 mm	171 mm (Feb 12)	Otikon, Libagon	6 days	La Nina episode and orographic effect

Sources: Philippine Atmospheric, Geophysical and Astronomical Service Administration (2007) and National Disaster Coordinating Council (2007).

1.2 Natural Disasters and Typhoons

Natural disasters in the Philippines include flood, flash flood, sediment (including debris flow, mud flow and lahars), landslide, storm surge, big waves, tornado, whirlwind/wind flow, earthquake, volcanic eruption, drought, and red tide. Among these, flood, flash flood, sediment and landslide are caused by heavy rainfall from typhoons or depressions or local storms. Storm surge is caused by typhoons, and big waves. Tornado and whirlwind are also related to typhoons. When the wet season commences, about 30 typhoons are formed in the north-western Pacific Ocean every year and move in a north-westerly direction. Of this number, an average of 20 typhoons impacts the Philippine islands.

Typhoons bring heavy rainfall and strong winds. These cause damages via floods, flash floods, sediment, landslides, storm surges and strong winds (NDCC, 2007).

The Philippine Atmospheric, Geophysical, Astronomical Service Administration (PAGASA), the government's weather bureau, has been using the following Typhoon Classification based on the strength of the wind near the centre: Tropical depression (45-63 km/hr), Tropical storm (64 to 117 km/hr) and Typhoon (118 to 239 km/hr). Public Storm Warning Signals (PSWS) are also determined by PAGASA according to the magnitude of the typhoon and the distance between its centre and the locality. PSWS consists of 4 warning signal levels as shown in Table 4.3.

Table 4.3. Philippines' public storm warning signals (PSWS).

Warning Level	Expected Winds	Expected Arrival Time
PSWS No. 1	30-60 km/h	36 hours
PSWS No. 2	60-100 km/h	24 hours
PSWS No. 3	100-185 km/hr	18 hours
PSWS No. 4	More than 185 km/hr	12 hours

Source: Philippine Atmospheric, Geophysical and Astronomical Service Administration (2007)

Table 4.4 shows the meteorological characteristics of the five flash flood and landslide disasters in the Philippines investigated in this study. The typhoon names used in this study were the local names given by PAGASA. The time of occurrence indicates the duration of the typhoons in the study areas.

Of the six typhoons, “Yoyong” had the strongest winds at 220 km/h, while “Unding” had the longest duration of eight days. Typhoon “Violeta” had the lowest winds at 45 km/hr, while Typhoon “Nanang” had the shortest duration of 3 days. In general, typhoons in the Philippines are formed at the onset of the wet season from June to December every year. The 2 weather events, the ITCZ and La Nina, are not characterised by strong winds, like typhoons, but by heavy rainfall over a longer period of time, as for Panaon Island and

Saint Bernard, Southern Leyte. Such rainfall can cause flash floods and landslides. In fact, Panaon Island had the same rainfall duration of eight days as Tyhoon “Unding” but had higher rainfall than the typhoon. The same also applies to Typhoon “Yoyong” and the La Nina episode, but the latter had the highest rainfall of the five disasters.

Table 4.4. Meteorological characteristics and date of occurrence of the five natural disasters.

Study Areas	Typhoon Name/Weather Event	Maximum Winds	Date of Occurrence
Ormoc City	*Uring*	<65 km/hr	2-6 November 1991
Camiguin Island	*Nanang*	<65 km/hr	6-8 November 2001
Panaon Island	Inter-Tropical Convergence Zone (ITCZ)	> 30 km/hr	15-22 November 2003
REINA, Quezon	*Unding*	120-150 km/hr	14-21 November 2004
	Violeta	45 km/hr	22-23 November 2004
	Winnie	55 km/hr	28-30 November 2004
	Yoyong	185-220 km/hr	30 November-04 December 2004
Saint Bernard, Southern Leyte	La Nina Phenomenon and Orographic Effect	> 30 km/hr	12-17 February 2006

Source: Philippine Atmospheric, Geophysical and Astronomical Service Administration (2007), and National Disaster Coordinating Council (2007).

1.2.1 Ormoc City Case Study. Ormoc falls under climate Type 4 which is characterized by an even distribution of rainfall throughout the year. Typhoon “Uring” was the 17th out of the total 19 typhoons that impacted the Philippines in 1991. It was the 4th typhoon that passed over Visayas, the central part of the Philippines in the same year. Table 4.5 and Figure 4.2 show the formation and movement of Typhoon “Uring”.

Table 4.5. Formation and movement of typhoon “Uring”.

November, 1991	Meteorological Condition
1	Tropical depression formed in the Pacific Ocean 1,000 km east of the Philippines
2	At 4 am, PAGASA named this tropical depression, “Uring” (International Code is Thelma and Japanese name is Typhoon No. 25). “Uring’ moved west-northwest at a speed of 15 km/hr (maximum winds of 15 m/sec). After 10 pm, “Uring” moved west at a speed of 11 km/hr (maximum winds of 15

	m/sec).
3	After 10 am, “Uring” turned its course south-westward at a speed of 11 km/hr (maximum winds of 15 m/sec).
4	After 4 pm, “Uring” turned its course southward at a speed of 7 km/hr (maximum winds of 18 m/sec). PAGASA renamed it Tropical Storm “Uring”. At 10 pm, “Uring” came close to 100 km east of Samar island and moved west at a speed of 7 km/hr (maximum winds of 21 m/sec).
5	At 4 pm, “Uring” came close to 50 km east of Samar Island. At 10 am, “Uring” crossed the central portion of Samar island and moved west over the northern part of Leyte island and the Samar Sea at a speed of 11 km/hr (maximum winds of 15 m/sec). PAGASA renamed it Tropical Depression “Uring”. At 4 pm, “Uring” moved west-southwest over the northern part of Cebu Island and the Visayan Sea (maximum winds of 15 m/sec). At 10 pm, “Uring” hit the vicinity of Conception in Panay island and moved-southwest at a speed of 11 km/hr (maximum winds of 15 m/sec).
6	At 4 am, “Uring” moved west-southwest over the vicinity of San Jose to the Sulu Sea at a speed of 11 km/hr. At 10 am, “Uring” dissipated to a low pressure area over the Sulu Sea between Panay and Palawan Islands.

Source: Philippine Atmospheric, Geophysical and Astronomical Service Administration (1991)

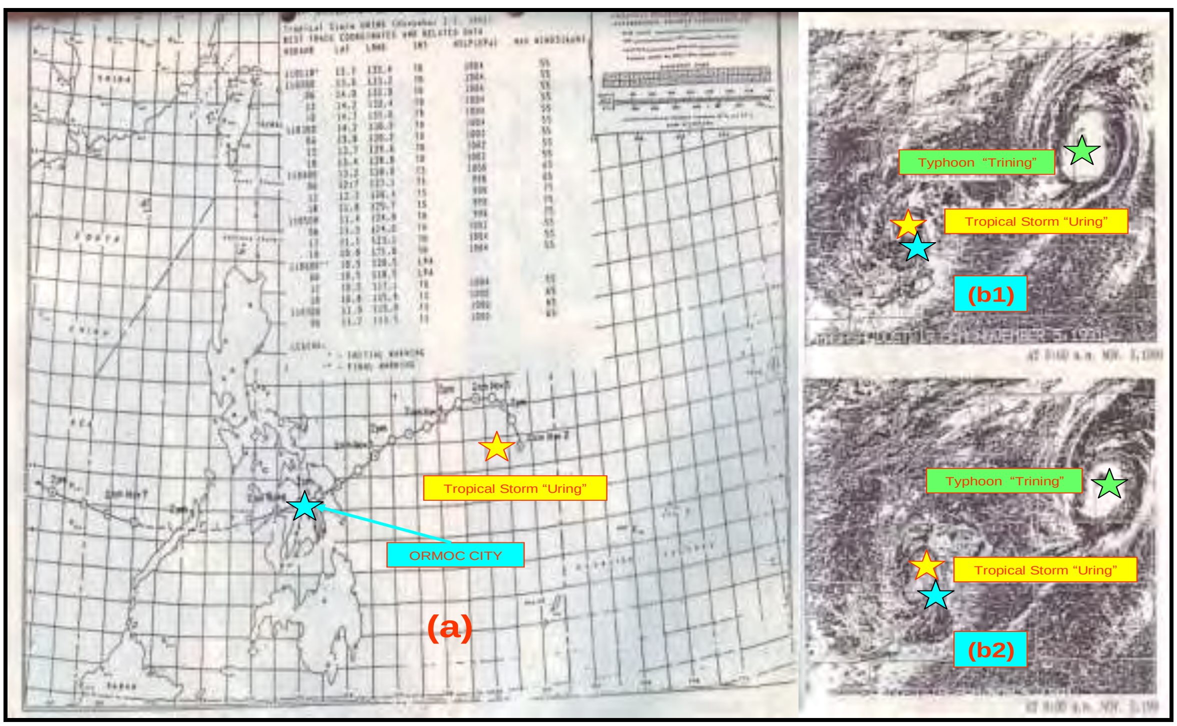

Figure 4-2. (a) Track of tropical storm “Uring”; satellite pictures of tropical storm “Uring” as it interacts with typhoon “Trining”, (b1) at 5 am, November 5, 1991 and (b2) at 8 am, November 5, 1991. Source: PAGASA (1991).

“Uring” had fully developed cumulonimbus clouds of up to 15,000 m in height similar to that of a big-sized typhoon. These clouds brought the intense rainfall to the mountainous area 1,000 m in elevation, which extends from the northwest to the southeast on the island of Leyte. “Uring’ was interacting with another typhoon “Trining” which was exiting northward of the archipelago. Records of daily rainfall from November 1 to 10, 1991 on the island of Leyte are shown in Figure 4-2. Tacloban is located in the north-eastern portion of the island of Leyte. A mountainous area extends between Tacloban and Ormoc. At the Tacloban gauging station, the following 6-hour rainfalls were observed:

05 November 1991, 2 am to 8 am = 29.5 mm

8 am to 2 pm = 140. 2 mm

According to the rainfall intensity-duration-frequency analysis by PAGASA, the 6-hour rainfall value of 140.2 mm has a 50-year return period. Meteorological records were also collected by the military at Campsite Tongonan, which is located in the mountainous area 15 km north of Ormoc. An extremely intense rainfall was observed at this station and the 6-hour rainfall value was 580.5 mm (8 am to 2 pm, November 5, 1991). Based on the field interview with local scientists, the duration of the rainfall may have been four hours (from 8 am to 12 nn). It was concluded that unprecedented heavy rains such as 150 mm/hr had fallen for four hours in the mountainous area that includes the watershed for Ormoc City.

1.2.2 Camiguin Island Case Study. Camiguin Island experiences a Type 4 climate (see Table 4.1). Tropical storm “Nanang” started as an active low pressure area in the afternoon (4 pm) of November 5, some 600 km northeast of Mindanao and exhibited winds of less than 65 km/hr. As shown in Figure 4-3 plate (a), it persisted as an active low pressure area until 8:00 am November 6, when it developed into a tropical depression and Public Storm Warning Signal No. 1 was raised over the provinces of Catanduanes, Sorsogon, Masbate, Samar Province, Biliran Island, Leyte Provinces, Dinagat Island, Surigao Province, and Agusan Del Norte. At 11 pm on the same day, the weather disturbance was estimated to be 60 km southeast of Guian or 110 km north-northeast of Surigao City (10.6 N latitude 126.1 E longitude). At 2:00 pm residents in low-lying areas were warned of possible flooding, a warning reiterated in every Severe Weather Bulletin issued by PAGASA. Typhoon "Nanang" crossed the area within a radius of 250 km of Camiguin on November 7, 2001. Figure 4-3, plates (b1-b4) also show the satellite imagery of its passage on November 6 to 7, 2001.

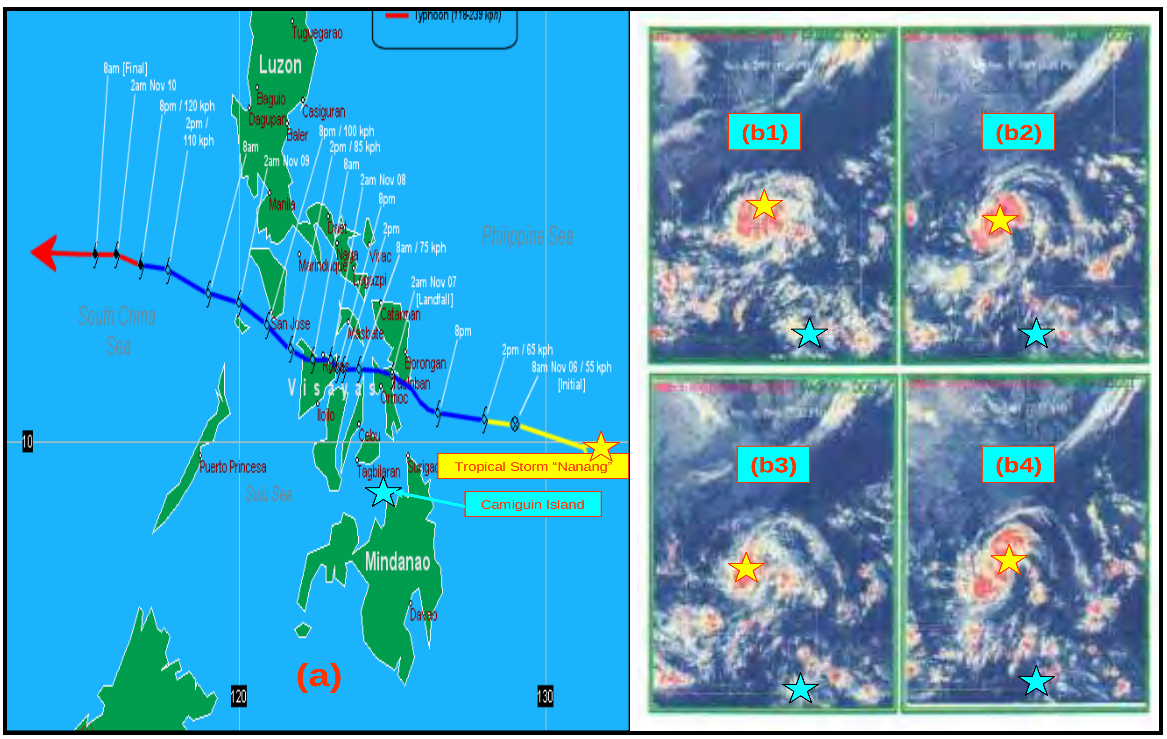

Figure 4-3. (a) Track of tropical storm "Nanang" by PAGASA. Source: Abigania et al. (2001). **Satellite imagery of "Nanang" passage on November 6-7, 2001, (plate b1) at 1:32 am, November 6, 2001; (plate b2) at 1:32 pm, November 6, 2001; (plate b3) at 7:32 pm, November 6, 2001; (plate b4) at 7:32 am, November 7, 2001.** Source: Relox et al. (2001).

The climate in Camiguin falls under Type 4. The peak rainfall that triggered mud and debris flows in Camiguin is shown in Figure 4-4. Maximum rainfall intensities occurred from 2:00 am to 3:00 am in the morning. Most of this rain occurred during the late evening and early morning period of November 6-7, 2001, when the 24-hour daily rainfall totalled

517 mm, as recorded at the PHIVOLCS' Hibok-hibok Volcano Observatory (HVO). This value is 36 times greater than the average daily total of 14.2 mm for the month of November 2001, based on the 11-year rainfall record of PHIVOLCS' HVO (Abigania et al. 2001, cited in JICA-DPWH Report, 2001).

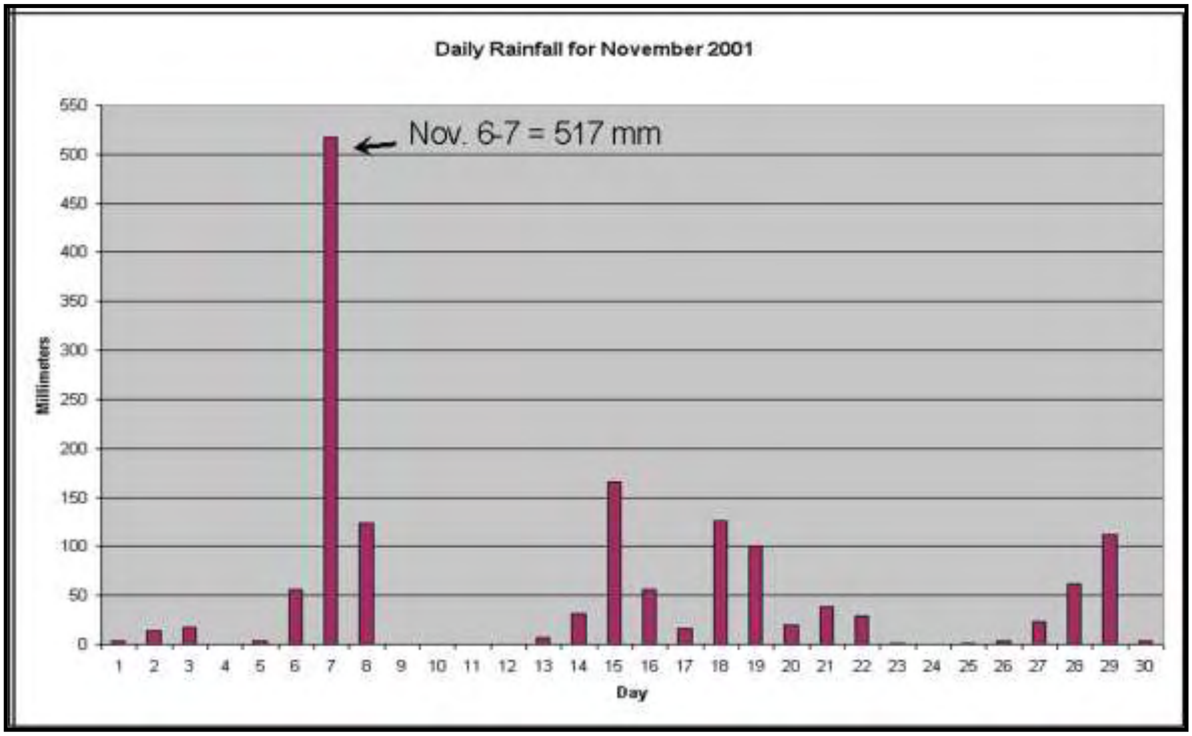

Figure 4-4. Peak rainfall recorded on Camiguin Island, November 5-6, 2001. **Source: PAGASA (2001).**

The same event was monitored by PAGASA and it was recorded that maximum 24-hour rainfall on November 5 and November 6, 2001 (meteorological time starts at 8:00 am) was centred over the Camiguin - Bohol area. Based on three days 24-hour rainfall observation, Hinatuan had the highest rainfall on November 5 (124.4 mm), Tagbilaran on November 6 (213.6 mm), and Dipolog on November 7 (171.2 mm). This finding was confirmed by the persistent existence of intense convective systems over the area as shown in the satellite images (Figure 4-3 plate's b1 to b4) from November 6 (1:32 am) to November 7 (7:32 am), 2001. These convective systems were the result of persistent wind convergence in the area as shown in the streamline analysis (Figure 4-5). Based on the field investigation carried out by the PAGASA study team, orographic effect had occurred in the volcanic mountains of Camiguin, which the local people had called [3]"buhawi" (Relox et al, 2001).

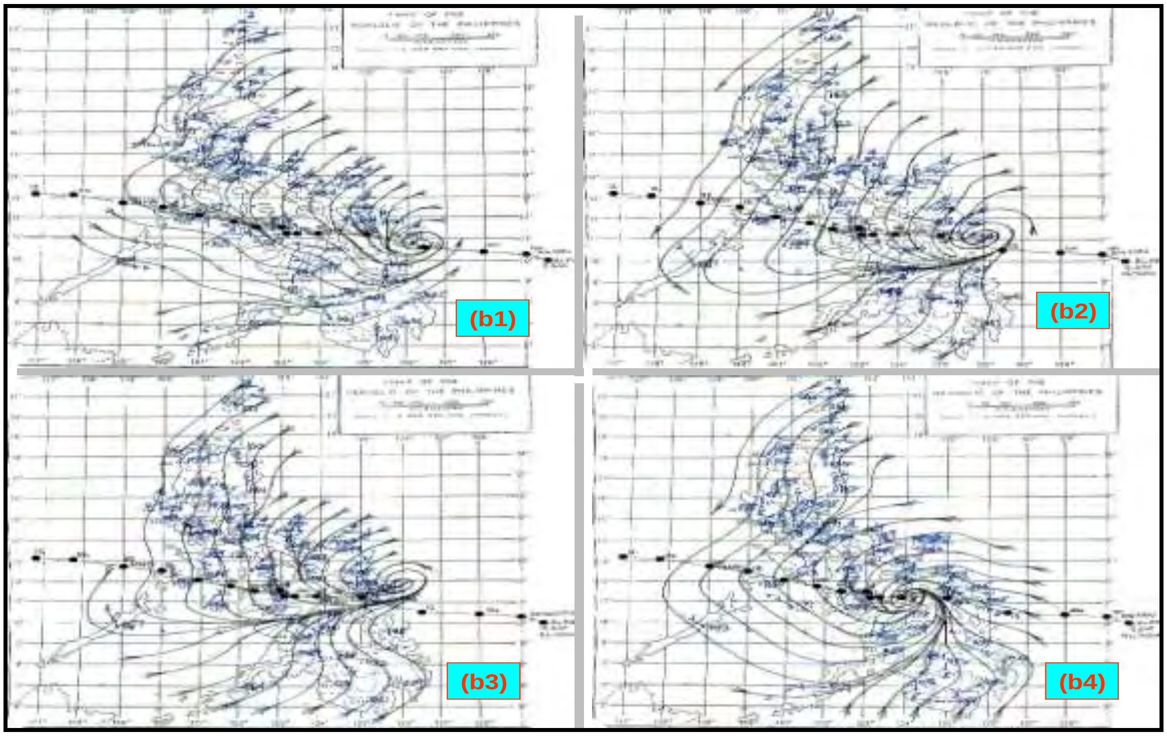

Figure 4-5. Streamline analysis during the passage of Typhoon "Nanang" from November 6 (1:32 am) to November 7 (7:32 am), 2001. Source: PAGASA (2001).

1.2.3 Panaon Island Case Study. The climate of Panaon Island falls within Type 2 of the climatic classification of the Philippines (see Table 4.1). Heavy rainfall occurs during the months of December to January and intermittent rains are expected during the rest of the year. The average annual rainfall precipitation is about 4,000 mm. However, it was the presence of the ITCZ that triggered continuous heavy rains on Dec 15-22, 2003, in the southern part of the Philippines. The seasonal movement of the ITCZ in the months of July (red band) and January (blue band) is shown in Figure 4-6. These seasonal bands bring heavy rainfall to the Philippines, which is situated in between the two bands.

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[3] *Buhawi* is a Filipino term for twister or whirlwind. It is a localized natural hazard and can be a violently destructive windstorm. It carries rains and is characterized by funnel-shaped clouds extending toward the ground or sea surface.

The ITCZ is an area of low pressure that forms where the northeast trade winds meet the southeast trade winds near the equator. As these winds converge, moist air is forced upward. This causes water vapour to condense as the air cools and rises, resulting in a band of heavy precipitation around the globe. This band moves seasonally, always being drawn toward the area of most intense solar heating, or warmest surface temperature.

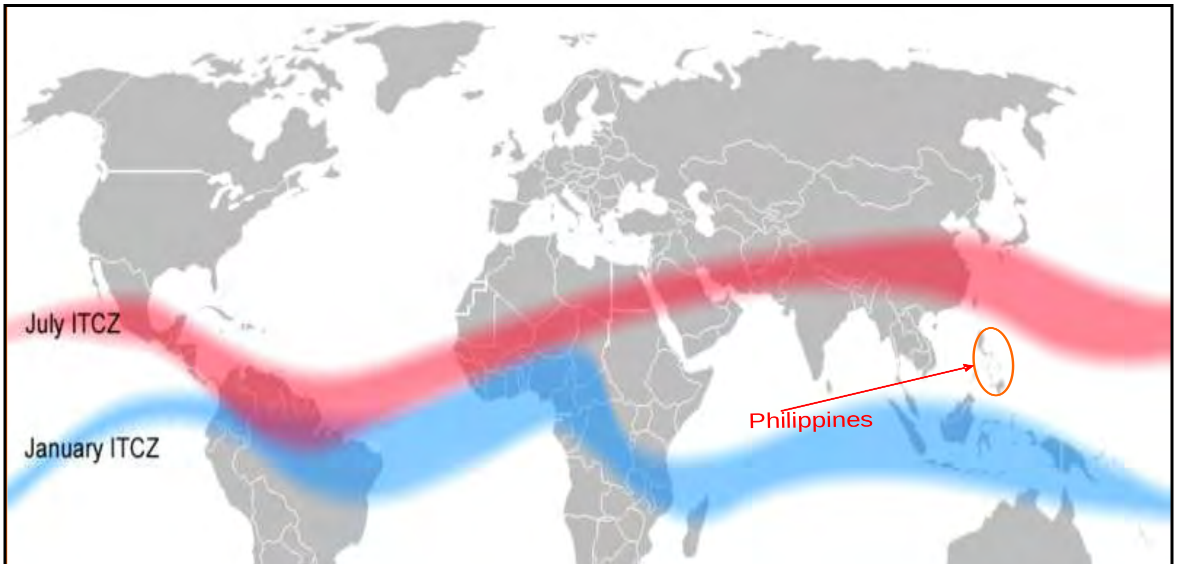


Figure 4-6. The **Intertropical Convergence Zone (ITCZ)**, also known as the **Intertropical Front**, **Monsoon trough**, **Doldrums** or the **Equatorial Convergence Zone**, is a belt of low pressure girdling Earth at the equator. It is formed by the vertical ascent of warm, moist air from the latitudes above and below the equator. The air is drawn into the intertropical convergence zone by the action of the Hadley cell, a macroscale atmospheric feature which is part of the Earth's heat and moisture distribution system. It is transported aloft by the convective activity of thunderstorms; regions in the intertropical convergence zone receive precipitation more than 200 days in a year. (source: Wikipedia). **Position of the ITCZ in July (red) and in January (blue).**

Figure 4-6. Rainfall-causing bands of the Inter-Tropical Convergence Zone (ITCZ). Source: NASA in Wikipedia (2007).

The eight day heavy rains caused by ITCZ affected much of Southern Leyte and Surigao. According to Daag et al. (2006), Panaon Island of Southern Leyte had an average of 300 mm daily rainfall (793 mm 3-day) on November 19, 2003, which is three times the usual recorded average rainfall of about 100 mm in the area.

1.2.4 REINA, Quezon Case Study. The climate of Quezon is marked by the absence of a dry season with a very pronounced maximum rainfall from November to January (Type 2). For more than two weeks, four typhoons hit the municipalities of Real, Infanta and Nakar (REINA). The first was typhoon “Unding”, which had the strongest sustained winds of more than 120 km/hr and gusts of up to 150 km/hr on November 16-20, 2004. It was followed by tropical depression “Violeta”, which had the strongest sustained winds of 45 km/hr near the centre on November 22-23, 2004. The third was tropical depression “Winnie”, which had strongest sustained winds of 55 km/hr near the centre on November 29-30, 2004. The last was super typhoon “Yoyong”, which had strongest sustained winds of 185 km/hr near the centre with gusts of up to 220 km/hr on December 2-3, 2000. Most of these storms were generated from the southeastern part of the country. These municipalities are located in eastern Luzon. Typhoons usually impact the region between May and December each year (PAGASA, 2005). Based on rainfall estimates from weather satellite image interpretation done by NASA (Figure 4-7), around 1,100 mm of rainfall fell during the period from November 16 to December 3, 2004.

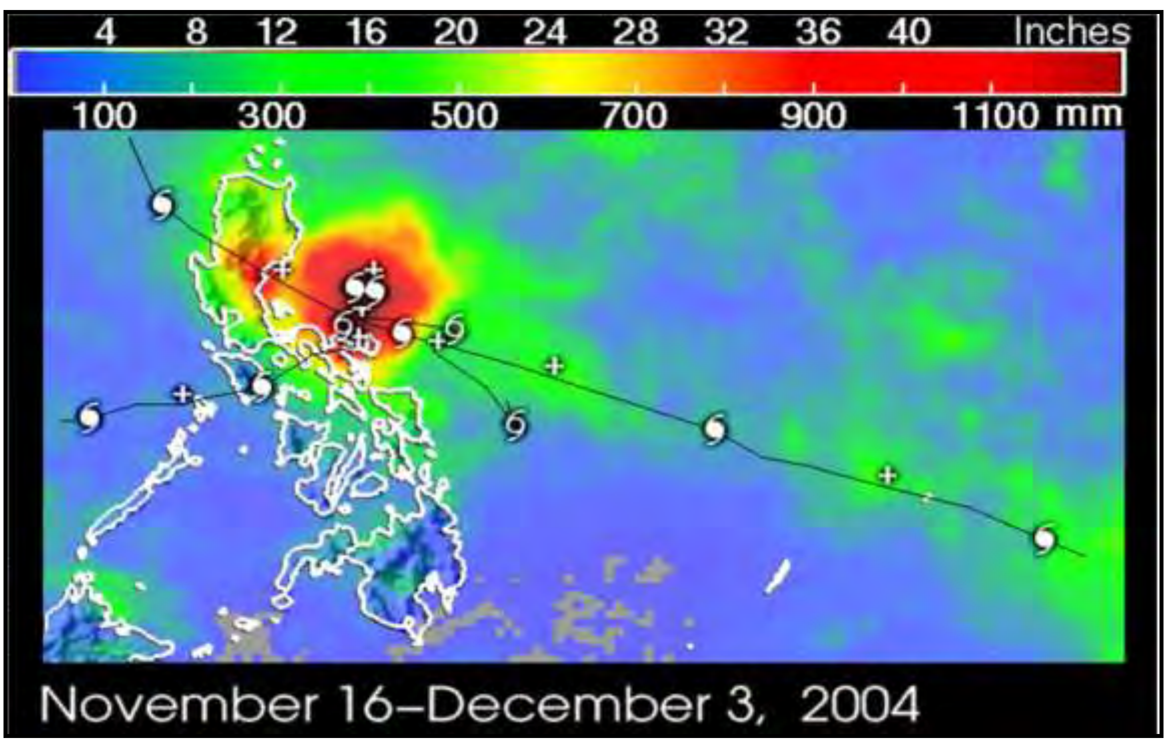


Figure 4-7. Total amount of rainfall in REINA, Quezon on Nov 16- Dec 3, 2004. Source: NASA and NDCC (2007).

However, this rainfall distribution over the area had various magnitudes and intensities. Figure 4-8 shows the various rainfalls as recorded at various PAGASA weather stations. It can be noted from the rainfall data from Casiguran and Infanta, that Typhoon “Unding” (November 16-20) did not bring much rain over the region. However, during Typhoon “Violeta” (November 22-23), the heaviest precipitation was centered in Casiguran and Aurora Provinces.

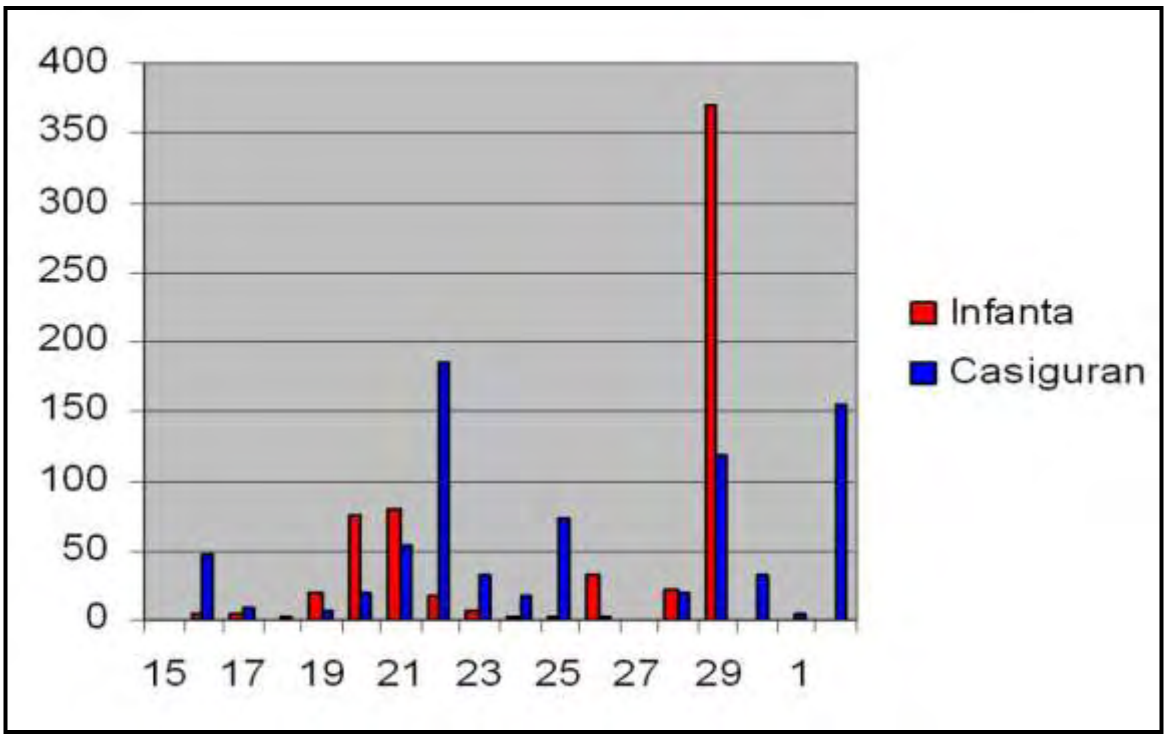


Figure 4-8. Rainfall distribution as recorded by PAGASA weather stations. **Source: PAGASA (2005).**

The spatial and temporal variability of rainfall during typhoon “Violeta” is shown also in Figure 4-9. Based on the November 22 weather satellite data, Casiguran and Aurora Provinces had a peak rainfall intensity of 20 mm/hr. Weather satellite images show that high rainfall intensity is more concentrated south of Casiguran, where Dingalan is located.

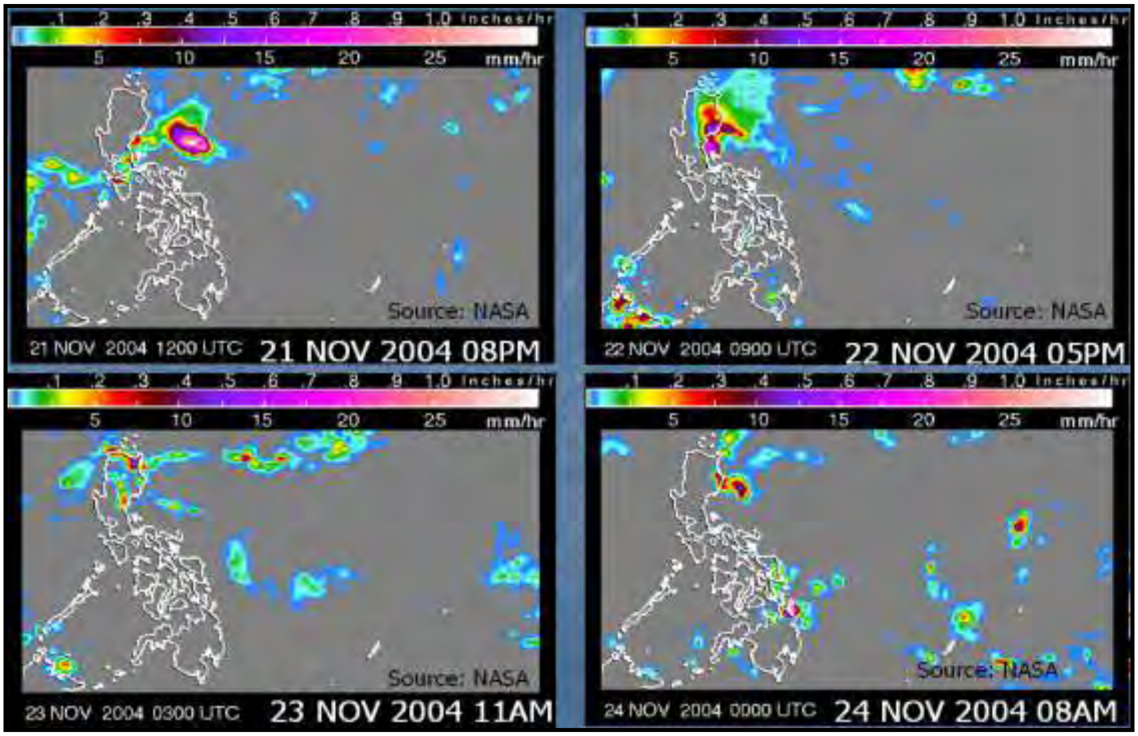


Figure 4-9. Typhoon “Violeta” precipitation images. **Source: Daag et al. (2005).**

The heavy rainfall caused flash floods and mudslides in Baler and in the Dingalan area as shown in Figure 4-10.

Figure 4-10. Flash floods and mudslides in Dingalan, Aurora Province. **Source: DENR (2004).**

Typhoon “Winnie” hit REINA region severely on 29 November, 2004. This can be shown in Figure 4-11 which maps the precipitation brought by the typhoon.

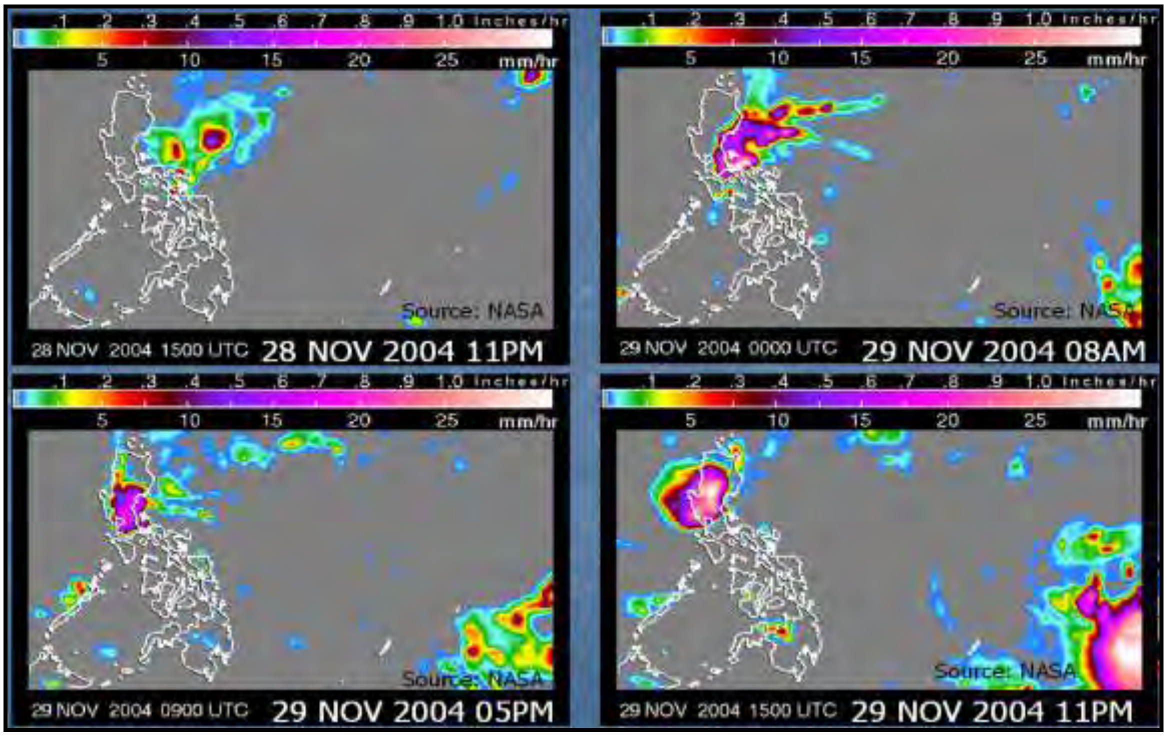


Figure 4-11 Typhoon “Winnie” precipitation images. Source: Daag et al. (2005).

Based on the series of precipitation maps, intense rainfall started on November 29 from 8:00 am till early evening. Long duration high intensity rainfall in the order of 25mm/hr had been sustained continuously for several hours. A rain gauge located in Infanta had recorded a rainfall magnitude of around 370mm on 29 November, 2004.

1.2.5 Saint Bernard, Southern Leyte Case Study. For almost one week in February 2006, heavy rains fell in Saint Bernard. This was unusual because the rainy season in the area should have ceased in January. The municipality has been classified as Type 2 climate (see Table 4.1) with no dry season and a very pronounced maximum rainfall from November to January. Local scientists from PAGASA have implied that the rains were associated with a La Nina which extended into the first quarter of 2006. El Nino and La Nina are the names given to changes in the winds, atmospheric pressure, and seawater that occur in the Pacific Ocean near the equator. El Nino and La Nina are opposite phases of a back and forth cycle in the Pacific Ocean and the atmosphere above it. These natural phenomena do not change with the regularity of the seasons. Instead, they repeat on average about three or four years. El Nino means less rain and La Nina brings much rain. Another natural process was an 'orographic' effect similar to that of Camiguin Island as shown in Figure 4-12. This occurs when moist air flowing from the ocean encounters a mountain barrier and is forced up over the mountains. The air continues to cool as it rises, and the moisture condenses and it rains on the windward side of the mountain. When the moisture-depleted winds flow down the other side of the mountains, they warm and become drier. Little rainfall reaches the leeward side of the mountains. Saint Bernard faces the Pacific Ocean, and is situated at the toe of Mount Cabalian. Guinsaugon village is also located at the toe of Mt. Cabac.

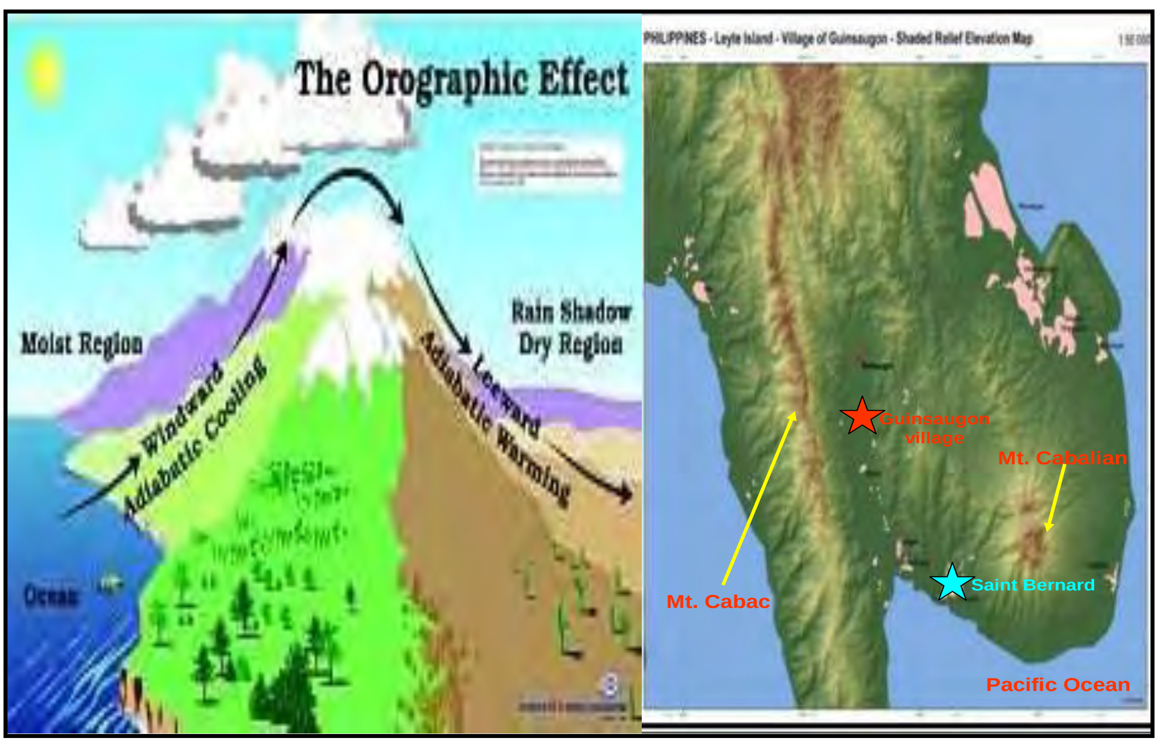


Figure 4-12. The orographic effect in Saint Bernard, Southern Leyte. **Source: PAGASA (2007).**

1.2.6 Synthesis. The foregoing case studies indicate that the exposure of the Philippine islands to monsoon or rain-bearing winds from the Pacific Ocean is changing. Usually, the wet season from June to December also sets off the formation and occurrence of typhoons. Most of these typhoons come from the southeast and exit to the northwest. On average, about 22 typhoons occur every year (PAGASA, 2007) and approximately three typhoons landfall per month. The four typhoons in December 2004 that battered Real, Infanta and Nakar (REINA), and Quezon in less than a month have altered existing records (NDCC, 2005). Records show a significant change in terms of increase in the number of typhoons that impacts the Philippines. Usually, typhoon names do not exhaust the 28-letter Filipino alphabet in one full year. However, since the 1990's, typhoons have exceeded the letters in the alphabet. Naming the typhoon requires a return to the beginning of the alphabet before year end, meaning that more than 28 typhoons had been formed and impacted the Philippines. The average is three typhoons per month, but the four typhoons of the 2004 REINA case have broken this record and by impacting these localities within 22 days. Another trend noted is about the unprecedented similarity in the path and the localities these 4 typhoons have affected. The third typhoon "Winnie", though considered a weaker typhoon in terms of winds at the centre, had heavy rains within 3 days which resulted in many flash floods and landslides in REINA. This resembles typhoon "Uring" of Ormoc City in 1991 which, with at least 65 km/hr centre winds, formed huge rain clouds that unleashed intensely heavy rains over a three day period. These changes indicate two emerging trends in natural vulnerability. First, successive typhoons over a very short duration, like the four which passed through almost the same path inside a month, can be catastrophic. Second, typhoon winds are no longer the sole harmful cause of disaster. Weaker typhoons with huge rain clouds can be equally or more disastrous given the potential for heavy rainfall, flash floods and landslides.

Another case to reckon is the 2001 Camiguin Island natural disaster. The passage of a typhoon through a region where they are least expected indicates similar vulnerability to natural hazards. Camiguin Island belongs to Mindanao region which had been previously identified as rarely impacted by typhoons. According to PAGASA (2001), the annual probability of a typhoon crossing Camiguin Island is 7%. Typhoons normally occur during the period from October to December. These occurrences coincide with the rainy season, which is influenced by the northeast monsoon. Typhoon "Nanang" happened in November 2001 within the shortest duration of 2 days. However, the eye of the typhoon crossed Leyte and not Camiguin. Leyte experienced stronger winds but Camiguin Island received more rain. This observation reinforces the second trend in natural vulnerability mentioned above. Intense rainfall is now more potentially dangerous to localities under climate types 2 and 4, particularly when enhanced by rain-bearing winds, depressions (ITCZ) and La Nina episodes. Unsuspecting local people may view such rain events as associated with the change of season. Hence, preparedness and warnings can be taken lightly.

All communities in the five cases were situated on the eastern side of the Philippines facing the Pacific Ocean. They are also bordered by high mountain ranges with growing human settlements at the toe of these mountains. These geographical attributes can intensify interaction with monsoon, orographic effect, rain shadow effect and local storms, which can trigger potential hazards such as landslides and flash floods.

These study observations confirm the following results of the World Bank Study (2005):

1. In terms of frequency of destructive typhoons by province from 1991 to 2003, Leyte Province (Ormoc City) was highest, having been affected 20 times by destructive typhoons. Quezon Province (REINA) had been affected ten times, closely followed by Southern Leyte (Panaon and Saint Bernard) with nine occurrences. Camiguin

had the lowest frequency of four typhoons. Higher frequency coincides with the usual typhoon paths.

2. Though not included in this study, it is worth mentioning that there were provinces with typhoon frequencies higher than the 20 times experienced by Leyte Province. National Capital Region or Metro Manila has been impacted 34 times, Pampanga 30 times, Zambales 26 times, Bataan 24 times, Ilocos Norte 24 times, Benguet 23 times, La Union 22 times, Pangasinan 21 times, Nueva Ecija 21 times, Negros Occidental 21 times, Bulacan 21 times, Nueva Ecija 21 times, Ilocos Sur 21 times and Tarlac 20 times.
3. Frequencies of typhoons in these areas range between one to more than two times per year. This is equal to a range of a two year return period to a one year return period.
4. The frequency of occurrence in Mindanao, which includes Camiguin Island (except the north eastern part), is relatively low with a range of zero to one time per year (a more than two year return period) on average.

In terms of typhoons, Luzon (north, southeast) and Visayas (east) are the most vulnerable regions, while in terms of rainfall and climate change, Luzon (central, south, southeast), Visayas (east) are the most vulnerable.

These significant changes in physical vulnerability to natural disasters necessitate corresponding adjustments in community preparedness. Disaster management institutions and service providers need to enhance the knowledge base of the communities at risk in responding to evolving natural hazards. Typhoon prediction and weather forecasting are more advanced now in the Philippines than before. Modern weather centres from neighbouring countries share hydro-meteorological data with the government's weather bureau, PAGASA, thus enhancing its forecasting capability. Transfer of scientific information into practical measures carried out by the local people so as to avoid disasters remains a great challenge for service providers. Records of increasing numbers of people killed in typhoon-related disasters underscore this need. Local people believe media announcements of typhoons from PAGASA. These warning bulletins include the tracking and projected direction of the typhoon. Information about the accompanying precipitation is included in the typhoon warning. Precautionary measures are also included for the general public to observe. Communities to be hit by the typhoon are encouraged to evacuate to safer places. Local disaster coordinating councils in the areas likely to be affected are activated and emergency services are placed on standby. Heavy rains associated with typhoons are also anticipated in identified dams and river-basin reservoirs that release excess water to low-lying areas or flood plain communities. This forms part of the usual typhoon and flood advisory service. These systems are confined to identified river basins and structurally-engineered dams and flood control structures where flood waters are more or less expected to rise. Communities in these areas are more prepared as they are aware of the flooding episodes caused by typhoons through the periodic advisories in place. Hence, fatalities are minimal and less damage is incurred. The rivers linked to the five cases however were not included in the major classification of river basins. Thus, no monitoring of rainfall intensity or prediction of natural dam formation was undertaken before the natural disasters struck.

The five case studies strongly suggest, however, that maximum rainfall was caused by weather events not categorized as typhoons. Information about these natural hazards such as monsoon rains, usually form part of periodic weather forecasts released by PAGASA for localised and individual use. This type of advisory service can be taken as normal rain conditions by the local people though the rains may continue for weeks. The accumulation of continuous rains in certain areas can develop into hotspots for flash floods and landslides. This is a grey area in the natural hazard prediction and alerting system in the country because no public warning is in place for this emerging disaster risk. Rain-induced landslides and flash-floods are now acknowledged as deadlier than typhoons. Causes of fatalities were directly traced to flash floods and landslides. Records at the Philippines' National Disaster Coordinating Council, however, listed these casualties under typhoons which can mean the gravity of the natural disaster of flash floods and landslides can be overlooked. Questions that arise from this issue are as follows: When and where should rains be considered as a life-threatening hazard? Who should be predicting the threat? What precautionary measures can be taken to prepare for rain-induced disasters? Are local-based predictions more effective and efficient in non-typhoon, rain-induced flash floods and landslides?

2. Floods

Overflows of water from rivers with large discharges caused by heavy rainfall in the river basins can result in floods which include flash floods. This study is focused on the latter. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets or mountain canyons, sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or log jam.

Figure 4.13 shows the natural process involved in landslide-dam formation and flash flooding as suggested by Punongbayan et al. (2004). Disaster case studies of 1991 Ormoc City, 2001 Camgiun Island, 2003 Panaon Island and 2004 REINA, Quezon events are examples of this natural process.

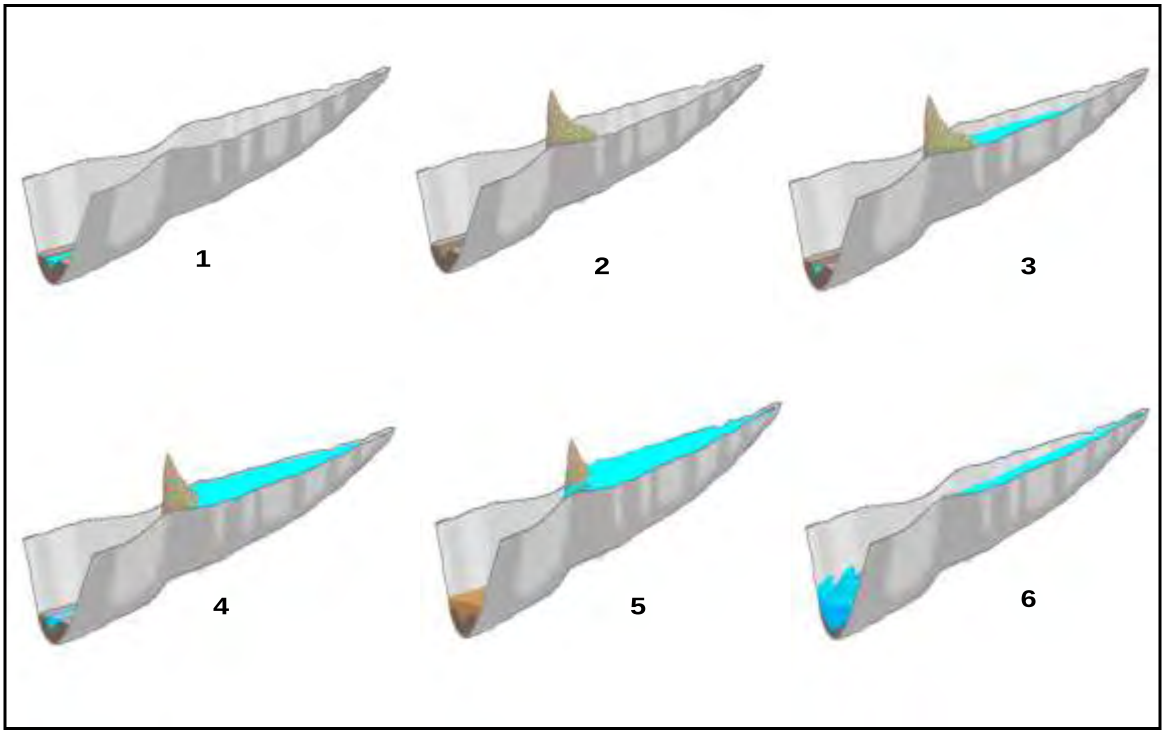


Figure 4.13. Formation stages of a landslide dam that can result in a flash flood or mudslide; (1) narrow valley with normal stream flow; (2) landslide deposit emplaced across river channel; (3) impoundment of water upstream of landslide dam; (4) near-overtopping stage; (5) overtopping of landslide dam leading to its failure, and (6) flash flood stage. Source: Punongbayan et al. (2004)

Table 4.6 shows the characteristics of flash floods. The major river systems cited were those geographically situated in the disaster-affected areas where many people were killed. Out of the five natural disasters, the 1991 Ormoc event was considered a major flash flood event. It was followed in severity by the REINA and Camiguin events, although simultaneous landslides also occurred in these places. Deep floodwaters and debris flows were experienced in the 2004 REINA event of four to six metres. The 1991 Ormoc City event had flood depth of three to four metres and the Camiguin event in 2001 had floodwaters one and a half to three metres deep. In terms of peak flow duration, Camiguin had the longest with seven hours occurring from late at night till early morning of the following day. The REINA event had a six hour duration occurring from the afternoon until late at night. The Ormoc City event has the shortest duration peak flow of four hours occurring in the morning till noon. Ormoc and Camiguin flash flood events were both influenced by two river systems while the REINA event involved three. Geomorphic features of these rivers can also affect water discharges caused by intense rainfall.

Table 4.6. Flash flood characteristics of the five natural disaster cases.

Study Cases	Date of Occurrence	Number of Major River Systems	Peak Flows Duration	Concentration time	Maximum Flood Depth
Ormoc City	November 5, 1991	2	8 am – 12 nn	4 hours	3 - 4 metres
Camiguin Island	November 6 - 7, 2001	2	8 pm (Nov 6) – 3 am (Nov 7)	7 hours	1.5 - 3.0 metres
Panaon Island	December 19, 2003	N/A	N/A		
REINA, Quezon	November 29, 2004	3	2 pm – 8 pm	6 hours	4 – 6 metres
St. Bernard, Southern Leyte	February 8-12, 2006	N/A	N/A		

Source: Philippine Atmospheric, Geophysical and Astronomical Service Administration and National Disaster Coordinating Council (2007)

2.1 Ormoc City Case Study. Ormoc City is situated between two rivers, the Anilao River on the western side and the Malbasag River on the eastern side. The city lays in a fan-shaped delta at the mouth of these two rivers. Table 4.7 shows the profile of the two rivers. The purpose of this information is to show the capacity of these river systems in relation to the flow and magnitude of the floodwaters.

Table 4.7. Profile of Anilao and Malbasag Rivers in Ormoc City.

Characteristics	Anilao River	Malbasag River
River Length (km)	16	12
Drainage Area (km2)	27	12
Height of Headwaters (m)	860	800
Average Stream Profile	1/19	1/15
In Urban Area	1/140	1/90
Average Channel Width (m)	40	20
Average Channel Depth (m)	3	3

Source: Report of the Ormoc Task Force Scientific Study Group, Department of Science and Technology (1991)

Retaining walls, stone masonry revetments or concrete channels were constructed along these channels at important spots in the urbanized area in Ormoc City. These two rivers are connected to each other by the irrigation canal which is located just north of the urbanized area. Riverbed material consists of sand with gravel downstream of both rivers, while large boulders are observed in the river channels of the upper reaches. The flooded areas are shown in Figure 4.14.

Figure 4-14. Flood-affected barangays in Ormoc City. **Source: RDCC 8 (2006).**

The flooding in Ormoc was caused by the heavy rainfall of typhoon "Uring" which started at 6 am on 05 November 1991. At around 10:00 am, the area along Anilao and Malbasag rivers was inundated with floodwaters due to overflow. The depth at the Anilao Bridge was approximately two to three metres but the flow was not too rapid. Before 12 noon, flood flow containing a great quantity of debris and driftwood surged over the areas downstream of Anilao Bridge. Consequently, the inundation depth of these areas abruptly increased. At this point, flood flow became rapid. Due to this natural phenomenon, a large number of people remaining in these areas were washed away. Approximately 45 minutes later, the floods subsided.

2.2 Camiguin Island Case Study. The November 7, 2001 episode of Typhoon "Nanang" was known to have caused significant damage and casualties due to flash flooding and debris flows. This event yielded an average rainfall rate of 21.5 mm/hr. Table 4-7 shows the measured rainfall amounts from November 1, 2001 to November 12, 2001. The total rainfall during the two day period prior to November 7, 2001 was only 59.0 mm. This indicates that the preceding days of rainfall need not be voluminous in order to trigger debris flows.

Table 4.7. Typhoon "Nanang" daily rainfall recorded at PHIVOLCS station.

Date	Rainfall (mm)	Remarks
November 1, 2001	3.0	
November 2, 2001	14.0	
November 3, 2001	17.0	
November 4, 2001	0.0	
November 5, 2001	3.0	
November 6, 2001	56.0	Typhoon "Nanang" episode starts
November 7, 2001	517.0	flash flood and debris flows
November 8, 2001	124.0	
November 9, 2001	0.0	
November 10, 2001	0.0	
November 11, 2001	0.0	
November 12, 2001	0.0	

Source: Unpublished HVO rainfall records by Philippine Institute of Volcanology and Seismology (PHIVOLCS) 2001.

Flood-stage flow discharges were already being observed as early as late afternoon of November 6, 2001. The majority of destructive peak flow events occurred within the early morning period between 2:00 am-3:00 am of November 7, 2004. Early peak flows, between 10:00pm - 12:00 am (2-hour period) of November 6, 2004, were restricted to river watersheds of Mambajao town draining from Hibok-hibok Volcano, which suggest potential differences in watershed characteristics (i.e. thickness of soil cover) and runoff response. By comparison, peak flow at Hubangon River, Mahinog town occurred at about 5:30 am on November 7, 2001. This suggests that the attendant triggering rainfall intensity and duration was generally regional in scope. A study by the Japanese International Cooperation Agency (JICA-DPWH, 2001) in Camiguin recommended that the total daily rainfall of 120 mm be considered as the cumulative threshold value for debris flows and flash flood occurrence.

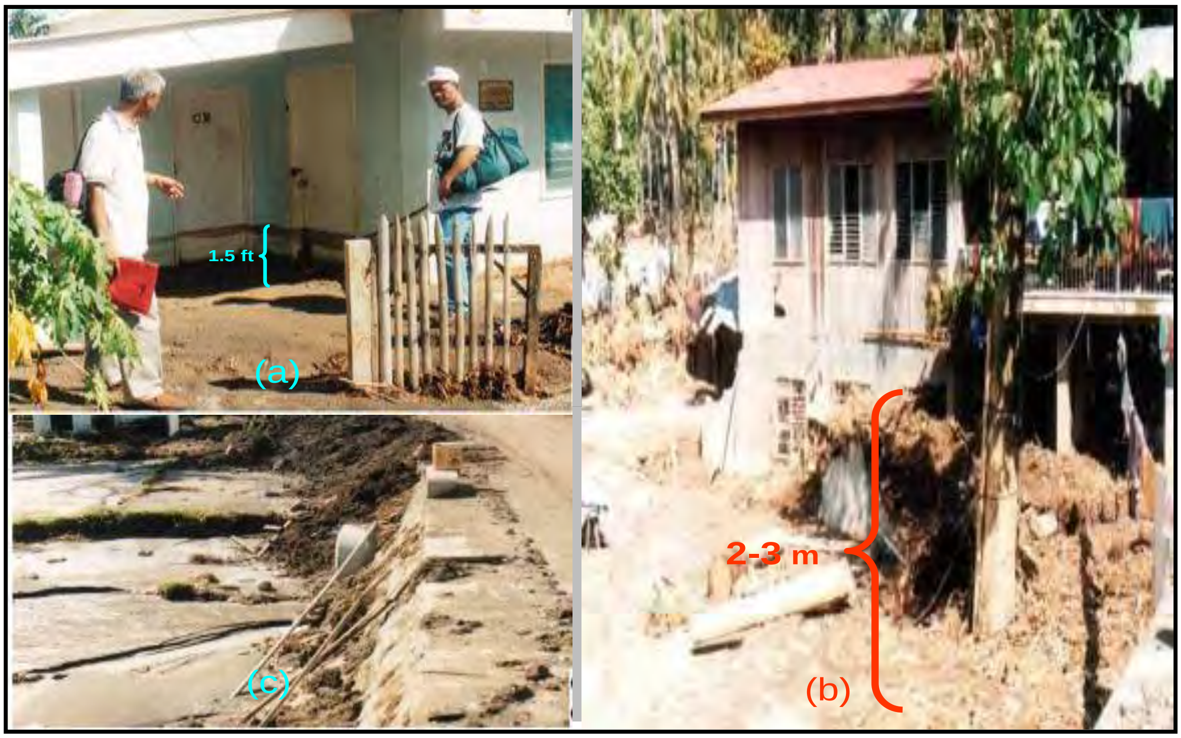


Figure 4-15. Flash flood damage in Camiguin. **Source: Relox et al (2001).**

The municipality of Mahinog was the most heavily damaged area in Camiguin with 132 people killed. The two rivers in Mahinog that experienced severe flooding were Malunay and Hubangon. Severely damaged communities of Mahinog were barangays Hubangon and Tupsan, because in these areas, the flooding was accompanied by landslides and debris flows. Figure 4-15 shows the following impacts of the flash flood: (a) flood marks in the Department of Social Works and Development Day Care Center building in Barangay

Hubangon shows a flood level of approximately half a metre; (b) highway elevation from the adjacent rice fields and residential area range from two to three metre-high flood level; (c) in some low-lying areas there was siltation with rocks and lahars due to the clogging of irrigation drainage, and adjustment of lowland elevation to the highway level.

2.3 REINA, Quezon Case Study. Typhoon “Winnie” was the event that brought the most damage to the eastern portion of northern Quezon. This includes the municipalities of Real, Infanta and Nakar. “Winnie” had a maximum centre wind of more than 100 km/hr with continuous heavy rainfall which lasted for three days. On the 29th of November, the rainfall was so intense that it progressively caused the Agos River, the main drainage system in the North, to overflow. Numerous massive landslides and debris flows occurred upland. It is supposed by Laserna et al (2005) that around 7:00 pm or 8:00 pm, landslide-dams occurred along the Kanan and Kaliwa rivers, two major upstream tributaries of the Agos River. Those dams suddenly broke at around 9:00 pm and released a huge amount of floodwater. This carried large quantities of logs and uprooted trunks that cascaded down the Agos River but clogged below the Infanta—General Nakar bridge, forcing the river to overflow massively and to divert into abandoned channels on the floodplain (Figure 4.16). Floods eventually reached General Nakar and Infanta at around 9:30 pm and submerged the town proper and the surrounding villages in four to six metres of water within 25 minutes. Taken by surprise and without any warning, most of the victims had no choice but to climb onto the rooftops of their houses where most spent several hours or days. Floodwater did not recede immediately and the logs floating everywhere amidst all the mud, rocks and debris, created a picture of utmost desolation. A total of more than 200 people in Infanta perished, swept away by the floods alongside their homes, livelihoods and possessions. Churches, school buildings and houses, among others, were steeped in muddy waters, while bridges collapsed and roads were washed out. Irrigation facilities were destroyed. In the first few days after the onslaught of typhoon "Winnie", telephone lines were also cut, and access to food, power and water supplies was strictly limited. About 100 people perished from the floodwaters of the Agos River in Nakar town.

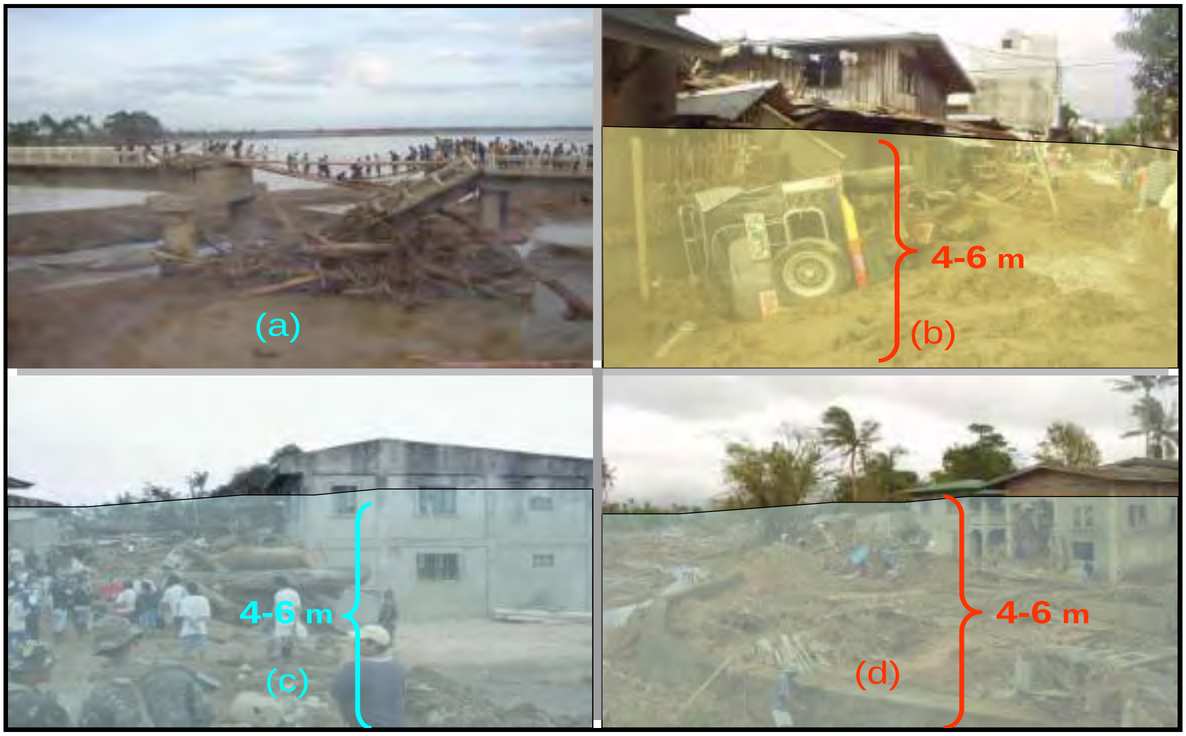


Figure 4-16. (a) Debris and logs clogged Agos River and destroyed the bridge; (b) 4-6 m level of floodwaters in Nakar, (b and d) 4-6 m level of floodwaters in Infanta. Source: NDCC (2004).

2.4 Synthesis. Except for the 2006 Saint Bernard case, all of the other cases were a combination of flash-floods and landslides. The 1991 Ormoc case was characterised by a sudden release of water by a debris or log jam after many days of heavy rainfall. Aside from the unusually heavy rains, the capacity of the river channels and the magnitude of water flow were identified as intensifying the flash floods. The shortest duration of four hour peak flows can be associated with the convergence of the two rivers, Anilao and Malbasag into the city proper. Constricted waterways due to human settlement and encroachment of river banks were found to aggravate the flash flood event. For the 2001

Camiguin case, the two rivers in Mahinog municipality, Malunay and Hubangon were overflowing with debris and floodwaters. The flash flood in Mahinog, Camiguin was suggested by local geologists to have been caused by the failure of a landslide-formed dam. Similar landslide-formed dams in two rivers upstream from REINA failed in 2004. Floodwaters and debris cascaded through the Agos River and clogged the Infanta-Nakar Bridge. Natural damming occurred at the bridge, forcing the floodwaters and debris to divert to the communities of Infanta and Nakar. These cases indicate landslide-formed dams or log jams preceded the occurrence of flash floods and debris flows. While these events can be considered natural processes, human activities may have induced the heightened condition. First, evidence of felled logs and sawed tree trunks in the 1991 Ormoc City and 2004 REINA disasters has implied existence of deforestation and tree harvesting in the watershed. This contributed to the formation of log jams and natural dams upstream. Another was the encroachment of the river channels due to human settlements cited in the 1991 Ormoc event. This reduced the capacity of the rivers to contain floodwaters and debris flows. Lastly, engineered structures like a bridge that traverses a river channel can facilitate the formation of log jams or natural dams. Here, a development project can increase vulnerability to disaster risks.

The time element is an important factor in early warning and evacuation. Night occurrence of flash floods like what happened in 2001 on Camiguin Island can be very devastating. Vision is impaired and mobility is limited at night time which can render people more vulnerable to rapid onset natural disasters. Chances of safety are higher in daylight than at night time during disasters. Local people interviewed who had experienced flash floods have also disclosed that there was a very short warning time or no warning at all. The rapid onset of these natural disasters always caught people unaware and left them no time to evacuate to safer ground. Usually, the impulsive instinct to save one's life becomes the overriding goal during a crisis. With regard to fatalities in these natural disasters, the young and children top the list of victims. In the midst of the panic and paranoia, the psycho-social coping ability of children may be minimal or dysfunctional. This indicates a high vulnerability for this group of the population in responding to the impact of natural hazards.

3. Landslides

A landslide is defined as, the movement of a mass of rock, debris, or earth down a slope as shown in Figure 4-17. It encompasses events such as rock falls, topples, slides, spreads, and flows (Cruden, 1997; Varnes, 1996). Landslides are a type of “mass wasting” which denotes any down slope movement of soil and rock under the direct influence of gravity.

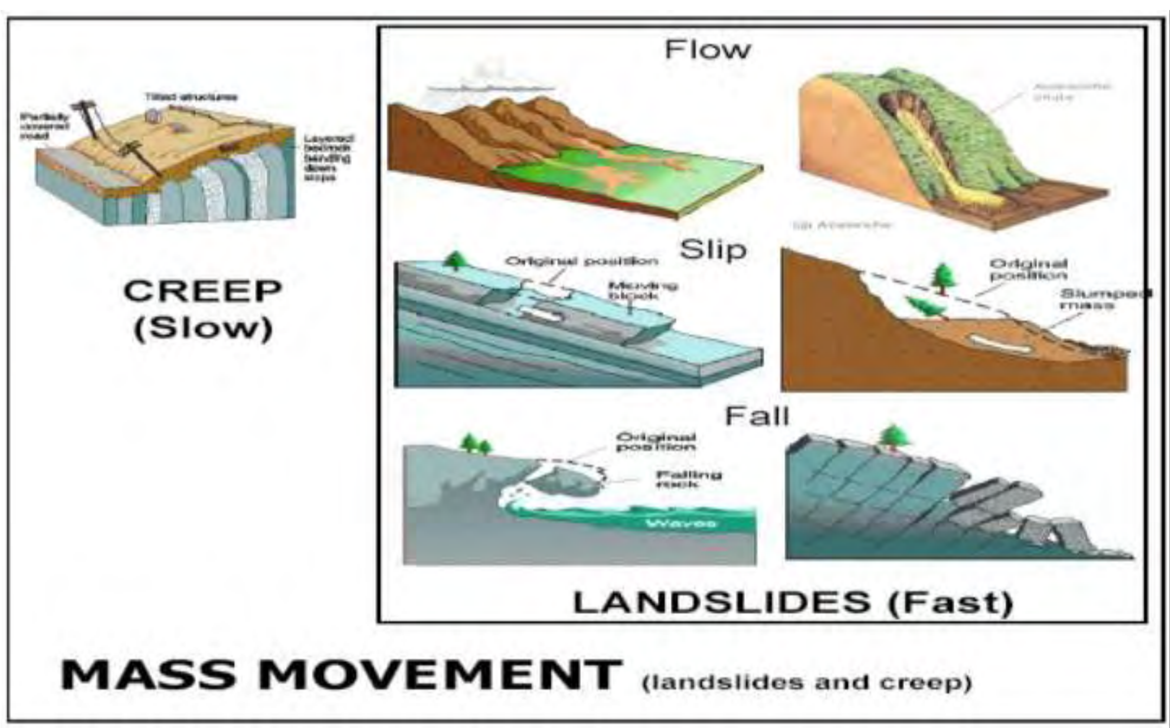


Figure 4-17. Various types of mass movements. *Creep* is the slow downward movement of a large surface mainly due to gravity. *Flow* is the downward movement of rock and soil materials aided by water. If the movement is very rapid owing to a very steep slope, this is called an *avalanche*. *Slip* is the downward movement of rock and soil materials owing mainly to structural weaknesses of the ground. *Fall* is the falling down of already detached blocks/fragments of rock due to inherent unstable conditions. Source: Inter-Agency Committee-DENR (2006).

Landslides can be initiated by rainfall, earthquakes, volcanic activity, changes in groundwater, disturbance and change of a slope by man-made construction activities, or any combination of these factors.

Table 4-8 describes the characteristics of the five water and sediment-related disasters. Among the five disasters, the 2006 Saint Bernard case was considered a major landslide of a single event engulfing a whole village. The rockslide event was accompanied by an explosive sound and happened in broad daylight. According to the UP-Ateneo team of geologists (2006), this landslide event was a rare event, a combination of debris flow and avalanche, and block slide. The 2001 Camiguin Island, 2003 Panaon Island and 2004 REINA, Quezon events were a combination of flash floods and landslides. The 2004 REINA case indicates that several landslides had formed natural dams at night time due to continuous rains. Dam failure caused a flash flood along the Agos River affecting Infanta first, then Nakar and Real. The same also happened in the 2001 Camiguin case where landslide-formed dams caused a flash flood and debris flows. A rumbling sound or an explosion accompanied the event. In terms of sediment volume, the REINA municipalities are ranked first with more than 20 million m^3. Next is Saint Bernard municipality with more than 15 million m^3. This is followed by Panaon Island with more than 5 million m^3. Camiguin Island has the least amount of sediment with more than 3.8 m^3. Three of these events, Camiguin Island, Panaon Island and REINA, Quezon were a combination of flash floods and landslides.

With regard to rainfall thresholds that trigger landslides, the 2004 REINA event has the least with 114 mm/day. It is followed by the 2006 Saint Bernard event with 118.5 mm/day. In these two cases, data suggest less rain was needed to cause the landslide after continuous rainfall had already saturated the ground. The 2001 Camiguin Island event has 120 mm/day and 2003 Panaon Island has 150 mm/day.

Table 4- 8. Characteristics of landslides in the five natural disaster cases.

Study Areas	Date of Occurrence	Landslide Period	Rainfall Threshold	Sediment Volume
Ormoc City	November 6, 1991	N/A		
Camiguin Island	November 7, 2001	5 am-6 am	360 mm in 3 days or 120 mm/day	<3.8 million m^3
Panaon Island	November 19, 2003	6 pm-7pm	459 mm in 3 days or 153 mm/day	<5.0 million m^3
REINA, Quezon	December 19, 2004	7 pm -8 pm	342 mm in 3 days or 114 mm/day	<20 million m^3
Saint Bernard, Southern Leyte	February 17, 2006	10 am	591.4 mm in 5 days or 118.5 mm/day	<15 million m^3

Source: Philippine Atmospheric, Geophysical and Astronomical Service Administration, National Disaster Coordinating Council, and Inter-Agency Committee (2007)

3.1 Camiguin Island Case Study. Vegetation along the slopes (Figure 4-18) is mostly coconut plantations and patches of secondary forest (miscellaneous species). The lowermost slopes are usually orchards, planted with fruit trees (i.e. lanzones), root crops and coconuts. Virgin forests are only found in largely inaccessible areas and in upper elevations of the mountain range. From Figure 4-18(a), traces of forest denudation are not visible. Instead, a landslide along the mountain slope can be seen at a distance. Also, in the same figure (b), a landslide and mud deposits are shown in Barangay Hubangon, Mahinog. The municipality of Mahinog was hardest hit by flash floods accompanied by landslides and flow of lahars. A local rescue team member has narrated the discovery of a landslide that exposed an opening on the mountain approximately 100 metres in diameter and 10 metres deep (plate c). This was a 2-hour fast hike from the highway which was silted over by the landslide. It contained water that flowed downstream following the newly created creek (Relox et al., 2001). This report suggested a natural dam had occurred upstream in Hubangon River which had failed and caused the flash flood. It deposited mud, lahars and big boulders onto the communities along its path.

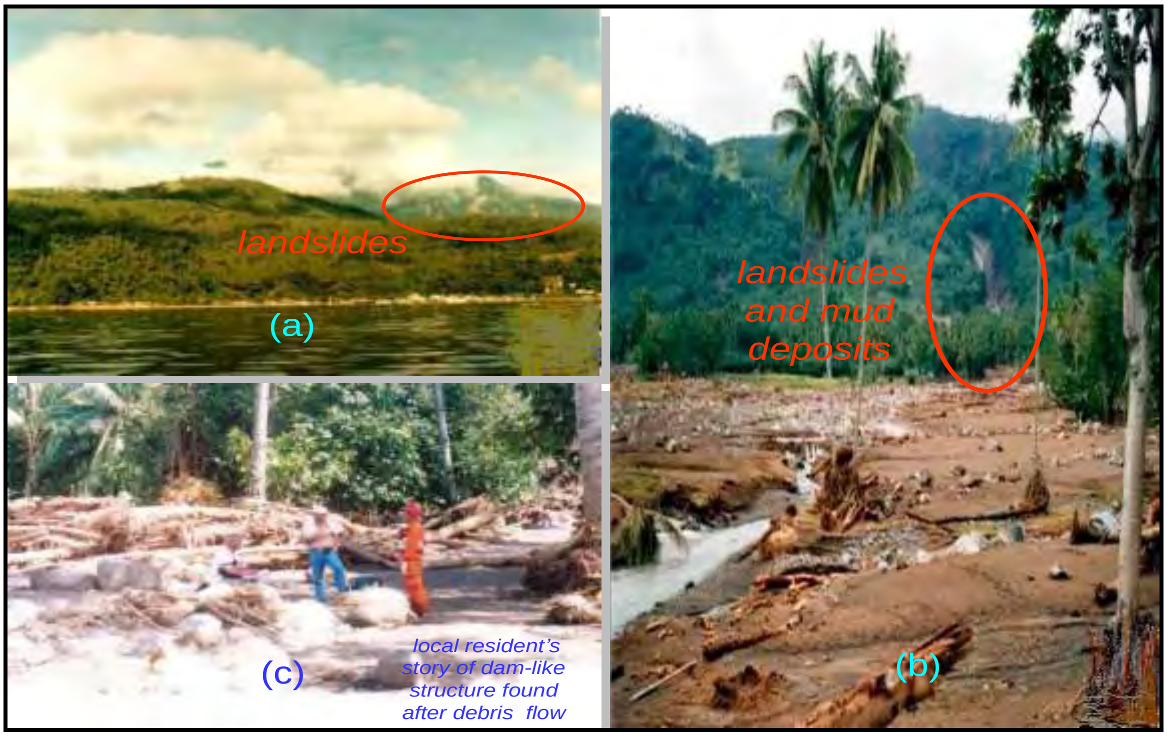


Figure 4-18. (a) Widespread landslide is seen in Verdant mountain of Camiguin; (b) Landslide and mud deposits in Barangay Hubangon, Mahinog, and (c) Philippine Rescue 2001 member narrates to PAGASA field staff their discovery of a dam-like structure resulting from an avalanche. Source: Relox et al. (2001).

3.2 Panaon Island Case Study. On December 19, 2003, several landslides and flash floods occurred in the area of Panaon Island in Southern Leyte. Most of these landslides in the San Franscisco, Liloan and San Ricardo municipalities occurred between 6 to 7 pm on December 19, 2003. Landslide occurrences were related to the amount of rainfall intensities being delivered during the event. Among the areas severely affected by landslides are Barangays Santa Paz and Punta (Figure 4-19) in San Francisco; Poblacion in Liloan; Barangay Kinachawa, Pinut-an, and Looc in San Ricardo municipality.

Figure 4-19. (a) Overview of the landslides in San Francisco; (b) landslide scarp in Barangay Punta, San Francisco; (c) mud littered with vegetative debris in Barangay Punta, San Francisco, and (d) houses damaged by the landslides. Source: NDCC (2003).

The landslides in Barangay Punta, San Francisco had the greatest number of casualties. Three large contiguous landslides directly hit the coastal barangays. The aerial photos would suggest that the area is a site of an old landslide. The area has very steep slopes with a thick soil covering. Beneath the two metre deep soil lays an impervious zone of slightly weathered andesite. This makes the contact between the soil and the impermeable andesite a zone of failure.

In Poblacion, Liloan proper (Figure 4-20) is composed of thick sandy soil with a very steep slope. It has been noted that it has a very shallow water table. This area was therefore highly saturated during the intense rainfall and this combined with a shallow water table, increased the pore-water pressure. This situation caused the slopes to fail.

Figure 4-20. (a) Landslide crown in Poblacion, Liloan, and (b) uphill view of the affected area at Barangay Lutao, Liloan. Note existing vegetation and thickness of the soil, and (c) dead bodies littered in the sides of the landslide scarp. Source: NDCC (2003).

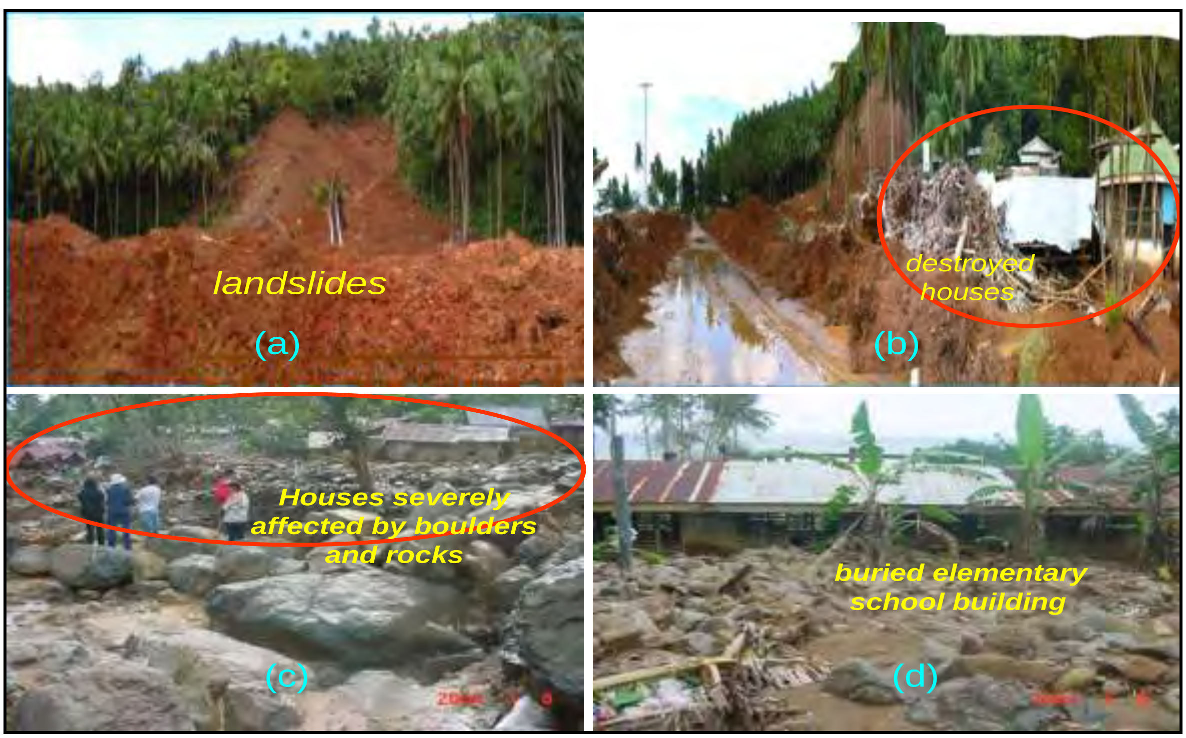


Figure 4-21. (a) Landslides in Looc, San Ricardo, Panaon Island; (b) with destroyed houses on the background; (c) big boulders cascaded through residential houses in Barangay Pinut-an, San Ricardo, and (d) buried and elementary school. Source: NDCC (2003).

Figure 4-21 shows landslide-affected sites in San Ricardo, Panaon with houses destroyed in the background. Big boulders cascaded onto Barangay Pinut-an, San Ricardo, that destroyed many houses and buried an elementary school which had previously served as an evacuation centre.

3.3 REINA, Quezon Case Study. In terms of impact, the municipality of Infanta was hardest hit with over three metres of flood waters and one metre of mud/sand. Debris flow came from landslide materials transported along Agos River. More than 20 million m^3 of sand, mud, rocks and logs was estimated to have cascaded through the river system. Most landslides that hit the REINA region occurred around 6:00 pm on 29 November. Figure 4-22 shows one of the landslides in Barangay Refador, Real, Quezon where several fatalities were buried by the landslide.

Figure 4-22. (a) Swollen Agos River with many landslides emplaced in constricted water channels; (b) Quezon landslides in which Refador building was completely buried, and (c) destroyed bridge traversing Agos River. Source: NDCC (2004).

3.4 Saint Bernard, Southern Leyte Case Study. Several landslides had already occurred in Southern Leyte prior to the February 17, 2006 Saint Bernard major slide. These were caused by continuous rains at the beginning of the year 2006. Chronologies of landslide events in various areas show the instability of the grounds affected by the intense rainfall. In Barangay Kahupian, Sogod town, seven people were killed on 12 February 2006 by a landslide while resting inside a bunkhouse. Earlier in the day, they were inspecting another landslide occurrence in Sitio Agas-agas in the same barangay.

Figure 4-23. Location of landslides in Southern Leyte from 16 to 20 February 2006. Source: MGB and Inter-Agency Committee-DENR (2006).

An alternate highway that connects the towns of Bato and Bontoc was also closed to traffic after a portion of the road sank by two feet (0.6 m). A portion of a road in Barangay Lepanto, municipality of Saint Bernard, had also slipped by two feet (0.6 m). As shown in Figure 4-23, other areas which experienced landslides were those in Barangays Pinamumunuan, Mahaplag; Barangay Sampongan Bato; Barangays Himay-angan and San Roque in Lilo-an; and Barangay Punta in San Francisco municipality.

Figure 4-24 shows other landslide areas in Southern Leyte:(a) Portions of Maharlika highway in Sitio Agas-Agas, Kahupian, Sogod; (b) Damaged road in Barangay Lepanto, St. Bernard; (c) Barangay Pancho Villa, Sogod; (d) Barangay Punta, San Francisco, Panaon Island; (e) Mudflow in Barangay Himay-angan, Liloan; and (f) Sitio Ballacao, Barangay Pinamunuan, Mahaplag.

Figure 4-24. Other landslide areas in Southern Leyte before the 17 February 2006 Guinsaugon event. **Sources: MGB and Inter-Agency Committee-DENR (2006).**

Farther to the north of Southern Leyte, about 2,500 people in the four barangays of San Francisco town were evacuated due to flooding. About 100 people were forced to move to higher ground due to flooding along the river bank in Pinut-an, San Ricardo.

In the 5-day period between 8 and12 February 2006, aggregate rainfall reached 591.4 mm, with an average of 114 mm per day (Figure 4-25). The continued heavy rains reportedly forced some residents to evacuate the area.

However, with the waning of the rains from 13 February, the residents started trekking back to their homes. Apparently becoming more comfortable with the improving weather situation, the people went on with their normal lives – schoolchildren went back to their classrooms, scheduled meetings were pushed through, and farmers resumed tending their farms.

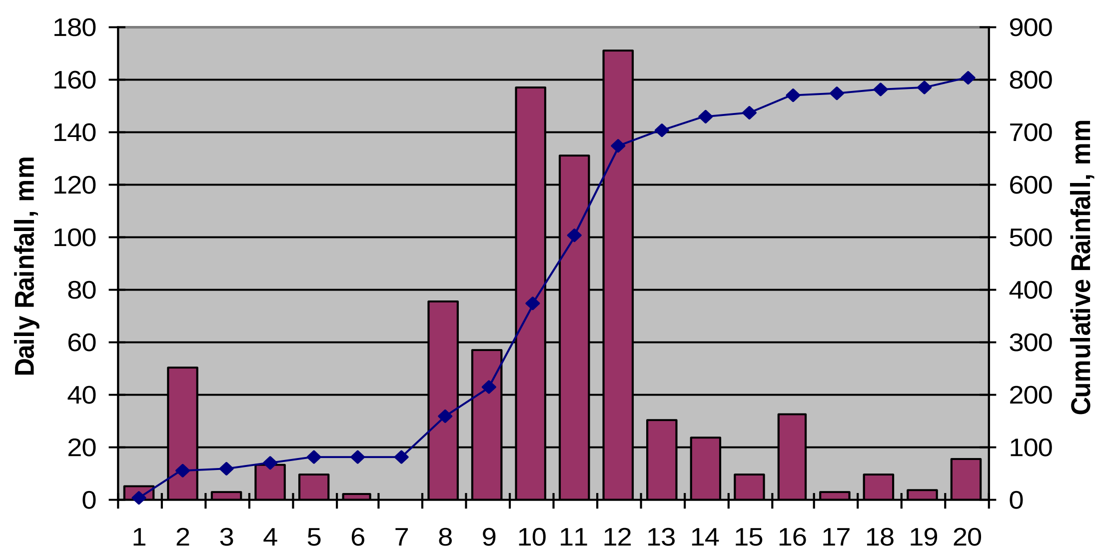


Figure 4-25. Rainfall history of Otikon, Libagon, Southern Leyte, from 01 to 20 February 2006. **Sources: PAGASA and Inter-Agency Committee-DENR (2006).**

Unfortunately, people were unaware that the full impact of the continuous rainfall was about to happen on them. On the morning of 17 February 2006, people reportedly heard “explosions” and “cracking” sounds. Such reported sounds most probably came from the rock-soil materials being detached and starting to come down from the mountains.

At about 10 am on 17 February 2006 (Friday), more than 15 million m^3 of mixed mud and rock fragments cascaded down the foothills of Mt. Cabac, engulfing an area of approximately 300 hectares (Figure 4-26), and entombing an estimated 2,000 people. Based on the accounts of the residents, the duration and the distance travelled by the landslide, the flow velocity was between 100 to 140 km/hr (Lagmay et al, 2006).

Figure 4-26. Overview of the Guinsaugon, St. Bernard, Southern Leyte landslides on 17 February 2006. Source: UP-Ateneo Team (2006).

Figure 4-27 shows a panoramic view of the landslide area and the rock and soil fragments of the rockslide-avalanche.

Figure 4-27. A view from the uncovered rice fields of the landslide area and sea of rock-soil materials that engulfed Guinsaugon, St. Bernard, Southern Leyte. Source: MGB Region 8 (2006).

Figure 4-28 shows comparative features of the landslide area during 24 February 2006 rescue operations (plate a) and 14 months after the landslide disaster. Photos in b, c, d and e were taken during fieldwork carried out by the researcher from April-June 2007. In plate a, numerous 'hills' or hummocks in the background seem to dwarf the rescuers. Houses and other structures were totally destroyed and swept away by the rockslide-avalanche. Plate b shows a hummock approximately eight metres wide and four metres high with the researcher and aide in front of it. Though by this time the area was already thinly-covered with vegetation, which partly hid the destroyed houses, the big hummocks and boulders remained undisturbed.

Figure 4-28. Comparative features of the landslide area, plate (a) rescue operations during 24 February 2006. Source: UP-Ateneo Team (2006). **Plates (b) one of the hummocks, (c) boulders and angular fragments of highly weathered volcanic rocks, (d) a protruding roof of a house destroyed 14 months ago, and (c) part of house wreckage made of galvanized iron roofing.** Source: Author's fieldwork (2007).

Salient findings from the joint team of geologists from the University of the Philippines and the Ateneo de Manila University are shown in Figure 4-29. The figure also includes photos and significant information from the report of the Presidential Inter-Agency Committee tasked to investigate the landslide disaster on 17 February 2006 in Guinsaugon. Note in plate (a) the approximate original location of Guinsaugon in relation to the Philippine Fault line.

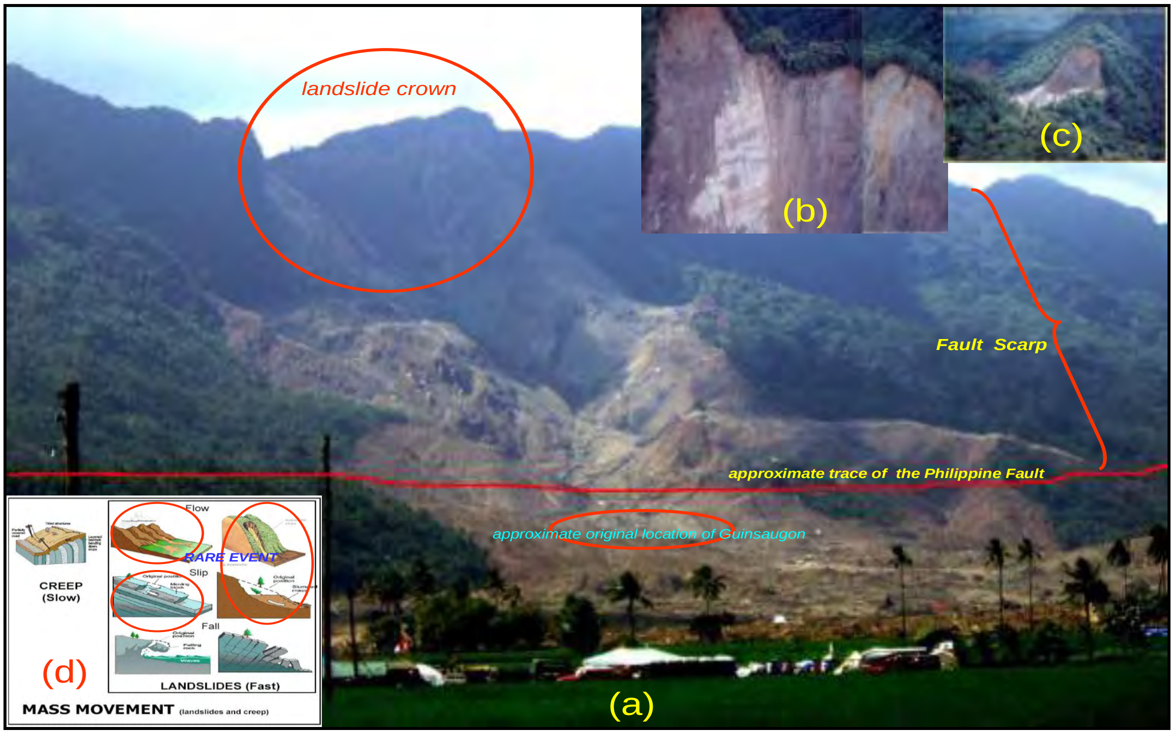


Figure 4-29. The 17 February 2006 rockslide-debris avalanche that buried Barangay Guinsaugon of Saint Bernard, Southern Leyte. Plate (a) slip-plane at the crown of the mountain showing a very steep slope > 50°. Plates (b) close-up view of the landslide crown, (c) landslide crown showing relatively thick forest cover. Plate (d) local scientists called it a rockslide-avalanche induced by heavy rains. **Sources: MGB Region 8 and Lagmay et al. (2006).**

3.5 Synthesis. Landslides formed natural dams in the 2001 Camiguin Island, 2003 Panaon Island and 2004 REINA, Quezon, disaster events. These natural events were triggered by intense rainfall. Witnesses accounts from Barangay Hubangon, Mahinog had claimed to have heard a rumbling sound 15 to 20 minutes before the 2001 Camiguin flash floods. Local people just ignored this until suddenly, rushing floodwaters accompanied by big rocks and trunks cascaded over the residential areas along the highway (Relox et al, 2001). The sound was actually the failure or breaching of a natural dam formed upstream on Hubangon River. The unfortunate residents of Barangay Punta who sought shelter from an earlier minor landslide in an evacuation centre were trapped and killed by the succeeding bigger landslide. This accounted for 105 fatalities out of the total 148 people killed in the 2003 Panaon Island disaster case. The 2006 Saint Bernard landslides were identified by local geologists (Lagmay et al, 2006) as a rockslide-debris avalanche. In this event, the people living at the toe of the mountain were completely unaware of the lurking danger above them, at the crown of Mt. Cabac. Local people reportedly heard "explosions" and "cracking" sounds. Such reported sounds came from the rock-soil materials detaching and starting to come down from Mt. Cabac. Rapid onset of these landslides made it difficult for the threatened communities to flee for safety. The interviews and testimonials of local people explain the misconceptions of affected communities about landslides and mud flows. Local people's understanding of the occurrence of natural phenomena and its effect on their daily living is an important issue, which needs to be addressed. Continuous rains were not considered potential agents of deadlier natural disasters such as landslides. Sounds like rumbling, cracking and exploding a few minutes before the actual event were ignored by the local people as a warning to flee. Another issue was seeking refuge in an evacuation centre that was located in harm's way of landslides. Was it coincidental or a lack of locally-based hazard mapping. All of these are issues of physical vulnerability on the part of people and communities to natural hazards. However, the decision to keep out of harm's way relies heavily on human responsibility to mitigate adverse impacts and stop the disaster from being repeated.

4. Impacts on People and Communities

Table 4-9 summarises the impacts of the five natural disasters on people, properties, agriculture and infrastructure. In terms of fatalities, the 1991 Ormoc City case has the highest toll, with close to 5,000 people killed. This is followed by the 2006 Saint Bernard landslides with more than 1,400 lives lost. The 2004 REINA disaster has the 3rd largest death toll with more than 1,000 people killed. Both the 2001 Camiguin Island and 2003 Panaon Island disasters have death tolls of more than 140. The people recorded as missing are considered fatalities because unidentified dead bodies during the disaster are categorised under missing persons.

However, with the exception of fatalities, the 2004 REINA disaster event had the highest impact record. More than 730,000 families or equivalent to more than 3.7 million persons were affected. Nearly 10,000 houses were totally destroyed and more than 42,000 houses were partially destroyed. Damage to agriculture was the highest totalling more than US$100 million. Damage to infrastructure was also the highest totalling more than US$42 million. Though the second highest in terms of physical damage, the magnitude of the 1991 Ormoc City disaster event in terms of socio-economic impact for a single-locality event, could be considered the most catastrophic. Ormoc City had more than 38,000 families or 193,000 persons affected. More than US$1.5 million damage to agriculture was incurred. Damage to infrastructure accounted for more than US$7.6 million. These damage costs are high because the City has more economic facilities, business establishments and human settlement.

The remaining three disaster cases of Camiguin Island, Panaon Island and Saint Bernard, incurred much lesser damage to houses, agriculture and infrastructure than either REINA or Ormoc City.

Table 4-9. Impacts on people and physical damage caused by the five natural disasters.

Socio-Economic Impacts	1991 Ormoc City	2001 Camiguin Island	2003 Panaon Island	2004 REINA, Quezon	2006 Saint Bernard, Southern Leyte
People Killed	4,921	180	154	1,068	1,447
People Injured	287	146	37	1,163	30
People Missing	3,000	72	40	553	968
Affected Families/ Persons	38,104/ 193,120	7,172/ 43,040	940/ 5,536	731,730/ 3,717,499	3,850/ 18,862
Houses Totally Destroyed	3,360	207	213	56,591	375

Houses Partially Destroyed	10,910	501	1,065	160,285	0
Damage to Agriculture (million US$)	1.512	0.761	0.039	101.293	0.427
Damage to Infrastructure (million US$)	4.044	2.976	0.031	42.755	5.103

Legend: Conversion *(1.00000 Philippine Peso = 0.0189 US Dollar)*
NDCC - National *Disaster Coordinating Council*
Source: National Disaster Coordinating Council (2007)

4.1 Ormoc City Case Study. Ormoc City experienced most of the damage caused by Typhoon "Uring" in the whole province of Leyte. Out of the total 4,930 people killed in Leyte Province, Ormoc City sustained 99% of this total or equivalent to 4,921 fatalities. Details of the devastation are shown in Table 4.10, where comparison is made between Ormoc City and the rest of the Province of Leyte.

Table 4-10. Comparison of damage between Leyte Province and Ormoc City

Variables	**Total**		**Percentage (%) Ormoc/Leyte**
	Leyte Province	***Ormoc City***	
Affected families	37,996	22,663	60
Affected Persons	193,076	121,536	63
Dead	4,930	4,921	99
Missing		3,000	
Injured	278	57	21
Houses Totally Damaged	4,448	3,360	76
Houses Partially Damaged	22,473	10,910	49
Commerce/Trade (US$ value)		US$0.924 M	
Agriculture and Fisheries	US$1.75 M	US$1.512 M	86
Infrastructure		US$4.044 M	

Source: Regional Disaster Coordinating Council Region 8 (1991)

Number of injured is less for Ormoc City because many people swept away by the flash flood were either killed or recorded as missing. Proper identification was carried out for those declared dead. Many victims were washed away into the sea. Delays in the retrieval of dead bodies and hastened decomposition of the corpses rendered identification of casualties difficult. Mass burials were carried out immediately to avoid health risks and plague. This explains the high number of people recorded as missing.

Losses in trade and commerce were also enormous because the flood swamped the centre of the City. Total losses amounted to almost US$1.0 million which corresponded to 664 establishments. This value is relatively large considering that trade and commerce is a modest portion of Ormoc's economy. As shown in Figure 4-30, the devastation in Ormoc City was enormous and appalling.

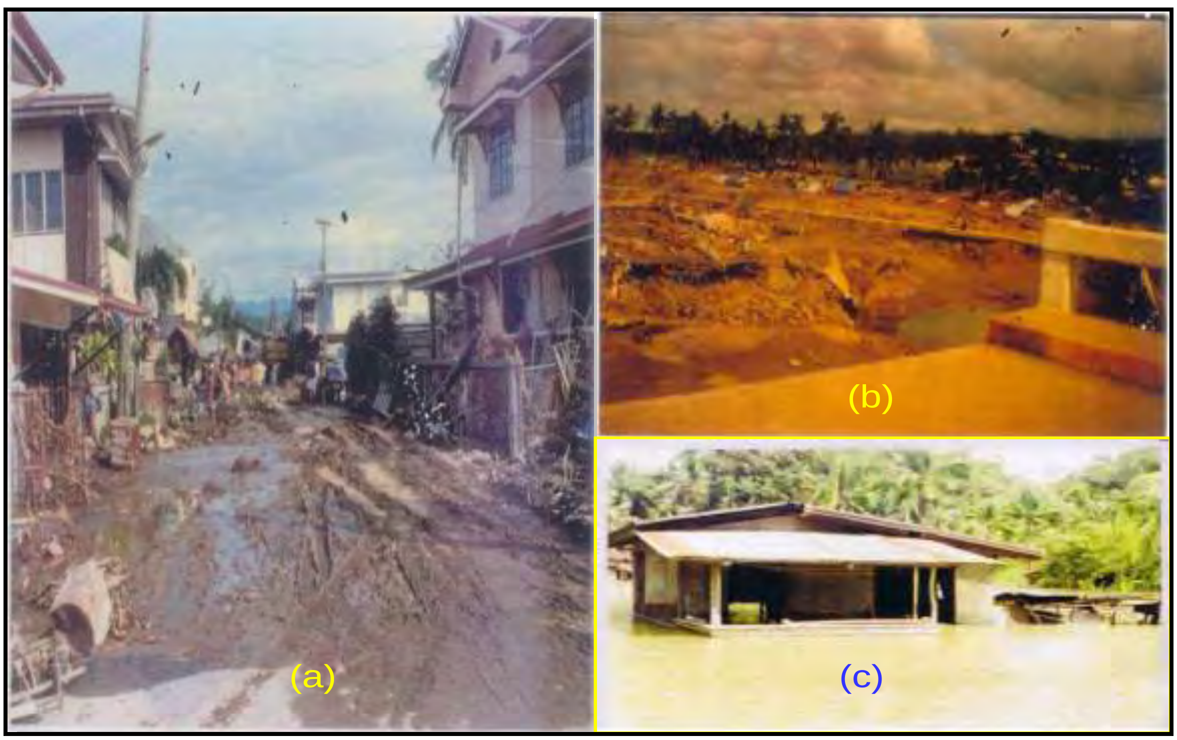


Figure 4-30. Panoramic view of devastation caused by the flash-flood in Ormoc City. (a) devastation in the centre of the City affecting the first floors of two-storey houses, (b) destroyed bridge and scoured roads and highways, and (c) submerged houses near the river channels. **Source: RDCC-OCD 8 (1991).**

Figure 4-31 shows devastation to rice fields deposited with sand. Damage to agriculture was valued at US$7.603 million, the highest sustained among all sectors, which is not surprising given the agriculture-dominated economy of the City. Damages to crops were mainly shared by rice and fruit trees. Damages to fisheries consisted largely of destroyed fishing equipment and boats. Agricultural infrastructure included nurseries of the Department of Agriculture.

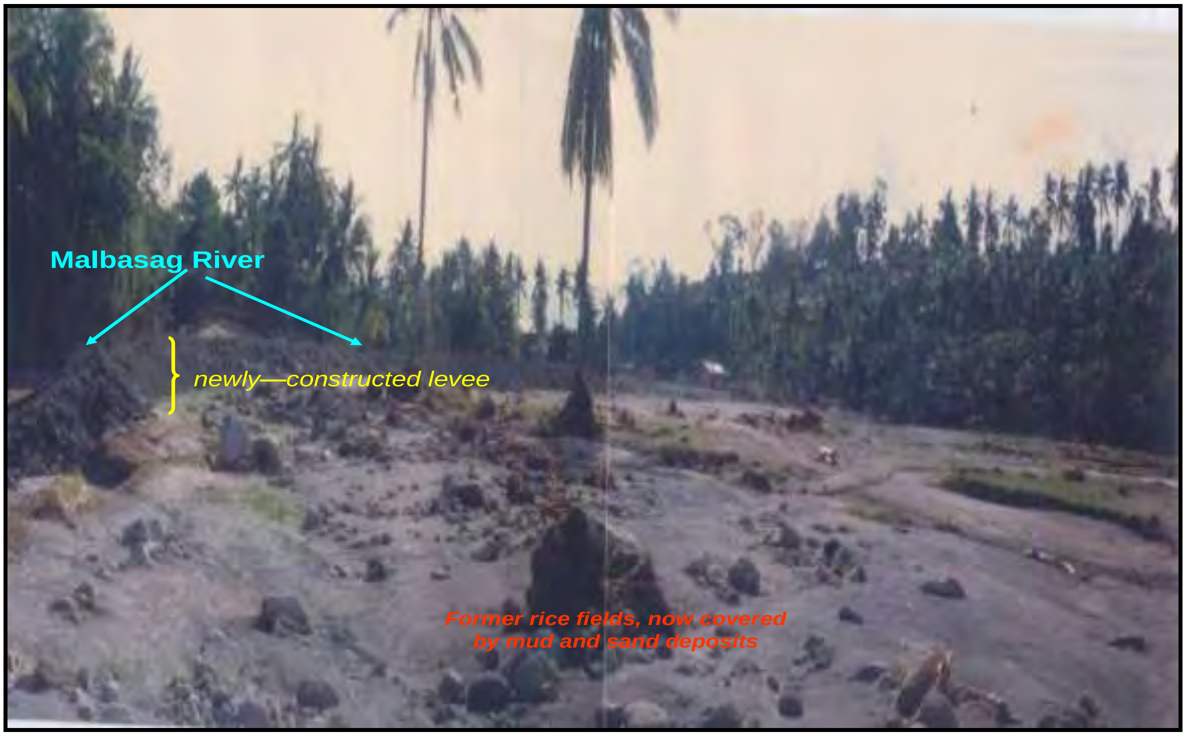


Figure 4-31. Former rice fields with grain ready for harvest when the flash-flood occurred, now covered by thick sand deposited by Malbasag River. The river channel is at the left with the newly-constructed levee. Source: RDCC-OCD 8 (1991).

Damages to infrastructures are shown in Figure 4:32. These consisted of eroded roads, broken bridges, washed out river dikes and other flood-control structures, school buildings, and other government buildings. Total infrastructure damage in Ormoc City was valued at about US$7.7 million. About 68% of the damage to infrastructure was shared by river control structures. These included the dikes scoured by the flood. Bridges affected were totally wrecked. The seven bridges reported destroyed comprised most of the damage to the road network.

Figure 4-32. (a) Houses destroyed by debris at Malbasag village showing concrete river walls in the centre background; (b) damaged concrete river walls (dike). Note the sharp channel curve at the bridge of Malbasag and Can-adieng. Remains of debris carried by overflowing floodwaters can be seen on top of the concrete wall, and (c) Malbasag River looking upstream at a point where it initially overflowed its bank. The west bank at the left of the photo is heavily damaged as noted by its height. Source: RDCC-OCD 8 (1991).

4.2 Camiguin Island Case Study. Comparison of the five municipalities of Camiguin affected by Typhoon “Nanang” is shown in Table 4-11. The municipality of Mahinog has the highest human toll with 166 people killed, 73 injured and 62 persons missing. The most affected community was Barangay Hubangon of Mahinog, which accounted for 136 of the 166 casualties listed. Mahinog also sustained the greatest damage to houses with 147 totally destroyed and 190 partially destroyed.

Table 4-11. Affected families and casualties per record by the Provincial Coordinating Council, Camiguin during the passage of Typhoon "Nanang", November 14, 2001.

MUNICIPALITY	AFFECTED PEOPLE		DAMAGE TO HOUSES		CASUALTIES		
	No. of Families	No. of Persons	Totally	Partially	Dead	Injured	Missing
Mambajao	3,148	18,890	30	105	9	32	9
Mahinog	1,608	9,652	147	190	166	73	62
Guinsiliban	256	1,538	1	0	0	0	0
Sagay	1,125	6,750	19	131	1	1	2
Catarman	1,035	6,210	40	72	4	27	4
TOTAL	7,172	43,040	237	498	180	133	77

Source: National Disaster Coordinating Council (2001)

In some flooded areas in Barangay Hubangon, boulders as high as half a standing man were deposited, as shown in Figure 4-33. This occurred in the residential areas near the creek between Barangays San Jose and Hubangon.

Figure 4-33. (a) Boulders deposited in Barangay Hubangon, Camiguin; (b) highway destroyed by boulders and rocks , and (c) road cuts caused by landslides and mudslides in Barangay San Jose, Camiguin. Sources: Relox et al and NDCC (2001).

4.3 Panaon Island Case Study. The effects of the rains brought by the Inter-Tropical Convergence Zone (ITCZ) extended not only to Panaon Island of Southern Leyte but also to other provinces. Table 4-12 shows the comparative impacts of natural disaster on various provinces in Southern Philippines. Panaon has the highest toll with 154 dead, 37 injured and 40 missing persons. However, damage to agriculture and infrastructure were lower in Panaon Island than in Compostela Valley, which suffered more destruction and heavy losses.

Table 4-12. Comparative damage of ITCZ rains and subsequent landslides in Southern Philippines.

Areas Affected	Casualties			Damaged Houses		Damages in million Peso/ *(US$)*		
	Dead	*Injured*	*Missing*	*Partial*	*Total*	*Agriculture*	*Infra*	*Properties*
Bohol	0	0	4	0	0	0	0	0
Southern Leyte (Panaon Island)	154	37	40	372	207	0	14.1/ *(0.27)*	0
Compostela Valley	2	6	0	0	0	32.951/ *(0.62)*	23.56/ *(0.45)*	.010
South Cotabato	3	0	0	4	24	0.090	0.020	0
Caraga	29	11	2	208	184	886.77/ *(16.76)*	168.7/ *(3.2)*	3.18
T o t a l	**198**	**57**	**26**	**584**	**415**	**P119.81**	**P206**	**P3.19**

Source: National Disaster Coordinating Council (2003)

The municipalities of Lilioan, San Francisco and San Ricardo were the most affected by landslides and debris flows. Figure 4-34 shows the extent of damage to people and properties in these areas. Most casualties were found in Barangay Punta, San Francisco and Liloan.

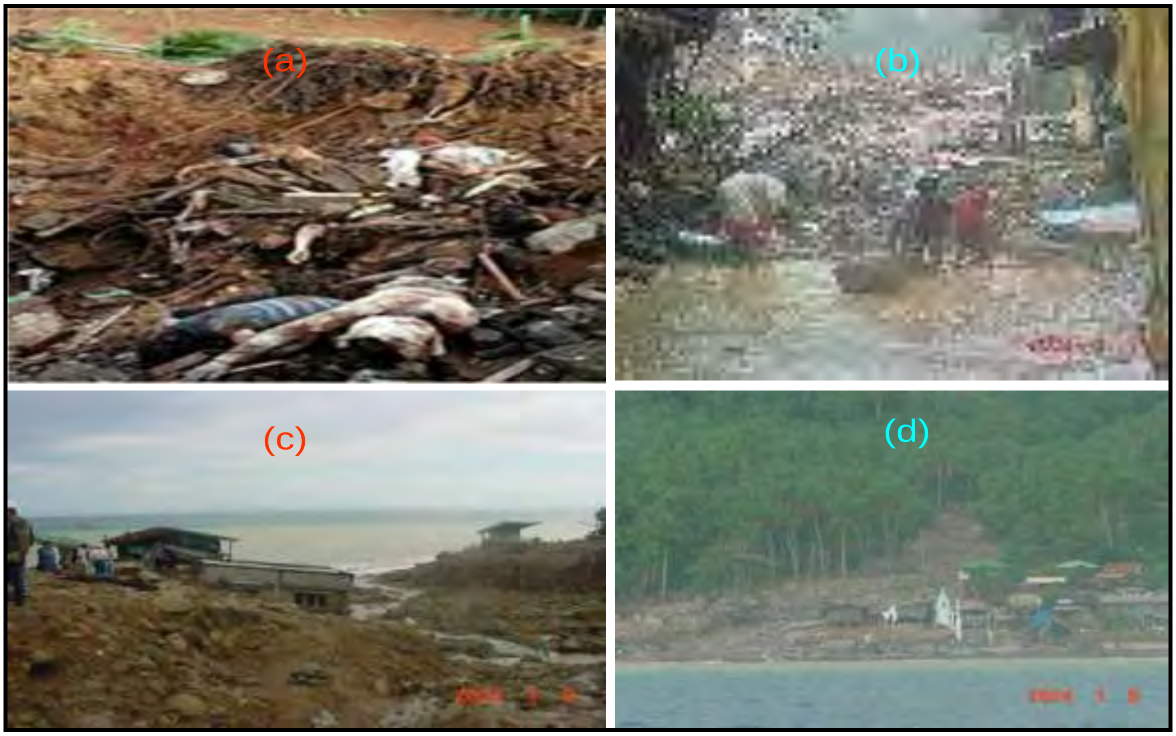


Figure 4-34. (a) Bodies lie in the debris of two deadly landslides that swept through an area in Liloan, Panaon; (b) Affected neighbourhood in San Ricardo, Panaon; (c and d) destroyed houses in Barangay Pinut-an, San Francisco, Panaon. **Source: NDCC (2003).**

4.4 REINA, Quezon Case Study. Effects of the four typhoons that impacted the Philippines in December 2004 are shown in Table 4-13. Typhoon "Winnie" impacted most killing 893 people, 749 of whom came from Quezon Province. The breakdown of fatalities is as follows: 324 people from Real, 136 from Infanta, 254 from Nakar and 35 from Mauban. Flash floods and landslides caused the death of these people in Quezon, most of whom were unrecognizable. By the records of the NDCC (2005), a great number of people killed in REINA, Quezon were unidentified, as follows: 134 from Real, 123 from Infanta and 134 from Nakar. Infanta recorded the least number of identified dead with only 13 of the dead people identified. Impact on people in REINA had the same high trend for people injured with 648 individuals and 443 missing persons. The municipality of Infanta, Quezon, incurred massive damage to infrastructure, amounting to US$5.67 million. School buildings were assessed to have incurred damages of US$1.89 million. These damages are also shown in Figure 4-35.

Table 4-13. Comparative impacts of the four typhoons on people and political-administrative subdivisions of the Philippines.

Indicators	*Typhoon "Unding"*	*Typhoon "Violeta"*	*Typhoon "Winnie"*	*Typhoon "Yoyong"*	*Total*
People killed	71	31	893	73	1,068
People Injured	160	187	648	168	1,163
People Missing	69	17	443	24	553
Affected the following:					
Families	144,553	21,151	170,036	383,575	719,315
Persons	759,045	99,461	845,429	1,939,835	3,643,770
Regions	*3*	*2*	*5*	*8*	
Provinces	*13*	*4*	*8*	*35*	
Municipalities/ Cities	*68*	*16*	*56*	*342*	
Barangays	*1,180*	*83*	*645*	*3,196*	

Source: National Disaster Coordinating Council (2005)

Figure 4-35. Damage in Infanta, Quezon, impacted by flash floods and landslides from Typhoon "Winnie" on 29 December 2004. The following are shown: (a) destroyed irrigation intakes and canals, (b) damaged social centre, (c) fire truck buried in the mud, (d) damaged school buildings, and (e and f) destroyed houses and properties. Source: NDCC (2004).

4.5 Saint Bernard, Southern Leyte Case Study. Local geologists (Lagmay et al, 2006) supposed that an en masse transport of the whole Barangay Guinsaugon had occurred on 17 February 2006. Figure 4-36 shows houses that include a 3-storey concrete building in front of the Barangay Guinsaugon grade school which were transported 550-600 metres southeast from their original position. Many collapsed houses found at or near the surface were transported down the slope but remained relatively intact with minimal scattering. Neighbouring houses that moved downward remained adjacent to each other. These show the direction of the transport by the rockslide-avalanche toward the toes of the deposit.

Based on the records of the National Disaster Coordinating Council (Final Report, 2006), Barangay Guinsaugon has a population of 1,857 with 375 households. There were 3,850 families or 18,862 persons affected, including families from other nearby barangays. Of this number affected, 1,014 families or 3,742 persons were displaced, most of whom, originated from Barangays Guinsaugon, Sug-angon, Ayahag, Nueva Ezperanza, Magatas, Hinabian, Atuyan, Camaga and Himbangan (see map in Figure 3-2, Chapter 3). Nine hundred and twenty (920) families or 3,272 persons stayed in evacuation centres and 94 families or 470 persons stayed with relatives and friends. Total survivors numbered 410.

In relation to casualties, 154 were reported dead (57 identified, 82 unidentified and 15 fragmented bodies). Thirty nine of them were claimed by relatives while the rest were buried in a mass burial. There were 30 persons admitted to the Anahawan District Hospital but two (2) died after admission. A total of 968 persons were reported missing**:** 496 females and 472 males. Of the number missing, 601 were adults and 367 were children: 24 infants (0-1 years old); 260 children (2-12 years old); and 83 adolescents (13-17 years old).

Estimated cost of damage to properties and infrastructure amounted to US$ 5.103 million Assessed damages to agriculture was US$ 0.427 million. Around 225 hectares planted with hybrid rice were affected, 25 hectares of which was completely damaged.

Figure 4-36. (a) Houses, buildings and other structures transported en masse by the landslides; (b) top view of destroyed houses, and (c) massive landslide debris materials from the detached slope entombing Guinsaugon village in thick mud. Source: UP-Ateneo Team, MGB 8 and NDCC (2006).

4.6 Synthesis. High death tolls characterise the communities hardest hit by the flash floods and landslides. Physical vulnerability of these communities is mostly geographically related. All of them were situated in harm's way such as on the toe or slope of mountains or volcanoes, close to rivers or water channels, near the sea or ocean. Ormoc City, Leyte Province is located between two rivers. It is situated in a fan-like delta exactly at the mouth of these two rivers. Saint Bernard, Southern Leyte, lays at the toe of a very steep mountain, Mt. Cabac, which lies parallel to an active fault beneath the province. REINA, Quezon, particularly Infanta town, is adjacent to Agos River which serves as the catchment river basin of two upstream rivers, the Kaliwa and Kanan. Mahinog municipality of Camiguin is also affected by two rivers, the Hubangon and Malunay. Camiguin is basically a volcanically formed island. Aside from the slope features of these mountains, the soil characteristics in these areas contribute to their physical vulnerability.

The high number of fatalities was also associated with the concentration of people residing in these hazard-prone places. Aside from the very dense population living in this City, as the economic centre for the area, the impacts on commerce, industry and infrastructure were enormous, with 66% of establishments severely affected. Victims in the Panaon landslides unfortunately were not successful in avoiding the second landslide that struck and trapped them inside the evacuation centre. They were at the right place in terms of safety but apparently not at the right time. More unfortunate was Barangay Guinsaugon of Saint Bernard, Southern Leyte which hosted the inter-village Women's Day activities. The occasion brought many people to the area which explains why many more than the actual population of the village were killed.

Experiences and lessons learnt from these five case studies can improve community resilience by overcoming vulnerability. This may require communities at risk to change and adapt to better ways of coping with natural disasters. Good disaster management should reduce, if not totally prevent the loss of lives and damage to properties, agriculture and infrastructure. This includes community preparedness and response activities aimed at reducing vulnerability to natural hazards.

Conclusion

The physical aspects of the five natural disasters associated with flash floods and landslides are discussed in this chapter. Findings from the atmospheric/weather conditions, floods, landslides and their impact on people and infrastructure indicate a trend of greater exposure of most communities to physical vulnerability. Though occurrences were site specific, all case studies suggest the complex interaction of physical agents of natural disasters. Aside from typhoon and strong winds, rainfall intensity and long duration can cause more harmful hazards such as flash floods and landslides. Human activities like deforestation and unsuitable development can increase to some degree the magnitude of the disaster. Enhancement of early warning systems and increased disaster preparedness remain the best option for improving community resilience.

One of these five natural disaster cases was used as the study area for the community survey. The human dimension of natural disasters will be presented and discussed from the results of the community surveys in Saint Bernard, Southern Leyte, which was impacted by the February 17, 2006 landslides. This will be reported in the next chapter.

CHAPTER 5

RESULTS OF THE COMMUNITY STUDIES

Introduction

This chapter reports the results of the community surveys and interviews with officials and service providers. These are the areas of data collection highlighted in research methods in Chapter 3. These results can help identify the root causes of people's vulnerability to natural disasters, which is a major objective of this research. At the same time, the same results can help to elicit the capacity for resilience to natural disasters of the local people. This thesis also aimed to test and refine the building blocks of the Landslip-Disaster Quadrant Model on community resilience presented in Chapter 2 (see Figure 2-7).

A disaster may be precipitated by a natural event, but vulnerability is the social condition that changes an act of nature into a disaster. Thus, understanding social realities and vulnerabilities is as crucial for ensuring success of all phases of disaster management – from preparedness and response to recovery and mitigation – as it is for achieving truly sustainable development (Delaney et al., 2000). The February 17, 2006 landslide disaster in Saint Bernard, Southern Leyte, provides the context for the fieldwork research. Perception and practices of disaster management by the community respondents comprise the results of the survey of the affected communities. This also includes their suggestions to improve community preparedness and disaster reduction.

The conduct of the questionnaire survey was authorized by The University of Newcastle's Human Research Ethics Committee Approval No. 365-0207 and Safety Clearance No. 136/2006.

The four results are from the survey questionnaires, non-prompted and open-ended interviews, the seven survivors' stories, and the discussion and interviews with officials and service providers as discussed in Chapter 3.

1. Results from the Survey Questionnaire

A questionnaire survey of the community was conducted from March to June 2007. The survey is a cross-sectional study of the municipality of Saint Bernard, Southern Leyte.

The following components are discussed in the results: demographic profile of the participants, geographical conditions and the built environment, livelihood and economic base, psycho-social and cultural attributes, and counter-disaster capacity and capability assessment. The last aspect assesses the participants' understanding of disaster, presents their disaster experiences, determines the physical causes of disasters, presents topics for community education, assesses disaster alert and warning preparedness, identifies gender concerns in the evacuation centres, reports the losses and recovery, and recommends disaster reduction measures.

1.1 Demographic Characteristics

There were 132 respondents from the four (4) barangays of Saint Bernard, Southern Leyte; 31 from Guinsaugon, 33 from Sug-angon, 34 from Ayahag and 34 from Nueva Ezperanza.

A summary of the demographic characteristics of the community respondents is shown in Table 5.1. Of the total participants, 66% are female and 34 % are male. More than one-third of respondents fall within the age range of 30 years old and younger with 24% being less than 20 years old. In terms of their education, 38% finished elementary school and 33% graduated from high school. Only 18% were college graduates. The average family size was 4.5 after the disaster as compared to at least seven members per family before the disaster. The number of dependents is reduced significantly to two (2) per household due to the number of people killed in the landslides. Casualty records show more children died in the landslide tragedy than adults.

Table 5.1. Demographic profile of community respondents (n = 132).

Indicators	Answer of respondents					
Gender	Male			Female		
	34.1%			**65.9%**		
Age Group	< 20 years	21-30 years	31-40 years	41-50 years	51-60 years	> 60 years
	24.2%	**22.7%**	**18.9%**	**20.5%**	**7.6%**	**3.8%**
Educational Level	Elementary	High School	Some College Units	College Graduate		
	32.6%	**37.9%**	**16.7%**	**6.8%**		
Number of dependents	No dependents	One dependent	Two dependents			
	20.5%	**25.0%**	**15.2%**			
Age group of dependents	1-8 years old	9-16 years old	60-67 years old			
	23.5%	**12.9%**	**6.8%**			
Family size	6 persons	5 persons	4 persons			
	12%	**22%**	**23%**			
Village of residence	*Barangay Guinsaugon*	*Barangay Sug-angon*	*Barangay Ayahag*	*Barangay Nueva Ezperanza*		
	23.5%	**25.0%**	**25.8%**	**25.8%**		
Number of years of residence	> 10 years	Between 2 to 4 years	Between 8 to 10 years			
	85.6%	**4.5%**	**3.0%**			

Community respondents were evenly drawn from the four affected communities. More than 23% of respondents came from Barangay Guinsaugon, the hardest hit village. One quarter of respondents came from Barangay Sug-angon. More than 25% of respondents came from Barangays Ayahag and Nueva Ezperanza. More than 85% of the respondents had been living in their respective villages since birth or for more than 10 years. Figure 5-1 shows the location map of respondents from the four barangays relative to the landslide area and the Philippine Fault.

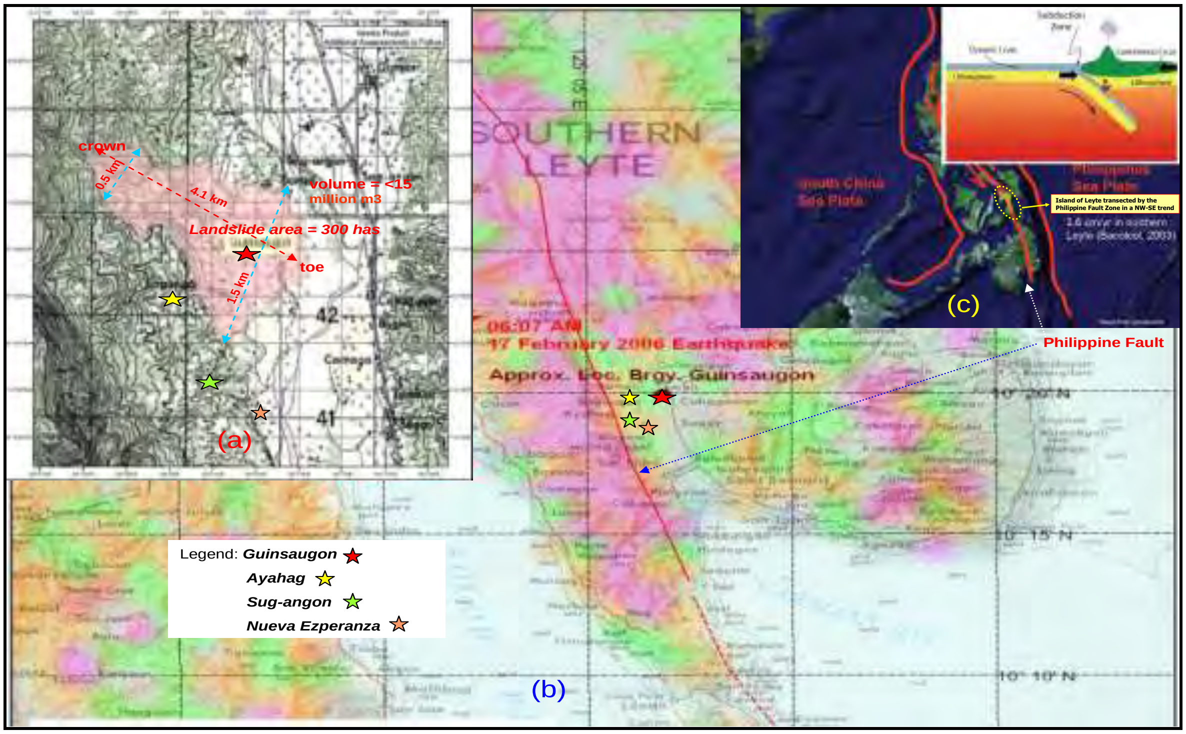


Figure 5-1. Location map of respondents from four barangays (villages) in Saint Bernard town: (a) proximity to landslide area; (b) provincial geographic location, and (c) relative location to the Philippine Fault. Source: PHIVOLCS-DOST and NDCC (2007).

1.2 Geographic Location and Built Environment

Table 5-2 summarizes the geographical features and housing characteristics where community respondents lived. Fifty-five percent of respondents indicated that their former houses were made of concrete hollow-blocks and wood, sturdy enough to withstand high winds and storms, as compared to 32% *nipa (hemp)* and bamboo-built houses. Design of the houses suits possible impacts from seasonal typhoons coming from the Pacific Ocean. Almost two-thirds of respondents have one-level houses, mostly bungalows. Respondents explained that this type of housing and materials had survived past strong typhoons. They need not fear flooding or coastal waves since they are far from the coast and high above sea level. Seventy-eight percent of respondents own their houses which the majority lost in the landslides. Ownership of houses can imply greater loss during calamities as compared to those who rent houses. As shown in Figure 5-2, the four barangays, especially the human settlements of Barangay Guinsaugon, are situated between Mt. Cabac and Himay-angan River. The provincial road is the main access to the four barangays which is approximately parallel to the Philippine Fault (see Figure 5-1). Fifty-five percent of respondents reside near roads and along highways, 25% in the interior of the village and only 10% along the river. More than 3% of the respondents live on hills or mountains. The communities are situated on the slopes of the steep mountain range of Mt. Cabac. Barangay Guinsaugon is at the toe of the mountain.

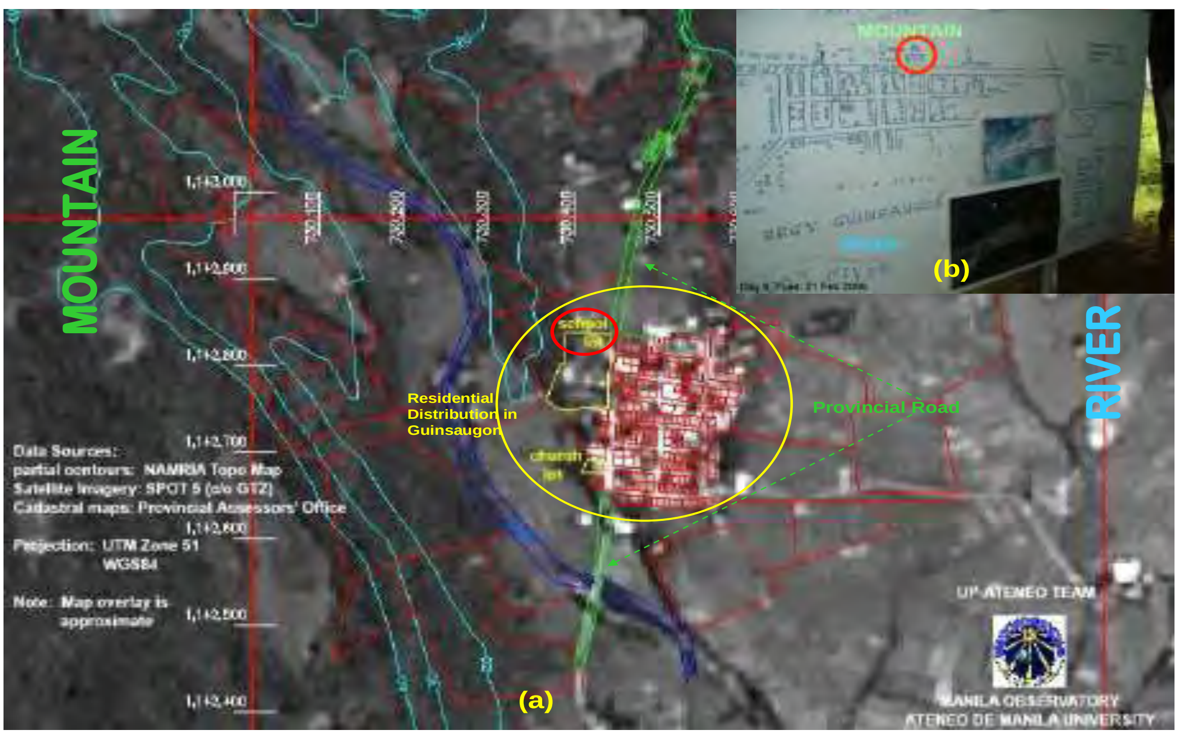


Figure 5-2. Human settlement and residential distribution in Guinsaugon village. (a) Geographic setting of the village using a map overlay. (b) Artist's illustration of the residential arrangement in Guinsaugon which highlights the buried elementary school containing approximately 300 school children and teachers. **Source: UP-Ateneo Team and NDCC (2007).**

Table 5.2. Geographical features and housing characteristics of respondents (n=132).

Indicators	Answer of respondents			
Type of Housing	*Nipa* (hemp) and Bamboo	*Nipa* (hemp) and Wood		Concrete + wood, *GI* sheets
	17.4%	**31.8%**		**43.2%**
Floor Level of Housing unit	One Floor	Two Levels		Three Levels
	83.3%	**15.2%**		**0.8%**
Geographic Location of residence	Along highway/ road	Interior	Riverside	Hill/mountain
	55.3%	**25.0%**	**9.8%**	**3.8%**
Status of Housing Tenure	Home-owner	Shared-unit/ Transient occupant		renting
	78.0%	**12.9%**		**12.9%**

1.3 Livelihood Sufficiency and Economic Base

Table 5.3 shows the economic and livelihood conditions of the community respondents. More than one-third of the spouses are engaged in farming. This means that an agriculture-based economy is the predominant livelihood of the local people. This is confirmed from the records of the municipal government of Saint Bernard, Southern Leyte. Augmentation of household income comes from members of the family working outside the town; in Manila or Cebu City or overseas, with 21% of the respondents confirming this kind of financial support. This explains why some survivors were comforted by having some members of the family left alive to assist them because they worked outside their communities at the time of the landslides. Other sources of income are evenly distributed as [4]*sari-sari* store owner/government honorarium (26%), agricultural piece-rate worker, [5]`*padyak drivers*’ (21%), and coconut drying/selling (21%). About 5% to 20% of the

[4] *Sari-sari* is a Filipino word for “various kinds”. An important socio-economic location, a sari-sari store is a privately owned shop and operated inside the shopkeeper’s house. Commodities like candies, canned goods and cigarettes are often displayed while cooking oil, salt, rice and sugar are often stored in sacks or cans.

[5] *Padyak* is the Flipino term for bicycle. As a public or ‘for hire’ transport, the *padyak* design will include a sidecar for passengers, light bulbs on the front and back and a reflectorized device installed at the back. No motoring machine or generator or similar device is mounted and operated.

respondents had no answer for livelihood/source of income because they either have no occupation or consider themselves dependents.

When asked whether their household income was sufficient before the disaster, 56% of respondents answered no. One quarter of respondents mentioned the reasons why they experienced very tight economic conditions such as high educational expenses, many dependents to support, high-interest loans and maintenance of medical needs. Some of them (21.2%) said that insufficiency was due to limited income sources, and the high prices of goods in the area. In contrast, more than 28% of respondents answered yes. They have sufficiency because more than 14% of them have other sources of livelihood which according to them were just enough to support their family. Household income is less than PhP 3,000 (A$77) per month, which is far below the poverty line and is a primary factor contributing to their high economic vulnerability. For the farmers who answered the status of tenure arrangements of their farmed lots, 3.8% confirmed that they are tenants. More than 10% of respondents were owners of their farm lots.

Table 5.3. Livelihood and economic profile of community respondents (n=132).

<table>
<tr><th>Indicators</th><th colspan="10">Answers of respondents</th></tr>
<tr><td rowspan="2">Major Occupation/ Livelihood</td><td colspan="2">Farming/ Coconut Planter</td><td colspan="3">Housekeeper</td><td colspan="4">Others (support, donation)</td><td>Industry (gov’t employee, store owner, buy and sell)</td></tr>
<tr><td colspan="2">47.7%</td><td colspan="3">13.6%</td><td colspan="4">20.5%</td><td>7.6%</td></tr>
<tr><td rowspan="2">Spouse occupation</td><td colspan="4">Part-time job</td><td colspan="2">Housekeeper</td><td colspan="3">Others (support, donation)</td><td>Industry (gov’t employee, store owner, buy and sell)</td></tr>
<tr><td colspan="4">43.9%</td><td colspan="2">10.6%</td><td colspan="3">10.6%</td><td>8.3%</td></tr>
<tr><td colspan="2" rowspan="2">Other Sources of Income</td><td>No other source</td><td colspan="6">Agriculture</td><td colspan="2">Industry (carpentry, laundry, cook)</td></tr>
<tr><td>21.2%</td><td colspan="6">21.2%</td><td colspan="2">26.5%</td></tr>
<tr><td colspan="2" rowspan="2">Land Tenure of Farmers</td><td colspan="6">Owner of Farm-lot</td><td colspan="3">Farm-lot not owned</td></tr>
<tr><td colspan="6">10.6%</td><td colspan="3">3.8%</td></tr>
</table>

Household Income	PhP 3,000 or less	PhP 3,001-6,000	PhP 6,001-9,000
	69.7%	**15.2%**	**5.3%**
Income Sufficient Before Disaster?	No		Yes
	57.6%		**28.8%**
Reasons for Adequacy/ Insufficiency	Have other livelihood/just enough to feed family	Educational expenses/ many dependents/ loans, medical need	Limited income/ high prices of basic needs
	14.4%	**25.0%**	**21.2%**

1.4 Psycho-Social and Cultural Attributes

Characteristics about the current mental, social and cultural orientation of the community participants are summarized in Table 5.4. In the aftermath of the landslide disaster, respondents were asked about current household assets to figure out what preventative measures and practices they may have acquired or were planning while the `healing process' was underway. More than 82% of respondents listed *emergency assets* like rope, flashlights, axe or bolo, whistle, fire extinguisher, life jackets and rubber duckies (inflatable boats). About one-third of respondents possessed *household electronics* which include television, transistor radio, landline telephone, cellular/mobile phone, handheld radio, megaphone, computer and internet services. More than 42% owned *transportation* like a motor vehicle, motorcycle, bicycle, and [6]*banca*.

Raising farm animals, especially fowls (30%) and livestock (25%), also augments the household income. When tropical storms and flooding occur, these animals are also vulnerable to these hazards. Raising farm animals to sustain livelihood needs is one coping strategy to overcome vulnerability. Seventy-five percent of the respondents raise

[6] *Banca* is a Filipino term for outrigger canoe. It features one or more lateral support floats known as outriggers which are fastened to one or both sides of the main hull.

fowls with 40% owning one chicken, and 8% owning as many as 10 chickens and ducks. Sixty-one percent owned livestock with 33% owning one domestic animal and 20% owning two.

Respondents were asked about what skills they possessed for survival and how they can help others in times of emergencies. More than 70% of respondents answered that they had the ability for *leadership* and *organizational* skills which include mobilizing people, resolving conflict, public speaking and keeping documents (casualty records, relief inventory and donor lists). About 65.2% of respondents possessed the skill for *Basic Life Support* such as First-Aid techniques and saving a drowning person. More than 58% of them possessed skills for providing *support services* like driving vehicles and swimming.

Respondents were asked what they feared most for their families. The reason for this question was to know their inward susceptibility and personal coping ability in relation to natural disasters. Nearly 95% of respondents feared most those things that relate to *physical/calamitous* causes. These include illnesses, loss of housing or house collapse, accident, logs hitting the house, damaged crops, fire, typhoons, floods, big waves, landslides and volcanic eruptions. About 80% of respondents were afraid of those things that cause *stress and trauma,* like death in the family, family getting into trouble (legal actions or drug use), family break-up or extra-marital affair, vices of husband and quarrel and conflict in the area (gang fights or insurgency problems). More than 78% of respondents feared the impacts of an *economic and livelihood* backlash. This includes loss of job or economic difficulty, lack of food and other needs, and children no longer able to continue studying or finish schooling.

Table 5.4. Psycho-social and cultural profile of community respondents (n=132).

Indicators	Answers of respondents		
Household Assets	Electronics	Transportation	Emergency
	75.0%	**46.2%**	**82.6%**
Animals Owned	Fowls		Livestock
	72.0%		**61.4%**
Skills Possession	Basic Life Support	Leadership/Organizational	Support Services
	34.8%	**70.5%**	**58.3%**
Fears of Family	Stress and Trauma	Physical/Calamity	Economic/Livelihood
	80.3%	**94.7%**	**78.8%**

1.5 Community Counter-Disaster Capacity Assessment

Results in this section were drawn from the interval scale answers of the community respondents regarding preparedness capability and the community's capacity to cope with the adverse impacts of natural disasters. Knowing what the community thinks, how they perceived their situation and what priorities and options they would most likely choose are presented in these results.

1.5.1 What Disaster Means to Community Respondents

Behaviour and response to disasters are influenced by the way people understand an event or phenomenon that causes a disruption to their `normal' lives. Figure 5-3 shows the results of the meaning of disasters as understood by the community respondents. Over one-half strongly agree that disasters are unexpected events owing to the sudden onset of landslides on that fatal day. More than 42% of respondents strongly agree by rephrasing disaster to mean damage, danger, threat and tragedy, alluding to the magnitude and enormous destruction it brought to the communities affected. About 30% of them firmly believe that it is God's act or punishment, manifesting their strong religious persuasion, where the majority are devout Roman Catholics.

However, more than 50% of the respondents only agree to relate the disaster to economic vulnerability and poor living conditions. About 47.7% of respondents agree that a disaster means a natural calamity. Only 36.4% agree that disaster can result from human-made activity. The first three meanings, of which most respondents shared a strong agreement, emphasised the physical aspects of a disaster.

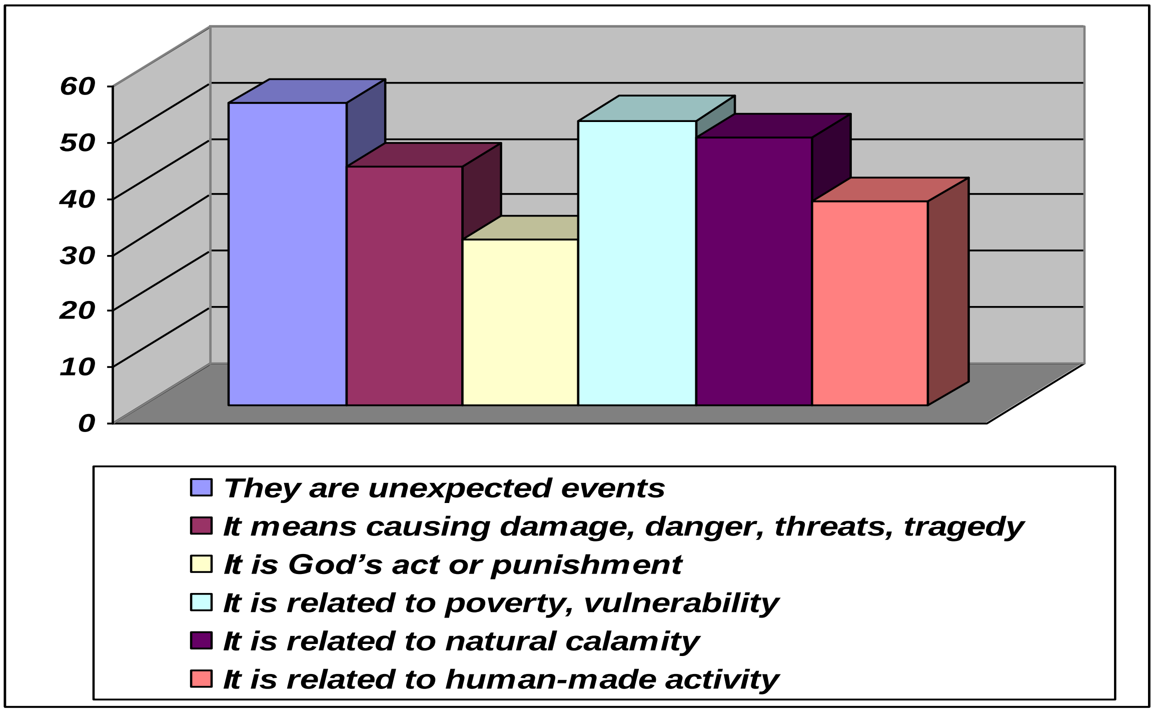


Figure 5-3. Meaning of disaster as defined by the community respondents expressed in percentage (n=132).

1.5.2 Disaster Experiences

Respondents relate their perception of the meaning of disaster to previous lifetime experience of hazards. As shown in Figure 5-4, during the last three years, the most common disaster experienced by the respondents were typhoons and strong winds (93%), including floods and waves (60%). Earthquakes ranked second with 72%. Though inadvertently missed out in the tick boxes, 29% of the respondents spelled-out landslides in particular, indicating the tragic experience they had of the 17 February 2006 *Guinsaugon* landslides, which according to them will never be forgotten in their lifetime. As compared to the usual typhoons and earthquakes, local people basically do not prepare for something that had not happened in their lifetime like the landslides on 17 February 2006.

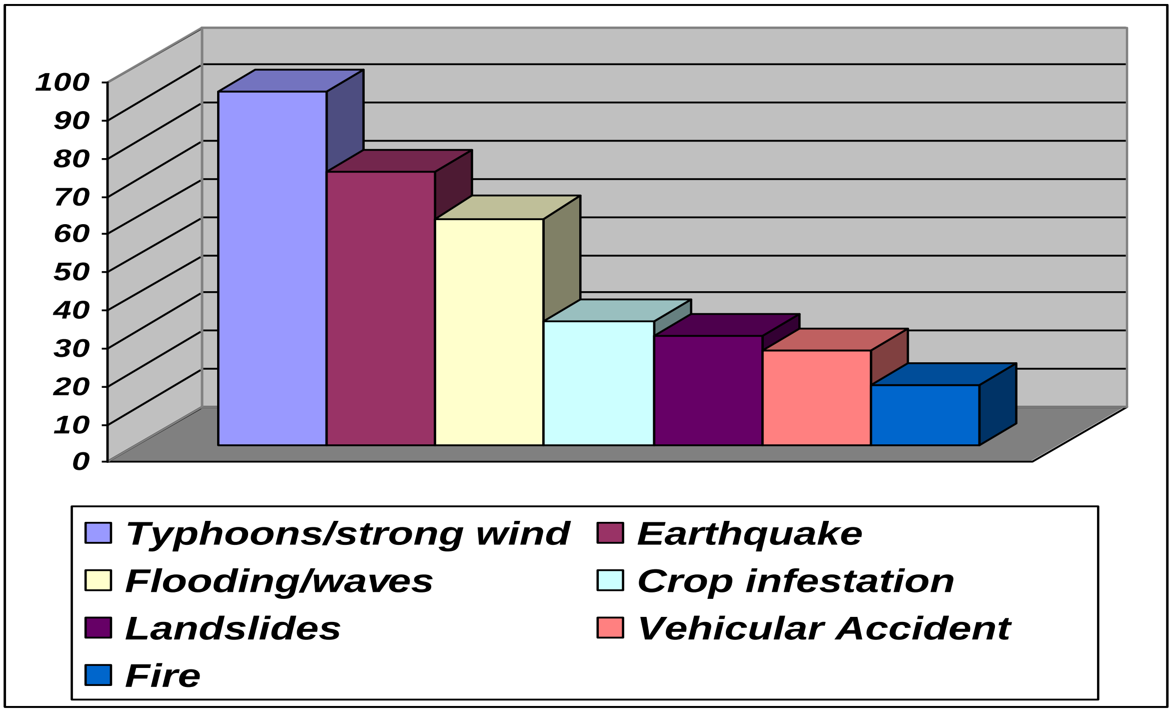


Figure 5-4. Common disasters experienced by the community respondents for the past 3 years expressed in percentage (n=132).

1.5.3 Causes of Disasters

Respondents identified what causes disasters as shown in Figure 5-5. More than 70% of respondents strongly agreed that disasters result from heavy rain, *buhawi* (orographic effect) and other natural forces, which can precede flash floods and landslides. Nearly 70% of the respondents cited illegal logging, cutting of trees, and the denudation of the forest as another major cause of disasters. Forty-six percent of these respondents strongly believed that disaster is God's will. About 32% of respondents believe that disasters are caused by accidents and human-made hazards. Only 20% of respondents considered disaster could result from poor living conditions and economic inequity.

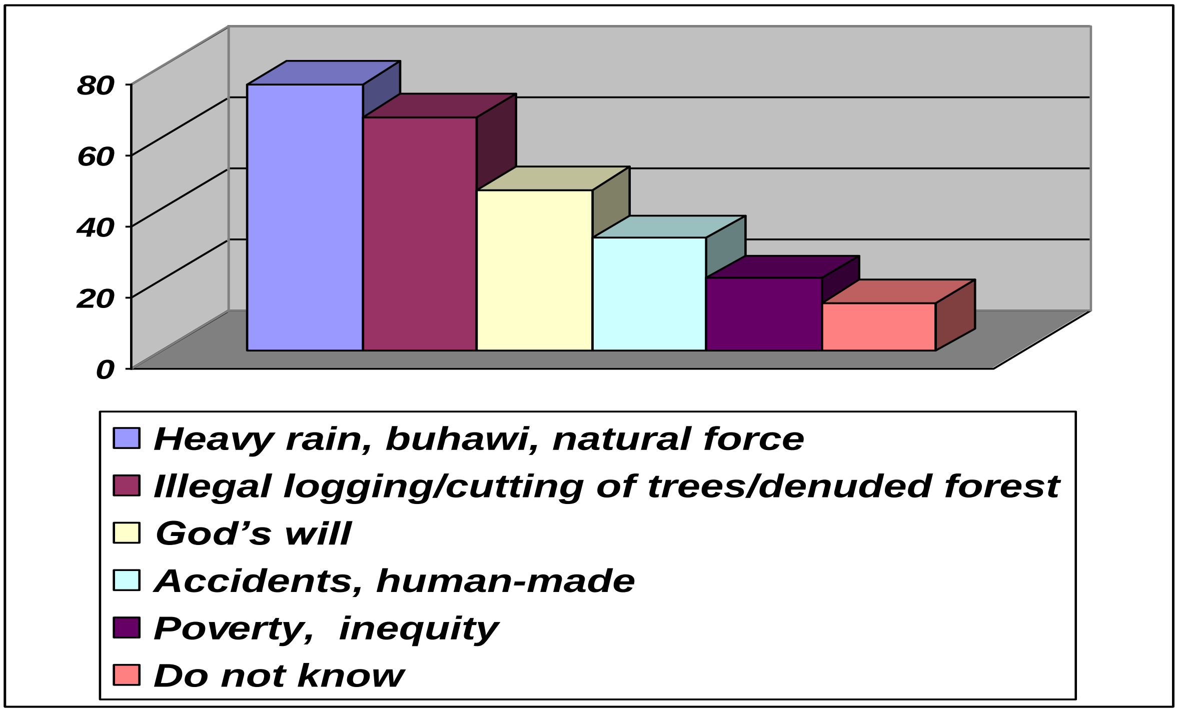


Figure 5-5. Causes of disasters identified by the community respondents expressed in percentage (n=132).

1.5.4 Topics for Community Education

Figure 5.6 shows the subjects that the respondents believed should be imparted to them as part of continuous community education extended to them by private service providers and government institutions. Over 51% of the respondents strongly suggested the topic of disaster preparedness. This was followed by the subject of environmental management with 9.1% of respondents wanting it to be taught in their community awareness campaigns. The same respondents also included cross-cultural theories of armed conflict as important topics to be included in public information activities.

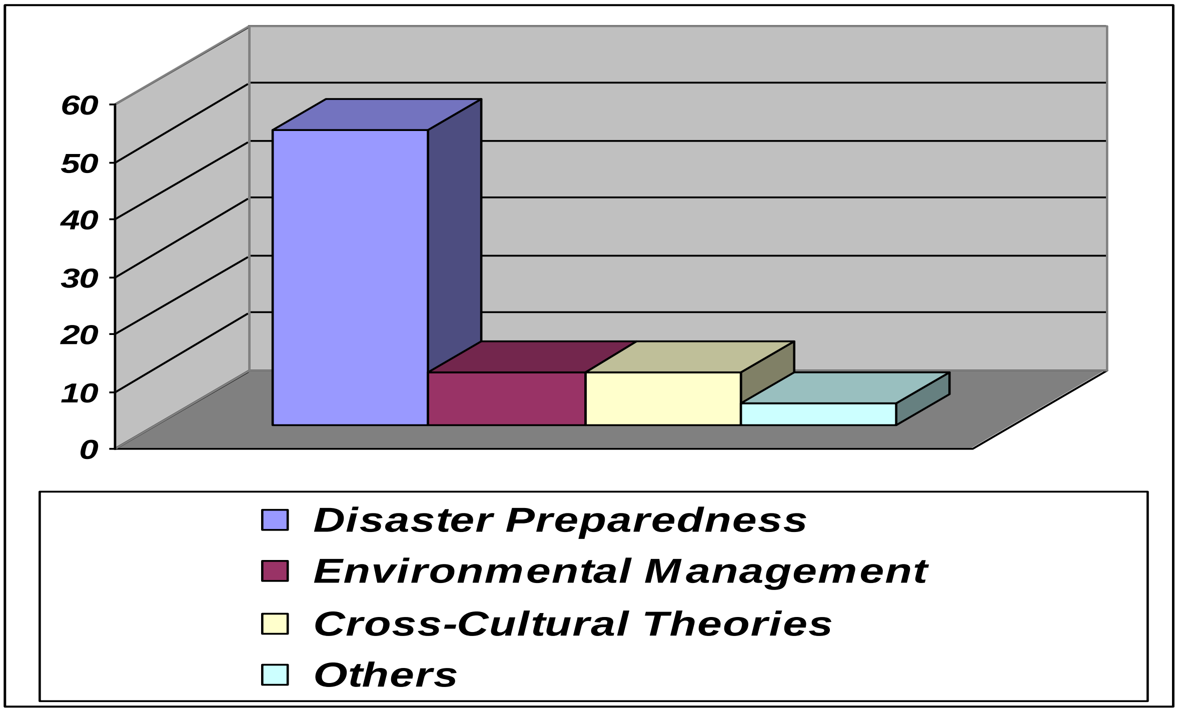


Figure 5-6. Topics needed to be taught in community awareness campaigns expressed in percentage (n=132).

1.5.5 Disaster Alert and Warning Preparedness

Natural hazards are not necessarily a natural disaster. Populations and properties must be impacted to convert a hazard to a disaster. Also, a natural disaster can trigger other hazard risks as consequential effects. For example typhoons bring strong winds and rainfall. Strong winds can cause direct impact when typhoons landfall. But rainfall may not be a threat immediately. Also rains may not result necessarily from typhoons but from seasonal monsoons and periodic episodes of the La Nina phenomenon. Aside from the magnitude of rainfall, the intensity of rainfall over a longer period can be equally dangerous or potentially more disastrous. Heavy rains can cause flooding and landslides. Formation of landslide dams and log jams in upstream rivers and watersheds is a potential disaster in the making. In a matter of time, failure of these natural dams can result in a deadly flash flood, debris flow and mudslide. These natural hazards have different natural processes which sometimes overlap with one another. In some cases, when one hazard is completed and an incoming hazard has started can be determined. Prediction and warning techniques are easily carried out in these very ideal cases. The formations of some hazards are visible but some are not. The `nots' are those that are hidden and creeps, in which onsets are quicker and deadlier. These are the cases happening today in recent natural disasters associated with flash floods and landslides.

Results from the following sections may explain the issues about predictability of natural hazards, disaster alert and warning preparedness. The answers of the community respondents from Saint Bernard, Southern Leyte impacted by the February 17, 2006 landslides can shed light on this issue.

1.5.5.1 <u>Tropical cyclones</u>. When it comes to incoming typhoons, more than 50% of respondents strongly believe television is a reliable source of information about the path of the typhoon and the strong winds it carries. About 47% of respondents had high regard for the typhoon information coming from the government weather bureau; the Philippine Atmospheric, Geophysical, Astronomical Services Administration (PAGASA) which are aired simultaneously on the radio stations are also considered trustworthy. In rural communities, the majority of households own transistor radios powered by batteries, which are still fully operational during electrical power outages, even during natural disasters.

Over 56% of respondents believe that a typhoon is coming by observing changes in the environment such as the wind, rain, clouds, sea and thunder. About 51.5% of respondents trust the typhoon warnings given by local officials and neighbours. Forty-seven percent of them believe typhoon alerts coming from information campaigns. More than 44% of respondents rely on newspapers. About 40% believe a typhoon is coming by observing seasonality. One-third of the respondents believe that observing animal behaviour, crows flying, and birds on the seashore can foretell a typhoon is coming. Figure 5.7 shows the warning sources and environmental conditions that have been observed. These were based on the experiences of the respondents when a typhoon is coming.

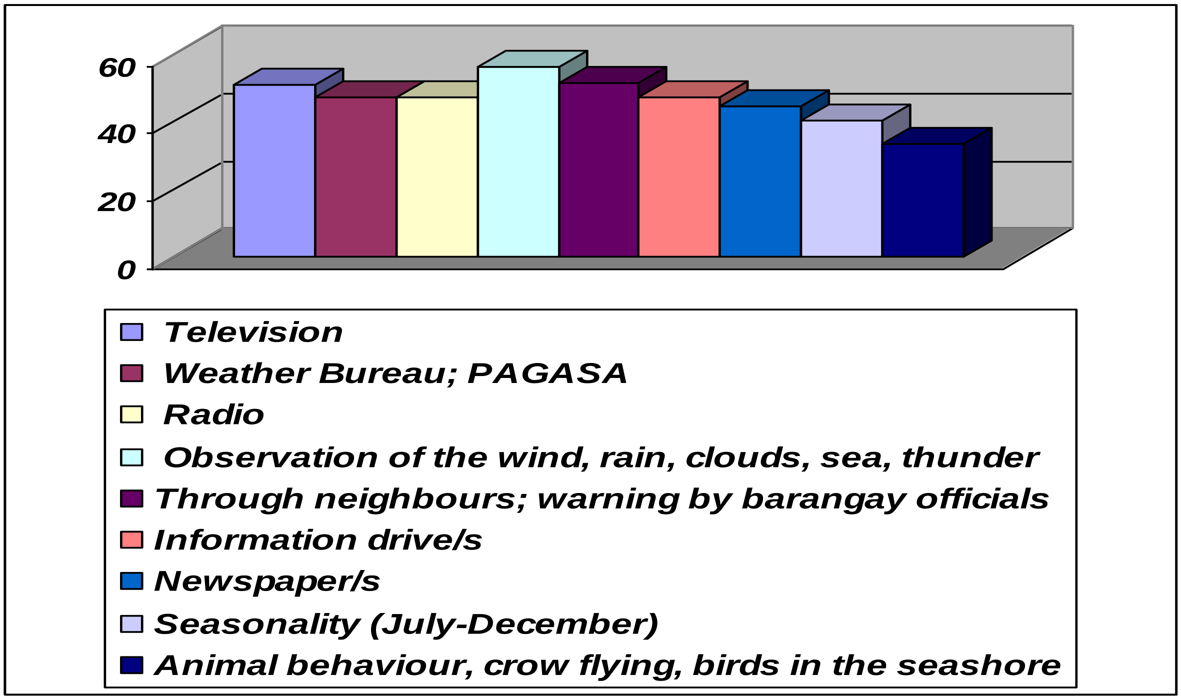


Figure 5-7. Warning sources and natural conditions observed by community respondents when a typhoon is coming expressed in percentage (n=132).

1.5.5.2 Flooding. Inundation resulting from the heavy rains associated with typhoons can be detected in advance today by modern technology, particularly those installed in man-made dams and river basins. More than 48% of respondents strongly believe that typhoons are good indicators of imminent flooding. This is true particularly for low-lying areas and those near rivers. About 47.7% of the respondents strongly believe that television is the best medium for flood alerts.

Fifty-three percent of respondents believe that flooding is imminent by observing the sounds of the river. About 49.2% of respondents believe that strong wind from the mountain can indicate a flooding may occur. More than 47% of respondents believe that flooding may occur when water levels are increasing and overflowing of the irrigation canal has been observed. Over 45% of respondents believe that when a river flows with debris, and the sounds of rolling rocks are heard, flooding is imminent. About 43.2% of respondents believe that by observing the change in the colour of the sky, flooding can be predicted. More than 42% believe that changes in the colour of the water can foretell a flood is coming. About 41.7% of respondents believe that when soil smells muddy or emits bad odour, flooding is underway.

More than 43% of respondents trust community officials and the radio as reliable conveyors of flood warnings. About 39.4% of respondents believe that observing the changes in season can predict that flooding will occur. About 34% of respondents believe that observation of crawling snails or molluscs can detect imminent flooding. Figure 5-8 shows what respondents believe will more effectively predict the occurrence of flooding in the community.

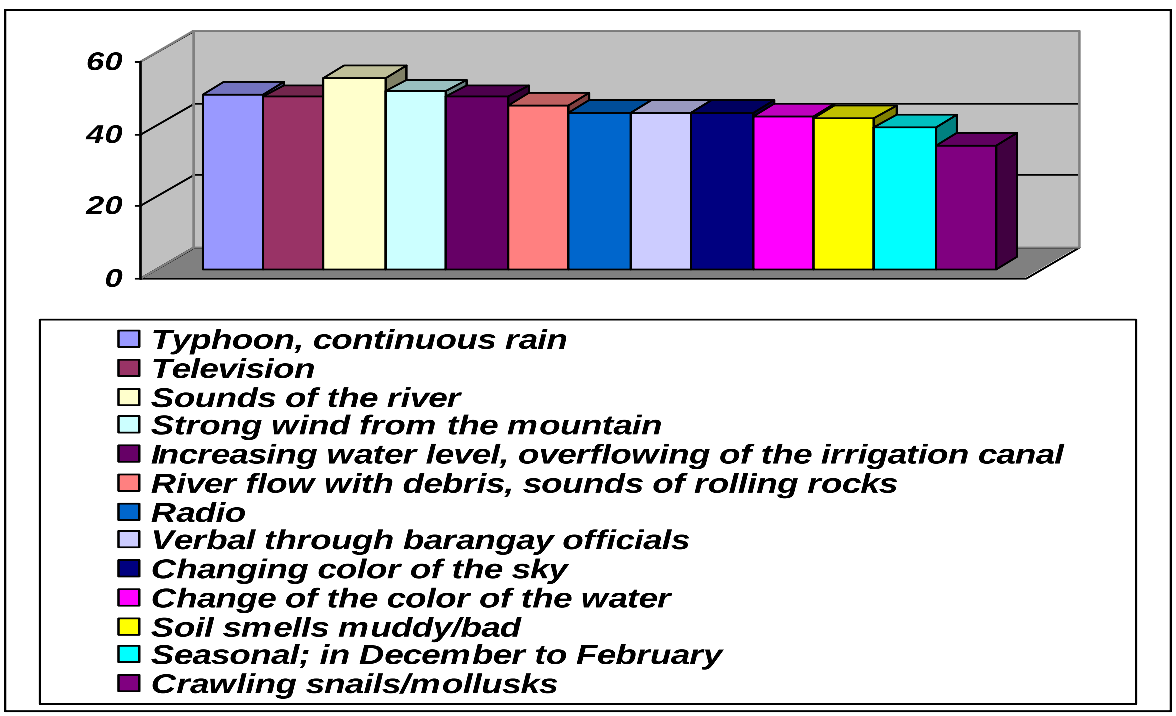


Figure 5-8. Conveyors of imminent flooding by community respondents expressed in percentage (n=132).

1.5.5.3 ***Community Early Warning System.*** The lead time to evacuate or run to a safer place is dependent on the system and practice that the community has been exposed to, which is usually based on their past experiences. At the community level, some traditional warning communication systems can be very effective and have proven reliable by the local people. Figure 5-9 shows modes of communicating warnings at the community level that the respondents find to be effective.

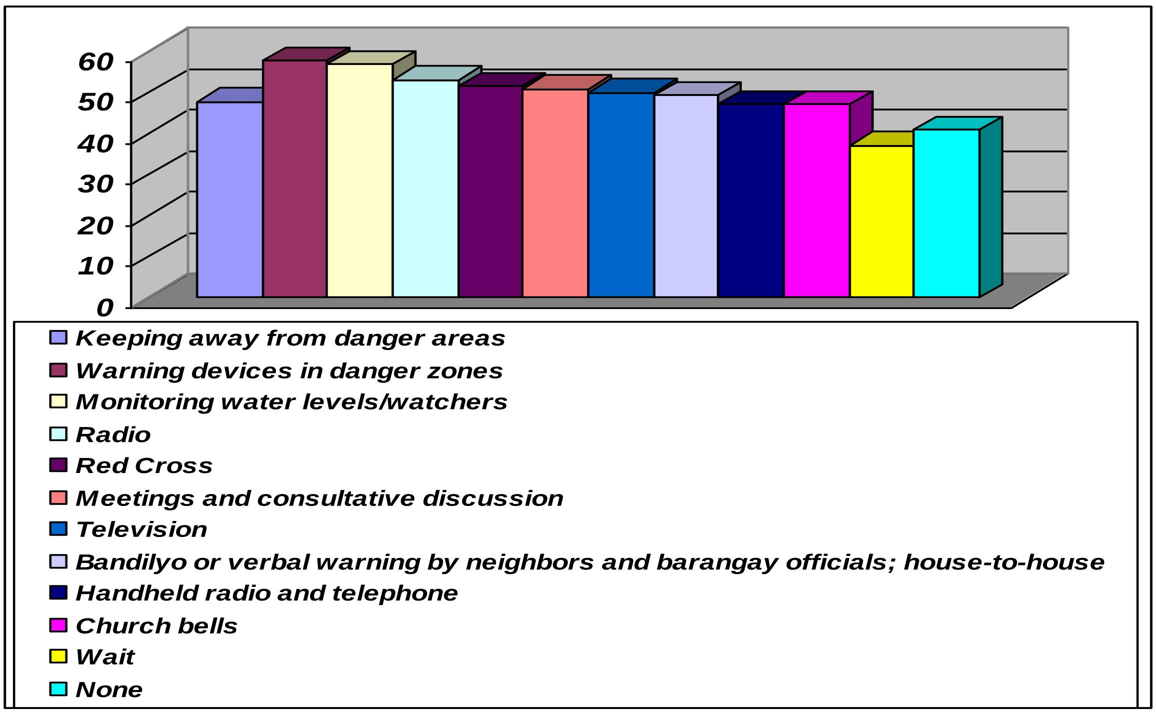


Figure 5-9. Early warning systems preferred by community respondents expressed in percentage (n=132).

More than 47% of respondents strongly believe that keeping away from danger areas is a proactive action for taking heed of warning alerts. More than 57% of respondents believe that placement of warning devices in danger zones is a better mode of warning. About 56.8% of respondents believe in posting watchers who will monitor water levels at periodic times. Fifty-three percent of respondents believe in radio as an effective means of early warning. About 51.5% of respondents trust Red Cross as conveyors of warning messages. Half of the respondents have relied on meetings, consultative discussions, and television as means of warning communication. More than 49% of respondents prefer verbal warning by neighbours or by *barangay* officials patrolling house-to-house as a warning system. Forty-seven percent of respondents believe that handheld radio, telephones and church bells are better alternatives for early warning at the community level. Figure 5-9 shows modes of communicating warnings at the community level that the respondents find to be effective.

1.5.5.4 Disaster Management Practices. Preparing for, responding to, and recovering from disasters at the community level can be best tested and described using a common hazard. Typhoons occur 22 times on average every year in the Philippines (PAGASA and NDCC, 2007). Figure 5.10 shows disaster management practices that have been adapted by the local people to cope better with natural disasters. More than 66% of respondents strongly agree that prayer has strengthened them to be more positive in responding to natural disasters like typhoons. About 62.9% of respondents strongly agree that evacuation and keeping their family in safe places as best preparedness practice. Half of the respondents also strongly agree that stockpiling of supplies, acquisition of emergency equipment, and saving money, as well as securing things in safe places are practical ways of better handling disasters. More than 56% of respondents only agree to the development of preparedness skills, heightened disaster awareness and improved rescue operations as better ways to cope with disasters. About 55.3% of respondents agree that securing *banca* and animals in safe places are practical ways of disaster preparedness. More than 54% of respondents agree that strengthening their houses will mitigate disaster impact. Fifty percent of respondents agree that warning neighbours and coordinating properly with *barangay* officials better prepares them against disasters. More than 52% of respondents agree that active participation during disaster operations can save others incurring less casualties and damaged properties. About 31.8% of respondents neither agree nor disagree about staying in their houses as a safety practice. This could be due to their experience that it was safer to stay in their houses during a typhoon passage but not during a landslide. Respondents knew that the impact of the landslides on February 17, 2008 carried or transported away and entombed whole houses. All the school children buried alive were inside the school buildings. Staying inside a house or a building in this landslide disaster did not make them safe or better prepared.

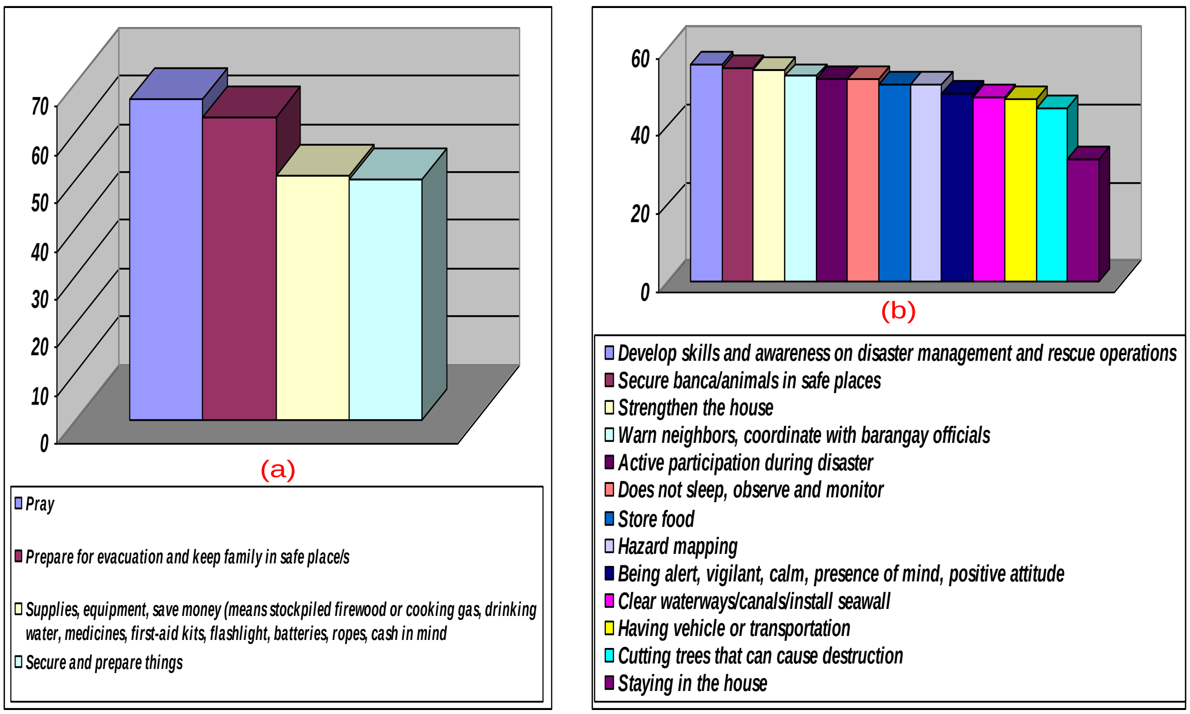


Figure 5-10. Disaster management practices adapted by community respondents expressed in percentage (n=132).

1.5.6 Gender Concerns

Differentiation in the gender roles during disasters is evident while survivors are living in the evacuation centres. Figure 5-11 shows the problems encountered by women in the evacuation centres. More than 45% of respondents strongly agree overcrowding and noise are stressful problems they have encountered while living in evacuation centres. About 43.9% of respondents strongly agree that their children get sick in the evacuation centres. Over 46% of respondents also agree that they cannot sleep and experience discomfort while living in evacuation centres. About 45.5% of respondents agree that they suffer from lack of sanitation facilities in the evacuation centres. More than 44% of respondents agree that inadequate water supply in the evacuation centres is a major problem. Nearly 40% of respondents agree they are more worried about thieves, their former house and children while they live in an evacuation centre. More than one-third of the respondents agree that women having no food to cook or a lack of food are a serious problem.

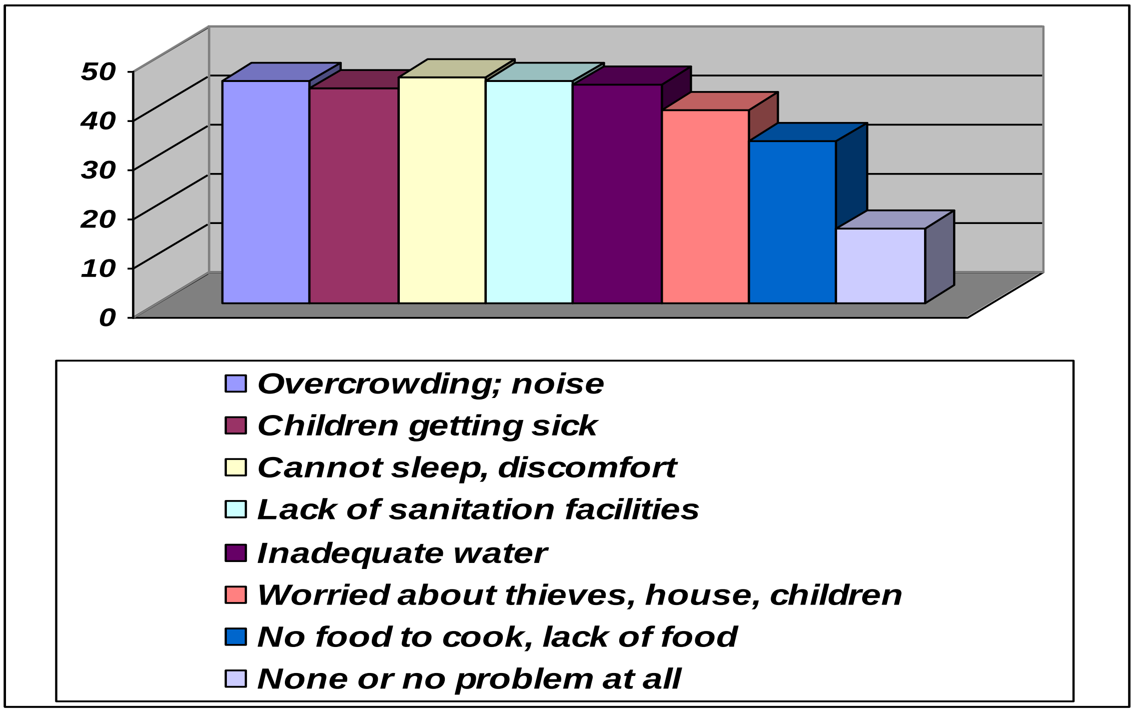


Figure 5-11. Problems of women in evacuation centres by community respondents (n=132).

In contrast, results about the problems men encountered in the evacuation centres by community respondents are shown in Figure 5-12. More than 51% of respondents strongly agree that having no work and no income are the pressing problems for men in the evacuation centres. More than 38% of respondents strongly agree also that a lack of food is experienced in evacuation centres. Forty-seven percent of respondents agree men are preoccupied with worries of prolonged disaster. More than 43% of respondents agree that men suffer from not being able to sleep and experience discomfort in evacuation centres. About 42.4% of respondents agree that men are worried about things left in their former house. More than 35% of respondents agree that lack of clothes and personal belongings are the worries of men in the evacuation centres.

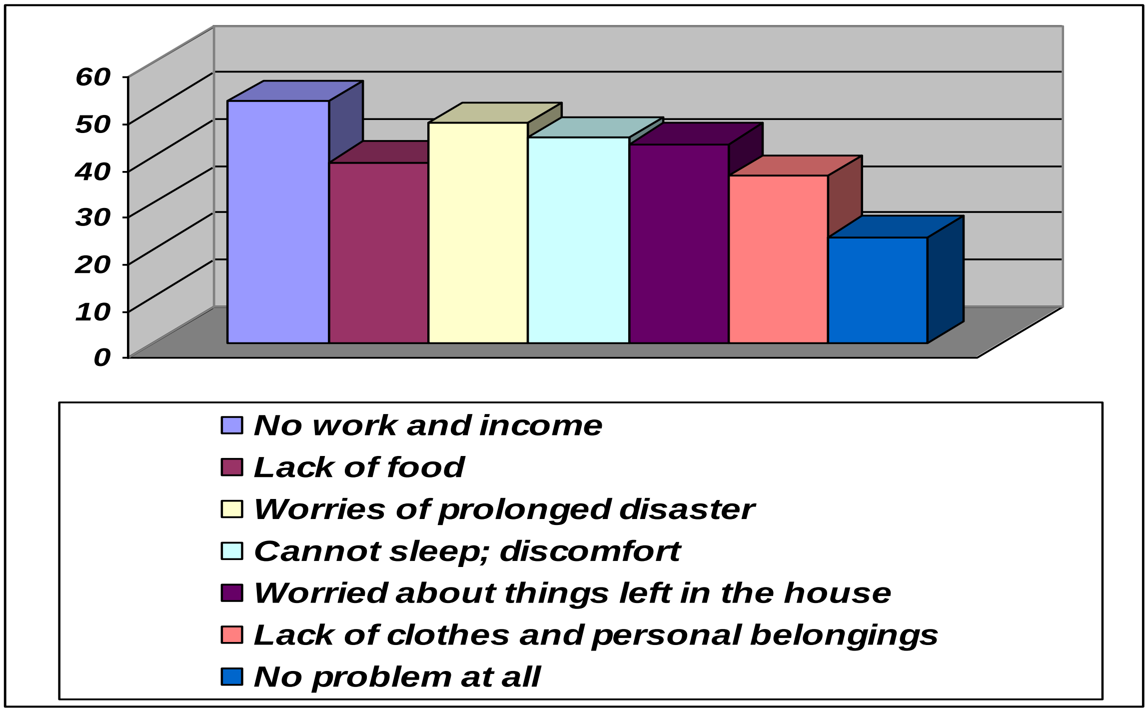


Figure 5-12. Problems of men in evacuation centres by community respondents (n=132).

1.5.7 Losses and Recovery

Post-disaster rehabilitation and reconstruction of affected communities can influence people's vulnerability and resilience. Interventions being provided to the local people must be adaptive to the community's values and norms. This will empower vulnerable groups in the community and mobilize strong support from local people. Positive changes in the community would only be possible when interventions and projects were prepared and planned by the service providers and institutions together with the local people. This bottom-up consultation process enables affected communities to facilitate recovery among themselves with less control from other organizations. Gaillard (2006) argues that resilient communities are those able to overcome the damages brought by the occurrence of natural hazards. It is done either through maintaining their pre-disaster social fabric, or through accepting marginal or larger change in order to survive.

1.5.7.1 Damages and Losses. As shown in Figure 5.13, more than half of the respondents (55.3%) lost relatives during the landslides. This loss explains prevailing trauma and depression, despite the new houses and other relief assistance they have received. Recovering from the psycho-social trauma can take years for those directly affected who suffered significant losses.

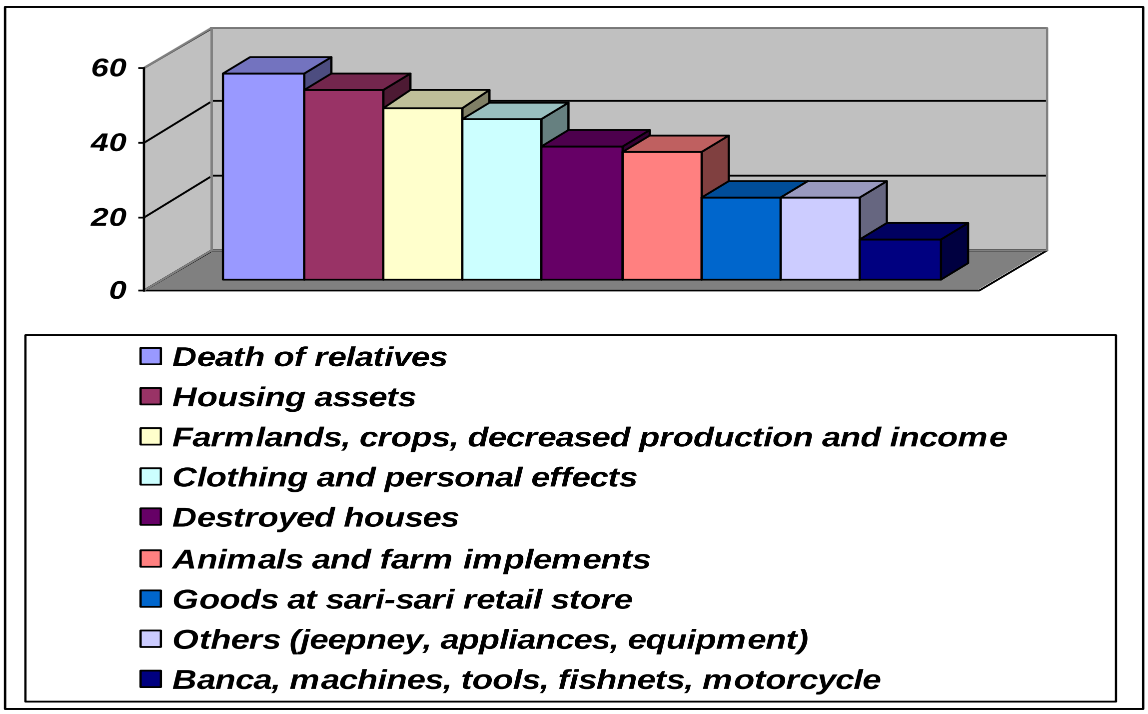


Figure 5-13. Damages and losses incurred by community respondents (n=132).

About 50.8% of respondents have lost housing assets which include rice mills, warehouses, rice barns, retail stores, billiard houses, and the like. Nearly half of them suffered major economic loss of farmlands, decreased production and income (46.2%), and basic necessities like clothing and personal effects (43.2%). Over one-third of them indicate that their houses were destroyed (35.6%). Other losses encountered by the families are loss of animals and farm implements (34.1%), goods at a sari-sari retail store

(22%), [7]jeepney, appliances, and equipment (22%), boats, machines, tools and fishnets (10.6%).

1.5.7.2 ***<u>Recovery Process</u>*****.** Going through the `healing process' and the transition period are quite difficult for the affected communities and for the families directly impacted by the landslides. Better ways to cope with the trauma of loss experienced by the local people are expressed through the suggestions articulated by the respondents. Figure 5.14 shows these suggestions. More than two-thirds (76.5%) of the respondents draw strength and courage to return to normal living and looking ahead to a brighter future through prayer. More than half of them (59.1%) strongly believe that to recover faster is to manifest their self-confidence and self-reliance in overcoming their ordeals. Fifty percent of the respondents emphasize the importance of neighbours helping one another to facilitate community recovery. More than 48% of respondents believe that seeking assistance from the Department of Social Welfare and Development can facilitate recovery. These respondents also believe that saving money or being prudent in spending money can help cope with everyday needs. About 34% of respondents mentioned they have bought new items or things in their house to make them feel that their living conditions are becoming normal. More than one-third of the respondents believe that asking for assistance from parents and relatives could help them recover better. About 17.4% of respondents believe that by engaging themselves in alternative paid-jobs can facilitate faster restoration to normal living. More than 12% of respondents have suggested that debris logs be made into lumber. About 6.1% of respondents do not believe that by doing nothing one can recover from losses. Fifteen months after the landslide tragedy, three quarters (75%) of the respondents are still housed in the evacuation centres. They are still in the rehabilitation phase of the disaster cycle where full recovery can only commence once

[7] *Jeepneys* are the most popular means of public transportation in the Philippines. Originally, they were made from US military jeeps left over from World War II and characterised by colourful decorations and crowded seating.

they are relocated permanently in the resettlement areas. Only the respondents in *Barangay Guinsaugon* (25%) have been relocated to their new resettlement village, today called as New Guinsaugon. For those affected by the losses, it took more than a year to recover. The recovery period for more vulnerable people may be longer.

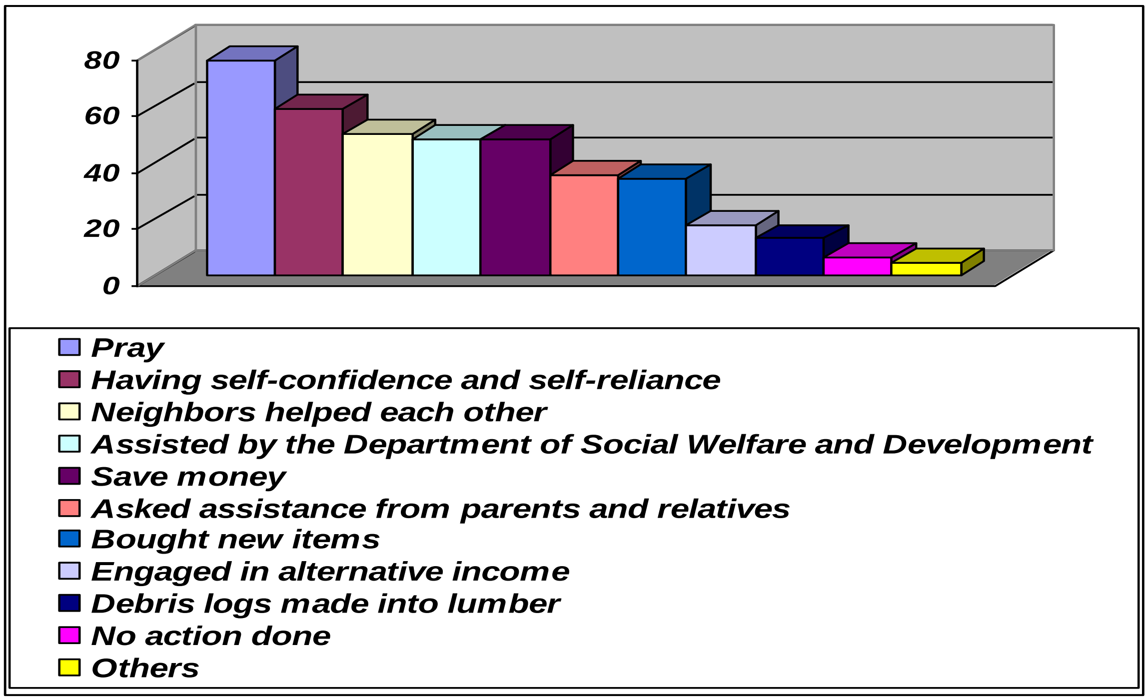
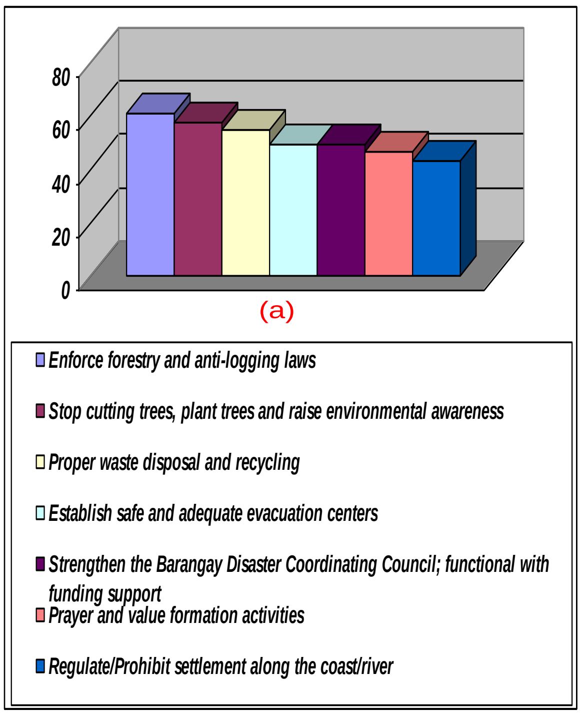


Figure 5-14. Coping practices in recovering from disasters by community respondents (n=132).

1.6 <u>Disaster Mitigation Measures</u>

Figure 5.15 summarizes the measures suggested by the community respondents that can best reduce adverse impacts of disasters. Plate (a) shows the measures that respondents strongly agree reduce disaster impacts. More than 60% of respondents strongly agree that enforcement of forestry and anti-logging laws can effectively reduce disasters. About 57.6% of respondents strongly agree that preventative measures such as stopping the cutting of trees, planting of trees and raising environmental awareness can better reduce disasters. More than 54% of respondents strongly agree that proper waste disposal and recycling mitigate disaster impacts. About 49.2% of the respondents strongly agree that by establishing safe and adequate evacuation centres in communities at risk, the impacts of disasters can be reduced. These respondents also strongly agree that by strengthening the *Barangay* Disaster Coordinating Council disasters can be better managed. Making this Council functional requires regular allocated funds for its operations and administrative services. More than 46% of respondents strongly agree that conduct of prayer meetings and value formation activities are of benefit. About 43.2% of respondents strongly agree that prohibiting human settlements along the coasts or river channels can contribute to the reduction in disasters.



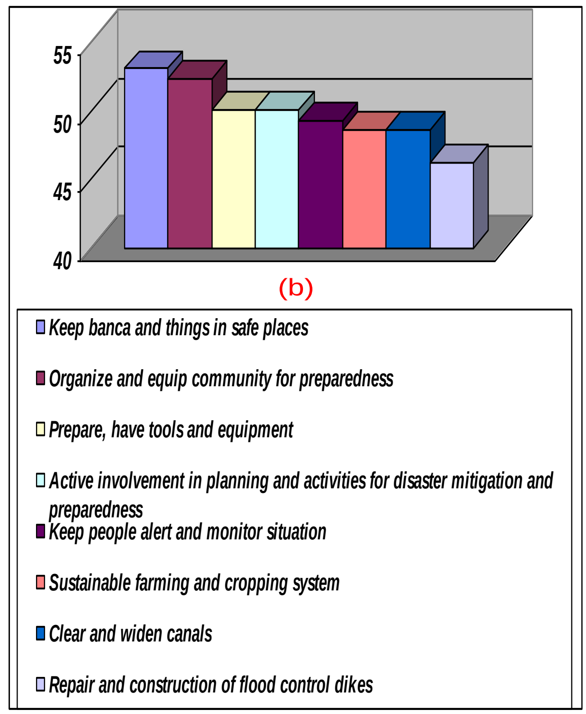


Figure 5-15. Better ways to reduce disasters by community respondents (n=132).

The other plate (b) presents the measures that respondents agree reduce disaster impacts. Fifty-three percent of respondents agree that preventative measures like keeping *banca* and things in safe places can reduce disasters. Over 52% of respondents agree that organizing people and training them for community preparedness can mitigate disasters. Half of the respondents agree that preparations like stockpiling food and water, having emergency tools and equipment can mitigate disasters. These respondents also agree that active involvement in planning and activities for disaster mitigation and preparedness helps to manage the effects of disasters. About 49.2% of respondents agree that keeping people alert and monitoring situations during disasters can reduce adverse impacts. More than 48% of respondents agree that practising sustainable farming and cropping systems are preventative measures against disasters. These respondents also agree that preventative measures such as clearing and widening canals can yield results. About 46.2% of respondents agree that structural measures to include the repair and construction of flood control dikes can better reduce disaster impacts.

2. Results from the Non-Prompted and Open-Ended Interviews

This is the second source of results from the responses of the local people to the non-prompted and open-ended questions of the social survey. The strength of the method comes from the spontaneity of the respondents in expressing their personal opinions and what they think is good for them. Probing through the uninhibited answers of the community respondents can reveal a deeper perspective on the aspirations, logic, philosophy, beliefs and choices in how their living conditions be improved and how community situations can be better managed. The embodiment of their suggestions, comments, and sentiments into the decision- and policy-making process can enhance strategies and development interventions for the service providers.

Using Meta cards and a colour-coding scheme, sensible answers were categorized and analysed via an assessment matrix composed of the following components (Appendix 9): physical/material, social/organizational, and attitudinal/motivational. The most repeated key words and similar answers are ranked according to frequency and sensibility on an issue. These issues are identified and become headings of the sub-sections below.

Results of the analysis of interviews using the matrix guide questions adapted from Anderson et al (1998) are presented in tables at the end of each sub-section. The following aspects are covered in this section: harnessing community values and local beliefs; improving communications, warning and alert system; enhancing community and household preparedness; improving evacuation centres and management; facilitating rehabilitation and recovery process; and mitigating disasters.

2.1 Harnessing Community Values and Local Beliefs

The community's capacity to survive and adapt to major changes in life after a disaster, are grounded in belief systems, philosophical values and cross-cultural thinking (Gilbert, 1995; Drabek, 1999; Buckle, 2000). Most of these stem from an `inside out' mindset of viewing things compounded by the intense longing for filial relationships severed by the tragedy. Findings of the study are shown in Table 5.5. More than 68% of respondents expressed that [8]***attitudinal and motivational*** issues have influenced their values in life most. These are reflected in the following answers:

●"*No matter how many material things I have now, it does not make me happy anymore*,"

●"*Let us rise up, move on and strive harder to improve one's lot in life*,"

● "*Cooperation among ourselves and help one another to rebuild our lives*,"

●"*Amend our ways, repent and fear and serve the Living God*,"

●"*Even if we have new houses today, I still missed my loved ones who perished in the landslides. This is not a trade-off, I suppose for they are more precious in this life than these material things*."

●"*I know now how to go along with other people, and know how to take care of our natural resources*."

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[8] Attitudinal and motivational attributes refer to how a community views itself and its ability to deal with the physical, social and political environment. These include, among others, people's perception of being empowered or victimized, fatalistic and dependent; and awareness of being agents of change for improving the community.

About 6.1% of respondents mentioned [9]***social and organizational*** issues had influenced their values as expressed in the following statements:

●"*First of all my children, our properties, my parents and siblings are supposed to be gathered together again*,"

●"*I was so afraid of the landslide that is why I and my family members parted ways*,"

Only 3.8% of the respondents believed that [10]***physical and material*** issues have affected their values in life as expressed in the following answers:

●"*I am not comfortable in our temporary accommodation in these evacuation centres, for everything here is procured. Unlike in Guinsaugon, we can move freely, right now, we do not have water supply here*,"

●"*We do not have food here because we do not have money to buy, we are poor*."

Table 5.5. How respondents value life after the landslide disaster (n=132).

Rank	***Values System using Capacity/Vulnerability Matrix***	***Frequency***	***Percentage (%)***
1	Attitudinal and motivational	90	68.2
2	Social and organizational	8	6.1
3	Physical and material	5	4.6
4	Others	2	1.5

2.2 Improving Communications, Warning and Alert Systems

Communications and early warning systems are the backbone of real-time information and reporting towards an effective disaster response. Evacuation, damage and casualty reduction are dependent on these mechanisms at the community level. Table 5.6 shows major suggestions of the respondents on how to improve warning systems, advisories and communication mechanisms for safer communities. About 27.3% of the respondents

[9] Social and organizational attributes refer to social structures that exist in the community whether formal or informal systems. These include, but are not limited to decision-making processes, leadership power and dispensation, societal divisions or conflicts, and socio-economic activities.

[10] Physical and material attributes refer to the resources available in the community e.g., land, climate, environment, people's health, skills and labour, infrastructure, food housing, capital, and physical technologies. These can also be the ways in which the community may be physically vulnerable.

recommended mostly ***social and organizational*** improvements. The following statements describe these improvements.

●*"Communication and coordination through our neighbours, barangay officials and house- to-house, if possible to warn us immediately"*

●*"People need to volunteer in alerting neighbours for any emergency"*

●*"Warning us by sounding loud the church bells", "watchers should announce the emergency warning loud and clear."*

Some 24.2% of respondents suggested ***physical and material*** remedies. The following statements mention what remedial measures and issues need to be addressed.

●*"Megaphones should be given to alert people",*

●*"Mobile phones can be used to warn others"*

● *"We lack communication equipment and no improvement yet"*

●*"Two-way radio is effective rather than cell phone and announcement most effective way of informing people"*

●*"We should dwell away from mountains, rivers and coastlines."*

About 9.1% respondents focused on ***attitudinal and motivational*** suggestions such as,

●*"Let us not be abusive so our community system will improve"*

●*"We must be united in love and peaceful environment"*

●*"Attend seminars"*

●"*This warning system is needed most in the disaster-affected areas to increase readiness"*.

Table 5.6. How to improve warning system, advisory and communication (n=132).

Rank	***Suggestions using Capacity/Vulnerability Matrix***	***Frequency***	***Percentage (%)***
1	Social and organizational	36	27.3
2	Physical and material	32	24.2
3	Attitudinal and motivational	12	9.1
4	Others	12	9.1

2.3 Enhancing Community and Household Preparedness

Preparedness at the household level is the first line of defence against disaster impact. Empowerment of families proved to be strategic in increasing community resilience. Identification of weak and strong family members, as well as weak and hotspots in the houses and vicinity, can minimise human injury and facilitate evacuation. Table 5.7 shows suggestions of the respondents as to how to increase household and community preparedness. More than 29% of respondents mentioned ***attitudinal and motivational*** remedies as highlighted in the following answers.

- "*Be strong, always ready for any impending threat and trust God"*
- *"Have savings that can be used during tragedies"*
- *"Let us help one another and be united in everything"*

About 20.7% of respondents expressed some ***social and organizational*** improvements such as those listed below.

- "*Have appropriate knowledge about our place, its conditions, and work together",*
- *"Cooperation and unity among the high officials of the local government and the people to understand and follow"*
- *"Family members must talk and determine what to do"*

Over 18% of respondents preferred ***physical and material*** recommendations as observed in the following statements.

- "*We must prepare transportation on standby before typhoon landfall"*
- *"Establish evacuation centres in designated areas"*
- *"Livelihood program"*
- *"Every family member secured, healthy and stockpile food"*

Table 5.7. How to enhance household and community preparedness (n=132).

Rank	***Suggestions using Capacity/Vulnerability Matrix***	***Frequency***	***Percentage (%)***
1	Attitudinal and motivational	39	29.5
2	Social and organizational	27	20.5
3	Physical and material	25	18.9
4	Others	4	3.0

2.4 Improving Evacuation Centres and Management

Provision of temporary shelters and tents are important aspects of disaster response and rehabilitation. Management of the evacuation centres is vital to sustaining community health and reducing further exposure to other risks like disease and psycho-social stressors. Table 5.8 shows suggestions of respondents as to how to improve evacuation centres and better manage the use of these facilities. About 31.8% of respondents mentioned ***social and organizational*** improvements to include,

●"*Cooperation among officials and leaders in the village";*

●*"We hope that relief assistance will be sustained continuously until we are relocated";*

●*"We hope to have alternative source of income or livelihood".*

More than 30% of respondents made some ***physical and material*** recommendations. These are expressed in the following statements.

●"*We need rice, plates, shelters,", "we lack potable water, toilets and electric power"*

●*"Construct new sanitary facilities to avoid sicknesses"*

About 15.9% of respondents emphasized ***attitudinal and motivational*** remedies as observed in following answers.

●"*Clean waterways, clean houses and surroundings, and sanitize toilets"*

●*"Help one another in solving our problems"*

●*"Understand one another; cooperate to maintain cleanliness in the evacuation centres"*

Table 5.8. How to improve evacuation centres and management (n=132).

Rank	*Suggestions using Capacity/Vulnerability Matrix*	*Frequency*	*Percentage (%)*
1	Social and organizational	42	31.8
2	Physical and material	40	30.3
3	Attitudinal and motivational	21	15.9
4	Others	1	0.8

2.5 Facilitating Rehabilitation and Recovery Process

Post-disaster reconstruction and community recovery are an important phase in the disaster cycle. The scope and speed of this transition phase depend largely on the service providers working with the community. Specific needs must be addressed in the recovery program so as not to further marginalize vulnerable groups in recovery like traumatized individuals and lone survivors. Table 5.9 shows suggestions of the respondents on how to expedite rehabilitation and recovery from disaster losses. More than one-third of respondents suggested ***social and organizational*** improvements as highlighted in the answers cited below.

●"*Work together in the community and coordinate properly with government agencies concerned to facilitate service delivery"*

●*"Ask help from non-government organizations and follow-up regularly"*

● *"Immediate action of support, but sad to say the municipal government here is not working"*

●"*They should send counsellors to the survivors to know what they fear and assist them to deal with their trauma"*

About 22.7% of respondents mentioned ***physical and material*** recommendations as expressed in the following statements.

●*"We hope the resettlement housing will be completed as soonest, so we can stabilize our everyday lives"*

●*"Fast-track site development, housing materials, water supply, electricity, livelihood alternatives, and food-for-work projects"*

●*"Procurement of new things and necessities"*

Nearly 16% of respondents articulated **attitudinal and motivational** remedies as reflected in the statements listed below.

●*"Do not overspend budgeted money in order to save", "strive to rise up and volunteer to finish the resettlement housing"*

●*"I will strive to finish my studies so I can work and help my parents and work together. I will find a part time job to help them sustain our daily needs while staying in the evacuation centres"*

Table 5.9. How to facilitate rehabilitation or recovery from the losses (n=132).

Rank	***Suggestions Using Capacity/Vulnerability Matrix***	***Frequency***	***Percentage (%)***
1	Social and organizational	44	33.3
2	Physical and material	30	22.7
3	Attitudinal and motivational	21	15.9
4	Others	3	2.3

2.6 Reducing Disaster Risks of Threatened Communities

Disaster mitigation ranges from medium-term to long-term strategies aimed at reducing disaster risks. It encompasses activities in preparation for, response to, and recovery from, the impact of disasters. Perception of the community to the whole program is crucial for sustaining government programs and in introducing strategic interventions to improve community resilience. Table 5.10 shows suggestions of the respondents on how to reduce or mitigate disasters in the community. About 34.8% of respondents suggested ***attitudinal and motivational*** strategies as emphasized in the following statements.

●*"Watch for changing weather"*

● *"Be always prepared"*

● *"Be alert all the time and taking care of natural resources"*

●*"Let us always pray, full of faith in God"*

●*"Avoid emergencies and threats by preparing"*

●*"Avoid disaster-prone areas; listen to seminars on disasters, monitor disaster warnings from television or radio and familiarize oneself about his/her community"*

About 18.9% of respondents recommended some ***physical and material*** improvements. These are described in the following statements.

- *"To avoid disaster, do not reside or dwell in hazard-prone areas and be prepared always"*
- *"Plant trees in vacant lots"*
- *"Reforestation to avoid landslides"*
- "*Do not throw garbage and do not cut trees*"

About 18.9% of respondents also endorsed ***social and organizational*** activities as preventative measures. The following statements express these suggested measures.

- *"Training seminars"*
- *"Continue programs on community disaster preparedness"*
- *"Counselling session and stress debriefing programs"*
- *"Have proper coordination with officials and neighbours and give deepest trust to government."*

Table 5.10. Suggestions to reduce or mitigate disasters (n=132).

Rank	***Suggestions Using Capacity/Vulnerability Matrix***	***Frequency***	***Percentage***
1	Attitudinal and motivational	46	34.8
2.5	Physical and material	25	18.9
2.5	Social and organizational	25	18.9
4	Others	3	2.3

3. Results from the Survivors' Stories

Using in-depth and qualitative interviews, this component of the community studies was designed to understand participants' lived experience "from their own point of view," as they struggled to reduce personal powerlessness and dependency (Lord & Farlow, 1990; Lord, 1991; Lord & Hutchison, 1993) towards empowerment and resilience. The complete documentation of the seven community interviewees (see Appendix 9) who volunteered to share their survival stories serve as the main data source in this section. The empowerment technique modified from Lord's (2002) method is employed to analyse the content of the stories and extract meaningful issues related to empowering vulnerable people groups. Drawing observations from the stories and their implications for disaster risk management are done using the building blocks of the Landslip-Quadrant Model on community resilience, as discussed in Chapter 2. The following aspects are covered in this chapter: Lord's Empowerment Approach, modified analysis method, results and findings from content analysis, observations and implications of the study.

3.1 Lord's Empowerment Approach

The empowerment approach of Lord (1997) involves vulnerable citizens, such as mental health consumers/survivors, self-advocates with developmental disabilities, and people with physical disabilities. He argued that personal control or empowerment is embedded in the community setting. People have a strong sense of self within a collective milieu. He suggested that individuals often had a degree of personal control and were involved with strong social networks. His studies focused on what the process and catalysts might have been for the changes these vulnerable people had experienced. This technique is used in this study as a basic guide for developing a tool for the content analysis of the survivors' stories. The studies conducted by Lord are similar to the psycho-social vulnerability of disaster survivors, except for the natural disaster as the causal agent. Table 5.11 shows the elements of the personal empowerment process suggested by Lord (1991).

Table 5.11. Elements of the personal empowerment process.

Experiencing Powerlessness	**Gaining Awareness**	**Learning New Roles**	**Initiating Participating**	**Contributing**
Social Isolation	*Acting on anger*	*Connecting with others*	*Joining groups*	*Being a role model*
Service dependency	*Responding to information*	*Linking with resources*	*Speaking out*	*Having influence*
Limited choices	*Responding to new contexts*	*Expanding choices/opportunities*	*Expanding participatory competence*	*Increasing self-efficacy*

Source: John Lord's self empowerment technique (1991)

3.2 Modified Analysis Method

The psycho-social dimension is an important component of the human capacity of resilience in dealing with the impact of disasters. The outcome from the data analysis of this component can be essential inputs to mitigation and preparedness capability-building activities of communities at risk. On a voluntary basis, seven (7) participants from the affected communities shared their stories about the tragedy that occurred fifteen (15) months before the fieldwork.

A modified technique of Lord's empowerment approach is developed by the author in this study to analyse the survivor's stories, so as to contextualize parameters for disaster risk management and to develop the building blocks of the Landslip-Quadrant Model for community resilience. Table 5.12 translates the modification of personal empowerment by Lord into a coping process of individuals in times of natural disaster as highlighted in red letters.

Table 5.12. Personal coping process in disaster risk management.

Phases of Disaster Risk Management		
Pre-Disaster Condition	***Disaster Impact***	***Post-Disaster Transition***
Normal Lifestyles and Daily Needs	*Powerlessness or Defencelessness*	*Learning and Connecting*
Natural Observation, Warning and Communication Means	*Precariousness and Awareness*	*Access to Valued Resources*
Near-Event Physical Sign and Immediate Reaction of People	*Self-Protection and Survival Traits*	*Participation and Contribution*

Source: Author's adapted technique (2008).

The coping process attempts to filter issues and concerns from the first-hand narratives of the survivors as categorized by the three phases in disaster management, before, during and after the disaster. Elicited issues and concerns can provide understanding of why and how a behaviour or action was carried out by the survivors that can be related to what action steps can be developed or improved in order to survive or respond better to flash flood and landslide disasters.

3.3 Study Findings and Observations

Content analysis was employed to extract the meanings from the survivors' stories using the coping process matrix in Table 5.12 as a guide. To maintain the personal view of the respondents, key words and essential phrases from the original transcripts are retained, highlighted, and expressed in first-person statements. These expressions or descriptions are correlated with the building blocks of the Landslip-Quadrant Model on community resilience in Chapter 2. Implications of the study are drawn from the issues and concerns that emerge from the analyses.

3.3.1 Pre-Disaster Condition

The pre-disaster phase can describe the day-to-day living conditions of the local people, the way they perceive and relate to hazard risks in their locality, the social structure and institutional arrangements they are aware of, and the level of safety and preparedness they possess and practice in their households and the community. These can be characterized into four components, namely normal lifestyles and daily needs, pre-cursors' observations, warning and communication means, and near-event physical signs and immediate human reactions.

3.3.1.1 Normal Lifestyles and Daily Needs

Living conditions and day-to-day lifestyles of the survivors and their families before the disaster happened can indicate prevailing socio-economic weaknesses that can surface and be exacerbated by a natural disaster. These weaknesses can also indicate which group or individual are more vulnerable than others. Table 5.13 summarizes the description of living conditions and well-being of the survivors. Survivor B had physical limitations due to her newly-delivered child. Survivor D and his family suffered from an inadequate income and pressing daily needs. He had to live in tight economic circumstances. He wanted to finish his schooling but was constrained by having to supplement the family's limited income. The financial weakness of the family was partially offset by helping one another. This indicated strong social support and self-reliance. Survivor F and her husband were engaged in marginal farming. The couple's insufficient income necessitated borrowing money from their parents. The couple may not have enough income but they have relatives to approach for relief and/or augmentation.

Other survivors in the pre-disaster condition seemed to have a stable economic base and comfortable daily living. Survivor A had a television set and Survivor C had a billiard business adjacent to her two-storey house. The son of survivor E was a driver of a public motorcycle transport who earns additional family income. Survivor F was a young local entrepreneur engaged in buying and selling businesses. Pre-disaster conditions of these survivors can be exacerbated by a natural calamity. This information is relevant in showing the first coping condition in Table 5.12, which indicates both strengths and weaknesses of the survivors' living conditions before the landslide disaster happened.

Table 5.13. Summary of survivors' living conditions and well-being.

Survivor	***Description of Living Conditions and Well-being***
A	*I was* ***inside the house*** *and* ***watching television*** *on that day*
B	*I just* ***delivered a baby*** *and came out of the hospital* ***a week earlier*** *before the tragedy struck. I was* ***recuperating*** *and doing light household chores in the house of my father*
C	*I was* ***doing some inspection*** *in my local business and other property. At that time, I was talking to the manager of our billiard game business downstairs in our* ***two-storey house****.*
D	*I am a youngster eking out a livelihood as a bus conductor with* ***meagre pay*** *to sustain my schooling and augment the daily income of my* ***poor*** *parents.*

E	*I am a plain* ***housewife*** *attending to the daily needs of my family members. On that day I was waiting for my* ***son*** *who was working as a* ***driver of a*** *passengers* ***motorcycle.***
F	*I and my husband went up to the other side of the mountain to* ***pick up coconuts*** *and other farm produce from our* ***upland farm lot****. I left my two daughters in the elementary school.*
G	*I am a local* ***buy-and-sell businessman****. I was helping my* ***father*** *who was the* ***community chieftain*** *at that time for a special gathering, the Women's Parade and Conference with our barangay as host.*

3.3.1.2 Natural Observation, Warning and Communication Means

Results shown in Table 5.14 record natural observation, warning and communication means extracted from the survivors' stories. All of the survivors observed unusual rainfall or non-stop rain for several days before the disaster. They were also aware of suspended bus trips and reported road cuts. However, these were not used as a basis for hazard risk assessment leading to emergency alert and evacuation of communities at risk. One of the respondents mentioned a form of warning which comes from beliefs and superstition. This story was confirmed by the municipal social welfare officer and even reached the municipal mayor for action on whether to evacuate the people or not based on a local psychic prediction. The point here is that the local people are basically looking for a reliable source of information and advice of actions from authorities, rather than from unfamiliar sources. Two of these survivors expressed unexplained emotional stress minutes before the disaster occurred. They felt unusual loneliness and the eeriness of something ominous about to happen. This explains why they seemed to feel a deep longing and intense affection for their loved ones who were still alive at that time before they left the village for some business appointments. While these unexplained instinctive feelings cannot be translated into a community-wide warning capability, at the household or family level this can be an alternative consideration for a psycho-social capacity-building program.

Table 5.14. Summary of natural observation, warning and communication.

Survivor	***Description of Natural Observation, Warning and Communication Means***
A	*It was **raining** for **more than a week**, so I stayed in the house and was watching a television show.*
B	***Heavy rains** and road cuts due to **damaged roads** on my way from the hospital to the house of my father were evident. An unknown **beggar warned** our neighbourhood and adjacent barangays about a tragic event that will befall us within three days. **Some** of our frightened **neighbours evacuated** due to the ominous prediction. Our **village chief** otherwise calmed us; not to panic and **encouraged us to stay**.*
C	*Because of **rainy conditions outside**, I was inside our house and from time to time visited the adjacent billiard hall where some gamers were playing.*
D	*Though it was **raining at that time**, I reported to work in the bus transport station.*
E	*I noticed that there were intermittent showers and **heavy rainfall** for about **two (2) weeks** before the landslides occurred. I was **feeling down** and **lonely** that day while I and my husband were on the way to the mountain to gather coconuts.*
F	*We noticed that the **rains will not stop**, me and my husband decided to go up the mountain to pick some coconuts, harvest vegetables and dig up root crops.*
G	*As a merchant, I practice sun-drying abaca hemp for good quality. I observed that the **rain showers** were on and off at that time and we kept bringing inside and outside the abaca hemp as well. I **felt restless** and **bothered inside** at that time and could not leave our house immediately to pay bills and buy petrol in the next village about twenty minutes before the landslide occurred.*

3.3.1.3 Near-Event Physical Sign and Immediate Reaction of People

As shown in Table 5.15, four of the survivors heard a loud sound so distinct and unusual on that day. Survivor A describes the sound as a roaring airplane and a crashing sound. Survivors E and C heard it like a big bang explosion. Three of them, Survivors C, E and F remembered that they clearly felt a tremor or ground shaking. All of them traced and looked where the sound came from. This unusual sound should have been the warning for immediate evacuation of the local people. In only a few seconds, the hazard impacted on the communities at the toe of the steep Mount Cabac. Survivors saw the mountain crumbling down very fast. Their immediate reaction was to run for their lives. To reach safe ground or a protected area was the critical issue. Indecisiveness or delay in action to seek safer grounds and take refuge shortens the chances for surviving the impact. However, one of them returned inside the house again and shut off the television she was watching. It is observed that such behaviour can be related to none of their previous experiences with natural hazards in their locality. This explains why some showed indiscriminate curiosity, ignorance and even delayed self-evacuation despite the imminence of the impending threat. In a rapid onset hazard like landslides and flash floods, pre-determined safety actions may not be observed due to emotional stress and mental lapses. Instead, psychological instinct just to get away from the path of the landslides can overpower one's normal logic and skill. Two of the participants were outside the disaster site at that time. However, survivor F with her husband felt a tremor and saw from another spot of the mountain range their whole village being engulfed by the mudslides. Survivor G only heard the news from a commotion in the town proper about a tragic event that happened in their village.

Table 5.15. Summary of near-event physical signs and immediate reactions.

Survivor	***Description of Near-Event Physical Signs and immediate Reactions***
A	*When I heard a sound like a **roaring of an airplane** and then, a **crashing sound**; I went outside to look.*
B	***I saw** the mountain came **crumbling down** toward us (she and her baby and her father).*
C	*While in the billiard hall, I noticed the **shaking** of the floor and the **balls** on the unused billiard tables were **rolling to and fro**. Then I heard an exploding sound.*
D	*While I was helping in the bus repair, my **lady owner shouted** that the mountain toppled. When **I saw** it, **I** immediately **ran as fast** as I could towards sitio Bodloy.*
E	*When my son arrived, we went home and were just entering our house, when there was a **sudden tremor** accompanied by a **big bang** coming from the mountain which at that time had already collapsed. I and my son were **very frightened.***
F	*At around 10:45 a.m., there was a **ground shaking.** Then, I and my husband **saw** the mountain topple with a **great crashing sound**. Helpless, both of us just **wept**.*
G	(Not applicable, Survivor G travelled to a neighbouring town few kilometres from the landslide site when the impact occurred)

3.3.2 Disaster Impact

During a disaster, disempowering situations are created by the hazard impact. The magnitude and extent of the situation depend on the onset of the hazard and the coping capacity and capability of individuals and the community. Flash floods and landslides are rapid onset natural events. Their deadly impact can suddenly disrupt the normal functions of the community, beyond its coping capacity in most cases. Lifelines and vital services are strained to the limits. Social structure and institutional response mechanisms are usually rendered dysfunctional and paralysed by disaster service demands. This can stem from either inadequacy or incompetency of staff in handling emergency operations. People's choices to take decisive but coherent action under critical conditions are evidence of their self-protection skills and survival traits. Leadership characteristics can also become evident in disaster situations as a display of strength and courage amidst chaos and confusion.

There are four aspects of the personal coping process which comprise this disaster phase: defencelessness or powerlessness, precariousness and awareness of the surroundings and existing conditions, and self-protection and survival traits.

3.3.2.1 Powerlessness or Defencelessness

In the studies done by Lord (1999), research participants described in great detail the anguish of feeling powerless. He found that no single factor or experience created a sense of powerlessness; rather, it was a build-up of factors and experiences that developed into a disempowering situation. Unlike Lord's respondents, this study targeted disaster survivors, hence, a single factor or experience created a sense of defencelessness among them. This was the landslide impact. Survivors of this disaster expressed their ordeals emotionally evident in the pain and anguish they showed while retelling their stories. From time to time they would pause and sob, and would blurt out that they could not do anything; it just happened. Feelings of defencelessness still pervade the memories of these survivors, even though 14 months had passed since the actual event. Descriptions of their defencelessness and disempowerment are summarized in Table 5.16.

Five survivors lost consciousness when hit or engulfed by the mudslides. All of them suffered grave physical injuries, deep wounds and bruises that required major surgical treatment. Despite the medical support that they received from the service institutions, it was only enough to keep them alive. The large scars and skin deformities on their bodies will need major plastic surgery to restore their wholesome appearance and functionality. They said this would entail costly medical operations. Survivors B, D and E needed major surgery. After regaining consciousness, survivors A, B, C, D and F were fully aware that they were buried and still breathing. They were conscious that they needed to get out of their dangerous situation. Mental anguish overwhelmed the survivors once the memories of their lost loved ones became the topic of the interview. While recalling details of the actual experience of the disaster, the survivors struggled to put into words the last moments they saw their loved ones being overtaken and buried alive by cascading mudslides. All of the survivors expressed emotional anguish by crying and shouting. Some of them had temporal suicidal tendencies or wanted to die. However, all of them did expect some form of miracle at the height of rescue operations that one of their loved ones buried in the mudslide would be found alive. Questioning how to carry on living after everything was gone, including their livelihood, Survivor G expressed his feelings of despondency and hopelessness in facing the future when he found out that nobody in his family that he had left in their house had survived.

Table 5.16. Summary of defencelessness or powerlessness during disaster impact.

Survivor	*Description of Defencelessness or Powerlessness during Disaster Impact*
A	*I saw big stones/rocks starting to cascade down the mountain. I had not gone far when the **landslides overtook me.** I **fell down** and **fainted**.*
B	*When the tragedy occurred, I saw the mountain come crumbling down toward us. I was so **confused** and **frightened.** I **did not know** anymore **what to do**. I **lost consciousness** when the mudslides overtook me.*
C	*I was **holed underneath** a billiard table when the **mudslides engulfed** the whole house. I could not do anything as my **whole body** was in **pain,** full of **wounds** and **bruises.** Thoughts of losing my loved ones in the tragedy ran through my mind at that time. These made me feel like **wanting to die** also. My fear that I might not be **able to handle** such a grave **loss** drove me like crazy.*
D	*When the **mud engulfed** me, I completely **fainted.***
E	*I was **overtaken** by the **mudslide** and **lost** my **consciousness**. I was no longer aware of what was happening.*
F	*My husband and I **felt helpless**, and we **wept.** I was **crying, hysterical** and **lamenting** for our two daughters while coming down from the other point of the mountain range.*
G	*I heard that a `tragedy' struck our village Guinsaugon. I hurriedly went back and saw everything was gone, all rocks and mud. I could not do anything, and was so **helpless**. All I did was to **weep** and **cry**. I **felt like wanting to die** with my deceased loved ones. With our livelihood and farmland gone, I **do not know** anymore how my younger sister and I will **subsist.***

3.3.2.2 Precariousness and Awareness

Survivors narrated details about their experience before the impact and after regaining consciousness due to fainting. These are situations where they were trapped or rendered immobile. How they appraise their precarious conditions and what they think is the best thing to do indicate the survivors' knowledge of safety. All of the survivors were fully aware of what was happening around them. Although paranoia and pandemonium pervaded the whole neighbourhood, each survivor knew where they were and what they were doing. Children and little kids were the most vulnerable. Information in Table 5.17 shows that each survivor had a clear mental imagery of the crises they faced, and their physical limitations. Trapped survivors were conscious that they must attempt to do something to free themselves from their entrapments because the situation was still unstable and fragile. Every moment of time counted in their trapped situation. If physical movement was not possible, a sound loud enough to be heard outside by the rescuers was needed. This was to avoid suffocation by drowning or being completely entombed by another flow of mud if the surroundings were still unstable. Survivors A, B, C, D and E were buried in the mud. Only survivor A was aware of the ability of both her hands to move freely, all the rest were immobile. Though trapped inside a house, Survivor D was aware that he could only turn his head and the rest of his body was buried in the mud. By looking around to ascertain exactly where he was buried, he saw a dead body in front of him. He turned his head more and found a hole with light passing through it from the outside. He peeped through this hole and was able to see what was going on outside and to detect who was approaching his position. Mental alertness and sensitivity to the outside world on the part of the survivors during this critical situation was evidently working. Fleeing from the mountain, Survivor F and her husband avoided passing through pathways and farm lots covered with mud. They presumed that the situation was still unstable. The enthusiasm of Survivor G to personally rescue his loved ones was hindered by the soft and watery ground which local authorities cordoned off as a prohibited zone.

Table 5.17. Summary of precariousness and awareness of immediately surrounding and existing conditions.

Survivor	***Description of Precariousness and Awareness of Immediately Surrounding and Existing Conditions***
A	*When I came to my senses, I **discovered** that I was already **buried in the mud** but it was **still shallow** as I was still **able** to **lift my hands freely** above the mud.*
B	*At that time, the **people around me** had **run for safety** together with our **children** and other **kids** in the neighbourhood. **All** of them were **crying** with so much **fear** and **paranoia all around**, and we did **not know what to do** anymore.*
C	*At that time, I cannot do anything, even though I **heard people shouting for help**. I **cannot see** them. Even though I saw them, I **cannot do anything** as my **whole body** was **in pain**, **full** of **wounds** and **bruises**.*
D	*A lot of **people ran** for their lives and **everyone** was **scared to death**. I saw **some** of them were **overtaken** by the **mud** rampage and were **buried alive**. When I regained consciousness, I was already **under** the **thick mud**. I was **thinking** it was only a **bad dream** because I was **hearing** a **noisy honking** of a **truck.** I thought it was our bus, but I **heard screaming** and **hammering** sounds **all around**. When I turned in front of me, I **saw** a victim's **dead body**. It seemed like I was **holed inside** a **collapsed house**, and I **saw** a **light** from a small **hole**.*

E	*My son told me, "Run now for your safety, mum", so I **ran together** with my **sister**. I saw my son ran towards the school where his younger sister was. While running, I looked behind and saw my son went back inside our house. All the **people** around us were **so frightened**, and **all** were **overtaken** by the **mudslide**. After that, I **lost consciousness** and was no longer aware of what was happening. When I regained my senses, I **saw** the **whole** of our **village** Guinsaugon was **covered** by **rocks** and **mud.** I prayed to God, and said "Help me, Lord, I cannot do anything without Your help, give me strength and good courage" because my two **children** were **gone** and both were **buried** in the **mudslide.***
F	*Me and my husband headed towards the town proper and **passed through** the **fields** that were **not covered** with **mud.** As we **passed by**, we **heard** somebody **shouting, "Help".** My husband wanted to help the victim but I hindered him because I was **afraid** that **water** and **mud** might be **flowing still**. We proceeded to the village of Sug-angon, **unreached** by the **debris flows***
G	*I **went back** to look for my father, mother and siblings somehow to **rescue** them **personally** if they were still alive underneath the mud. The affected **people around** me **looked pitiful**. They were **missing** their **lost loved ones**. I said to myself that I had no material things to **offer them** except my **moral support**.*

3.3.2.3 Survival Traits and Self-Protection

Self-protection and survival traits are essential components in handling crises. These descriptions from the survivors are featured in Figure 5.18. These components are best described as the ability of saving oneself and helping others. Among the survivors caught in the mudslides, Survivor A was found with half her body buried in the mud. Her hands could move freely and she used them to push herself above the surface. Rescuers spotted her. Before being overtaken by the mudslide, survivor B had to snatch her baby from the crib and run as fast as she could, barely one week out of hospital. She did not think of her physical limitations but drew all her strength to save her newborn baby. Her father, being aware of her delicate physical condition, ran after her and took her baby. Contrary to this, survivor F hindered her husband from helping a victim shouting 'help'. She said they have to ensure their safety first because the mountain that collapsed was still unstable. They saw mudslides still flowing. They were in a hurry to come down because they wanted to know what had happened to their two daughters who they had left in school. This is self-preservation for the nuclear family before others outside the family. In fact, the couple avoided the fields with the mudslides while heading towards safer ground. Their actions were driven by wanting to see all of their family members safe and together. Any delay on the road was viewed by the couple as moments critical for the rescue of their children in the disaster site. Aside from first securing their safety, the next thing they thought of was their children and if they were safe. This shows solid family ties and a strong social network. Survivors D and E were sensitive of noise coming in their direction and people roaming near where they were buried; they shouted for help. Survivor C prayed to God for her deliverance and quoted Scriptural verses she knew to strengthen her faith and help her to take sensible actions for her safety. She was also rescued by emergency workers. Survivor F returned to their village but was too late to rescue his loved ones. Instead he looked for his sister studying outside the village who had not gone home at the time of the tragedy. Heroic acts of individuals or groups of people during emergencies are indicative of strong survival traits and self-protection.

Table 5.18. Summary of survival traits and self-protection measures.

Survivor	***Description of Saving Oneself and Helping Others to be Saved***
A	*After regaining consciousness, I discovered I am already buried in the mud. But it was still shallow as I was still able to lift my hands freely above the mud.* ***What I did was to push myself up the best I could. I successfully delivered myself from being buried completely,*** *and the rescuers carried me to the Health Centre.*
B	***The only thing I did was to get my baby from the crib to save us and ran for our lives.*** *My father was looking for us because* ***I ran ahead*** *of him out of the house. When my* ***father reached us****, he* ***got*** *the* ***baby from me*** *because he knew that I was still weak, barely one week after I gave birth.*
C	*Buried in the mud, my whole body was in pain, full of wounds and bruises.* ***All I could do was to pray, pray and pray. Then I recalled by memory Psalms 23*** *and there it is the* ***Living Christ manifested*** *and did* ***save*** *me. A man clothed in white raiment appeared and suddenly a whirlwind caught me up from beneath the mud and* ***pushed*** *me close to the* ***surface****.* ***Rescuers found*** *me easily and took me to the nearest hospital.*

D	*I was holed inside a collapsed house and saw a light outside from a small hole.* ***I noticed some people were coming in my direction, so I screamed for help. My friends who survived heard and helped me out by digging from beneath.*** *I felt excruciating pain due to body cuts, wounds, and was really grimacing in pain. They carried me and I thought what could have happened also to my loved ones and whether they were alive or dead altogether? I felt scared that they had all died, and I am the only one left alive, totally orphaned.*
E	***I tried to save myself by crying out for help from other people, and I saw them coming over to rescue me.*** *I am really grateful, first of all to God, and then to the people who helped and rescued me.*
F	*My husband and I headed towards the town proper and we passed through the fields that were not covered with mud.* ***As we passed by, we heard somebody shouting, "Help". My husband wanted to help the victim but I hindered him because I was afraid that water and mud might be flowing still.*** *We proceeded to the village of Sug-angon, unreached by the debris flows.*
G	***Unauthorized rescue*** *operation was* ***forbidden*** *because of the* ***soft ground****. I called up one of my brothers working in Manila, and told him that our father, mother and three siblings were dead. My brother urgently replied to come back home. Then, I* ***remembered*** *my* ***sister studying*** *in the town. I went to her and she was crying too. I brought her to the disaster site. We could not do anything. We just waited for news and for those that were rescued. We* ***looked*** *for* ***another sister*** *named Suzette; she was found dead. We saw her body full of wounds. Among my loved ones lost in the tragedy, she was the only one we saw whose corpse had been retrieved from the mud. Her remains were pitiful to look at. We do not know until now where the others had been buried in the mudslides.*

3.3.3 Post-Disaster Transition

Recovering from disasters is considered a difficult process for both individuals and the community. The processes involved can be catalysts for changes in the attitudes and practices of the local people towards disaster resilience. A community setting provides stronger support relationships during disaster recovery where self-empowerment capabilities can start to develop and fully mature (Leone et al., 1999). It is also suggested by Lord (1997) that while many vulnerable citizens seemed to feel powerless, a number were in fact empowered. These individuals often had a degree of personal control and were involved with strong social networks. This disaster phase has three components for the personal coping process: learning and connecting with others, access to valued resources, and participation and contribution.

3.3.3.1 Learning and Connecting

Personal supports are vital in expanding personal empowerment. Support relationships from surviving members of the family become an important source of strength and morale boosting. This social capital is most useful when the participants have already started to become aware of alternatives in recovering from disasters. Another important source of coping better with natural disasters is the view of local people that these hazards are acts of God. In a study by Schmuck (2000) about the Bangladesh floods, it was suggested that Muslim-dominated communities believe that Allah sent the floods, and that He will also give believers the strength to survive them. Schmuck (2000) argued this religious explanation is a healthy reaction, a self-help strategy to overcome crises as quickly as possible and return to daily life. Acceptance of this concept prevents those affected from literally wasting time and energy asking why disasters happen to them and not to others.

Table 5.19 summarizes their learning and connecting with others in the community. Survivors A, B, C, E and G expressed that their religious beliefs had helped them pass through the ordeals and trials. They were enabled to sort things out and came up with a strong disposition to rebuild their lives. According to them, thanking God, praying and trusting Him for their daily needs was easier after they had survived the landslide ordeal. They also acknowledged their self limitations and were depending on others for social support. They also admitted that life and cherished loved ones are more important now than material possessions and property. Survivors also accepted that they now valued other people, listened to them, responded to what they needed and shared whatever they had. Though they still struggle from time to time, like survivor D, most of them displayed the courage and strength to face challenges together in rebuilding their lives and the community. The survivors now treasure the relationships they have with loved ones who are left, though they are few in number. Connecting with a support relationship can be the key, in part, because “people building on other peoples’ strengths” is one of the primary ways to facilitate personal empowerment (Dunst et al., 1988; Rapp, 1993; Rappaport, 1987).

Table 5.19. Summary of learning and connecting with others.

Survivor	***Description of Learning and Connecting with Others***
A	*At present, by the mercy of God, I am **completely healed** and **fully recovered**. I am **thanking the Lord** that He gave me a second life on this earth.*
B	*Yes, until now, even after one year, **things** are still very **fresh** in my **memory.** It is really very **difficult** to **lose** our **families**. I do not know what first step should I take; my life is difficult now because we have to **look** for our **everyday livelihood.** I am **always praying** to **God**, for **me** and my **sister’s good health** and **whatever trial** in life will come my way, I will be **ready**.”*
C	*The **tribulations** I went through, why **God gave** it to me, I think because I **can handle** them, like losing my ten (10) grandchildren. It was very painful, but what can I do about it? All I know is, we are but temporary dwellers in this earthly life, we are only **stewards** here on **earth**. All of these were only **lent** to us **by God.** That is why **all** my **trials**, I **gave** them **back** to **God.** If my attitude won’t be like this, I think I would lose my sanity. I **need to open up** and **tell all** the **pain** I am **feeling inside**, and the heavy burden which I felt at that time when I lost all of my loved ones. Right now, I **am** still **blessed** because I have a **son working**, **supporting me.** My old practice of borrowing my tithes from the Lord and not giving it to Him on time; I am not doing anymore. Even if it is small, I would set the tithe apart, for the Lord, and I am not borrowing it anymore, that is why **all** my **needs** are **supplied** now by Him.*
D	*Today, my **father** and **I** live in New Guinsaugon Relocation Site, **together facing a new life.** My **plan** is to **continue** my **schooling** if someone would support me until I finished college. I am missing the physical presence of my departed loved ones. I know I will never see them again. I wish that the government will give us more attention especially we do not have livelihood here in New Guinsaugon Village, and give us a brighter future. I learned to drink booze already just to forget the tragic memories, but it is really difficult. Whenever I **see other children**, I r**emember** my **mother**, **siblings**, **nephew** and **niece**. That is why I frequently **weep** and **cry** until **now**. I hope we can be helped to forget those horrible experiences. It is not a joke, particularly **losing one’s family**, my mother, siblings and the rest whom I **loved** and **cherished**. My father, nowadays drinks liquor just to forget and is sobbing every now and then. Whenever my father has some money, he would spend it on some drink.*
E	*I am **really grateful**, first of all to **God,** and then to the **people** who helped and rescued me.*
F	*My two daughters died in the tragedy, and we have never seen their corpses. I went through a lot of **nightmares** and **dreams** after that. In one of my dreams, I saw my two **daughters clothed** in **white** and **they comforted me** saying, “mother, please do not cry, we are in a secured haven.” Today, while I **narrate this story**, as much as possible, I **don’t want to talk about it** anymore*

	because it only reminds me of my two (2) daughters who were lost in the tragic event, and I cannot help but cry.
G	*The affected **people around** me looked **pitiful.** They were missing their lost loved ones. I had no material things to **offer them** except **moral support**.*

3.3.3.2 Access to Valued Resources

In disaster situations, access to valued resources is an important aspect of the empowerment process. In a defenceless state, most participants had access only to resources which they perceived as humanitarian or social welfare. Beginning to have access to the same valued resources and opportunities as other community members was important according to Lord's empowerment process (1999). Table 5.20 summarizes participants' access to valued resources. In this study, the most available and accessed disaster services were emergency medical services for survivors A, B, C, D and E. These included search and rescue, basic life support services or first-aid treatment, and minor medical services in Health Centres and the Provincial Hospital. Survivors had to be transferred from one treatment point to another because of the lack of medical facilities, staff expertise and medicine. Hospitals and health centres are critical lifelines for emergency medical services. Survivors rescued alive can die due to inadequate medical treatment or in the transfer operation. The survivors were basically treated just to keep them alive and enough to heal their wounds. Their needs, however, go beyond these services. According to Lord's studies (1999), valued resources include those being accessed by other members of the community like housing, technical resources such as a motorized wheelchair, and money. Survivors B, D and E are vocal about their appeal to have further medical rehabilitation and treatment like plastic surgery for survivors D and B. Survivor E needed major medical scanning and surgery to make her feet and legs move normally as they did before. A stress-debriefing service offered by the Catholic nuns was availed by survivor G. Emergency transport like the dump truck ridden in by survivor F was also made available in the nearby communities. Survivor F and her husband made use of relatives as a source of much needed resources to recover from the disaster.

Table 5.20. Summary of access to valued resources.

Survivor	***Description of Access to Valued Resources***
A	*They gave me **First-Aid** treatment. After which, they brought me to **Anahawan Hospital** where I stayed for **two (2) months**. I had many wounds, cuts and bruises all over my body.*
B	***Rescuers** found me and they brought me to **Anahawan Hospital** where I was given immediate **medical care. Doctors** ensured that I passed the critical hours of my treatment.*
C	***Rescuers** found me and they brought me to **Anahawan Hospital.***
D	*When we reached the **Health Centre** in the town proper, they brought me immediately to the **Anahawan Hospital** and operated on me there. After my surgical operation, the doctors performed 24-hour survival observation. When I had survived for 3 days, I was transferred to **Maasin Provincial Hospital** because my wounds and cuts were deep in the arms, and there were **no more medicine** in Anahawan. Once I arrived in Maasin City, they treated me until all my wounds got healed. The **doctor** said that I **need plastic surgery** to cover the ugly deep scars in my arms.*
E	*After being **rescued**, I was taken and treated in **Anahawan Hospital**. But because of my condition, I was transferred to **Maasin Hospital** for better **medical treatment***
F	*At Sug-angon, we rode on a **dump truck** going to the town hall of Saint Bernard. There, my husband answered a **mobile phone** call from a relative in Manila asking if the landslide occurrence that was in the news was true and which we confirmed. It was already late afternoon and we still did **not know where to sleep** for the night. I remembered I have a **sibling** in Cabalian and so we spent the night there. We were **evacuated t**he following day to **Christo Rey High School** where we temporarily resided.*
G	*Some **nuns** approached me for **stress-debriefing** sessions with them where I **let out** my **emotional stress** and **pent-up feelings**, and it did help. I was **able** to **recover** in due time.*

3.3.3.3 Participation and Contribution

This aspect of the coping process is seen to be the most empowering. Lord (1999) found that as people gained in self-confidence, they would seek more avenues for participation. Their involvement in community activity would in turn enhance their self-confidence and sense of personal control. Talking about their struggles in an interactive mode reduces their social isolation and eradicates their pent-up emotions and stress. At the same time, they become aware and appreciative of the value of social interaction which facilitates their healing processes. Initial participation was usually based on personal interest which they shared with others.

The results of this aspect are summarized in Table 5.21. Survivor C used her ordeal as a testimony of faith in Christian circles, bible studies and fellowships. She is now a bible teacher and a preacher. Survivor G received stress-debriefing services from the Catholic nuns. In return, Survivor G applied the nuns' technique and gave counselling sessions to his friends and neighbours. He even organized volleyball and basketball games as a form of developing stronger social support within the community. Survivor D stayed with his father and continues to work as a bus conductor. Survivor F gave birth to a healthy baby boy as if a replacement or blessing from God for her two daughters who perished in the landslide. This couple had put a small retail store in front of their new resettlement house. Both survivors A and B attested to their closer intimacy with God and more humane treatment of less fortunate people in their sphere of influence. These insights show that participation in community activities and groups enabled survivors to try new things and expand their participatory competence. Skills are developed in their progressive involvements which enhance competence and coping ability. It is in this manner that participation and contribution advanced the process of personal empowerment (Keiffer, 1984). Regardless of the nature of their involvement, being part of a group and/or making a contribution to the community was important for all the survivors at some point of their journey. It seems that the collective experience affords a level of trust and comfort with others and a vehicle for asserting oneself (Watt et al., 1988).

Table 5.21. Summary of participation and contribution with the community.

Survivor	***Description of Participation and Sharing in Rebuilding Ones Life and Others***
A	*My **advice** to the **people i**s to have a closer **relationship with God,** for we never know what will happen to us. Just like what happened in Guinsaugon, we never knew why that tragedy happened, it just happened."*

B	*The lesson I had learned is to show* ***respect to beggars*** *and listen also to them. Most importantly, is for us to be* ***always prepared*** *and* ***pray everyday****, so that* ***whatever*** *will* ***happen*** *or* ***trial*** *that might come our way, we have the* ***strength*** *to* ***face them****.*
C	*I am being invited to many Christian churches and bible studies. I* ***shared with them*** *my* ***testimony*** *of how I got saved from the deadly landslide. Now, I am being trained by our church pastor to* ***preach*** *and* ***teach*** *the Holy Bible in fellowships and bible studies. This* ***strengthened*** *and* ***encouraged many*** *in the faith and* ***helped overcome other's problems*** *and* ***trials****.*
D	*Today, I still go with a* ***passenger bus*** *and* ***work*** *for a salary of 1,000 pesos (A$27) per month. I just* ***make myself happy****.*
E	***Many*** *have* ***interviewed*** *me already****.*** *One of the national* ***television shows*** *has* ***featured my story.*** *Some doctors also visited me to see my scars and assess my recovery. Catholic* ***prayer meetings*** *were held for the repose of my departed loved ones. They usually ask me to* ***share my experience*** *and how it changed my life. I tell them always to* ***pray, stay humble and love one another.***
F	*I have just* ***given birth*** *to a healthy* ***baby boy*** *this month, April 2007 through caesarean delivery. He is* ***a blessing*** *from the* ***Lord.*** *After the February 17, 2006 landslides, I became* ***closer to God*** *and my* ***faith*** *became* ***stronger*** *and I can now* ***face*** *the* ***future*** *with so much* ***hope.*** *I received also a* ***livelihood loan*** *from the community which I used as a* ***capital*** *for my small but* ***earning retail store.***
G	*I was* ***able*** *to* ***recover*** *and I* ***did the same thing*** *to some of my* ***friends.*** *I* ***talked with them*** *and told them, "let us now slowly accept what had happened, no matter how painful it may be, so that we can already start to look ahead for things that will help us rise from this tribulation or maybe God has a plan for us why we survived." I talked with them,* ***encouraged them*** *to* ***leave behind*** *the tragic memories. We tried* ***playing volleyball, basketball*** *to release our* ***emotional stress****. Yes, it was not easy because of the pain and trauma it impacted our lives. What I* ***could advise*** *to my fellow survivors, while helping some of them to get over their trauma, is to* ***help one another*** *and* ***share whatever one has.*** *With what happened to us, we have seen that there were* ***many people*** *who were willing to* ***share*** *their* ***food, rice, viand*** *and some* ***money.***

4. Results from the Discussions with Officials and Service Providers

This component reports the implementation level of remediation and interventions undertaken by various institutions and service providers to help disaster-affected communities. A program-based review and assessment is employed to determine the impact of projects and activities in disaster-affected communities. Focusing on the program of disaster risk management nationwide, an inductive presentation of results is adapted in this section. It starts from the study municipality, Saint Bernard, then the province of Southern Leyte, and then crosses to other municipalities or provinces that have been affected by or are prone to flash floods and landslides.

The first component deals with the institutional coping capacity of the Municipal Disaster Coordinating Council (MDCC) of Saint Bernard, Southern Leyte. It is drawn from self-assessment discussions with officials and service providers on how they have responded to the pressures and challenges brought about by the disaster impact. The second component highlights those programs being implemented in Leyte Province, the site for the community survey. Other selected communities that have best practices in disaster management particularly in coping with flash floods and landslides were also included. The data gathering in this component was constrained by the national and local elections that coincided with the fieldwork. Most officials were busy in their political campaigns. Another limitation was the short time left because of the intensive social survey and individual interviews of survivors. Though not exhaustive, it focuses mainly on major programs aimed at helping local people enhance their capacity for disaster reduction.

4.1 Disaster Management Infrastructure

Presidential Decree (PD) No. 1566, dated June 12, 1978 provides the impetus in establishing the disaster preparedness and response capabilities of the government from the national down to the barangay levels. It created the Disaster Coordinating Councils (DCCs) at different levels of the government.

In keeping with the goals and objectives of PD 1566, the disaster coordinating councils (DCCs) of the Province of Southern Leyte comprised the following: the City of Maasin and 18 municipalities with 501 barangays were organized in 1998. The organized councils can make regulatory policies in disaster preparedness, mitigation and response as stated in the provisions set forth in the National Calamities and Disaster Preparedness Plan. The same decree provides the guidelines for a multi-sectored, multi-agency and multi-level approach to disaster prevention through the DCCs. Figure 5-16 shows the organizational structure of MDCC or PDCC.

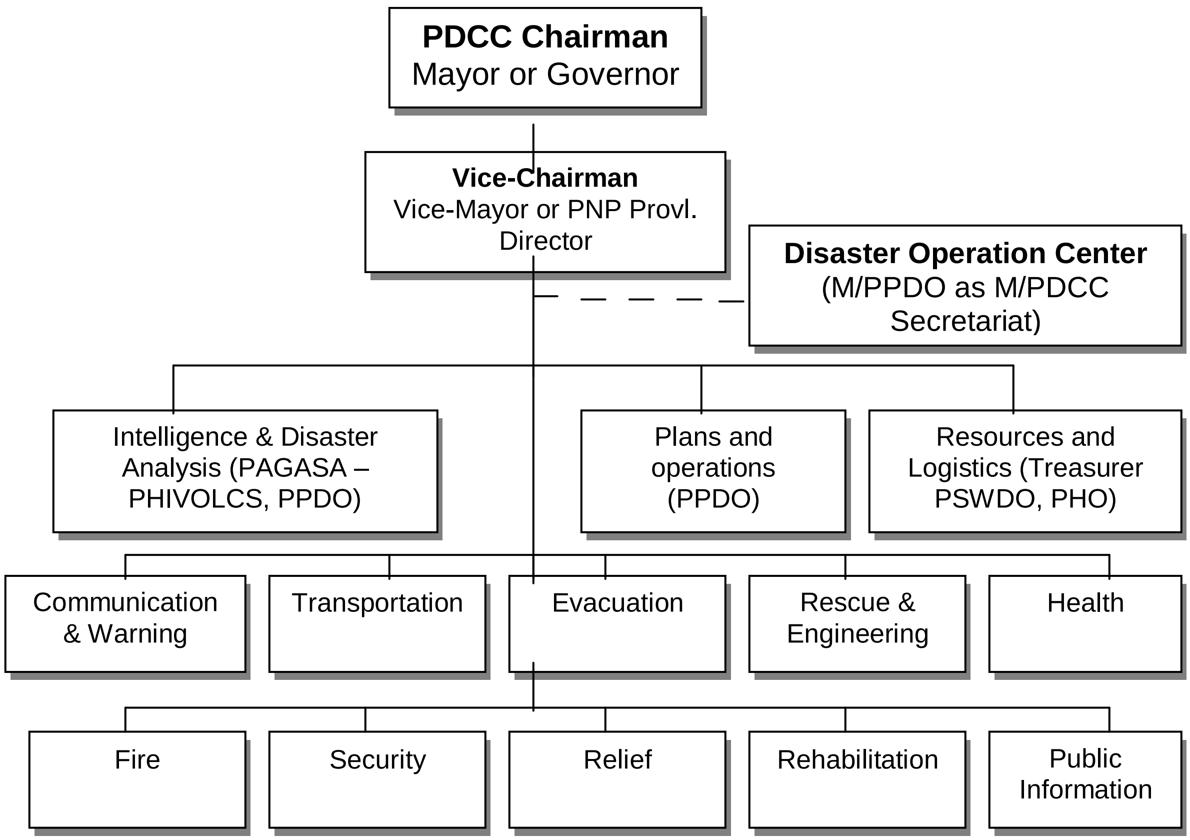

Figure 5-16 Organizational structure for the PDCC. **Source: NDCC (2007).**

At the local government level, as in the case of Southern Leyte, the Provincial, Municipal and Barangay DCCs (PDCC, MDCC, and BDCC) constitute the core of disaster preparedness and mitigation. It is at this level that disaster mitigation, protection, emergency and rehabilitation operations are carried out. Roles of DCCs and the leadership at each level were defined by PD 1566 and strengthened by Republic Act 7160, otherwise known as the Local Government Code of 1991. This law gives authority and assigns responsibilities to the local government units (LGUs) to develop their respective disaster reduction and risk management programs. The Disaster Operation Centre is activated during disasters and emergencies. The best thing that the governor did was to establish the whole Provincial Capitol as the disaster operation centre with his/her office as the command post where information and reports are received and issued.

The Philippine disaster management organizational structure that shows the relationship among the disaster coordinating councils DCCs at different levels is shown in Figure 5-17. Focus is given to the linkage between PDCC and MDCC as well as between MDCC and BDCC. It should be noted that the structure is hierarchical and that information for the BDCC should pass through the MDCC.

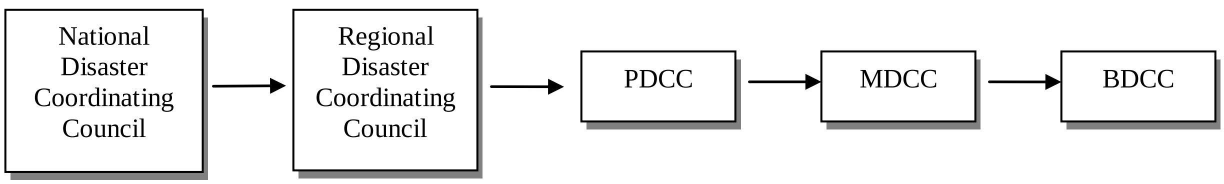

Figure 5-17 Communication flow of the DCC network. Source: NDCC (2007).

4.1.1 Effects of Landslide Impact and Crises Pressure on Disaster Management Systems of Saint Bernard Municipality and Southern Leyte Province.

4.1.1.1 Pre-Landslide Assessment. One of the municipalities of Southern Leyte Province, Saint Bernard, scheduled a disaster preparedness capability-building seminar for its local officials and team leaders of the different functional committees of DCC (see Figure 5-16) in March 2006. The Civil Defense Deputized Coordinator confirmed that most of the leaders of the DCC were not familiarized with or oriented into their roles and responsibilities as specified in their Municipal Disaster Calamities and Disaster Preparedness Plan. While the structure is filled with names of team leaders and staff members, this is in paper only, and the workability of such a structure has yet to be tested by drills. Seminar training was scheduled for this very purpose. Unfortunately, the actual operation happened earlier than the scheduled disaster preparedness training when the Guinsaugon landslide caught everybody off-guard. The Committees of Saint Bernard Municipal Disaster Coordinating Council (MDCC) and its Disaster Preparedness Plan were about to be tested on that fatal day of 17 February 2006 in a magnitude beyond their capacity to handle.

The Municipal Social Welfare and Development Officer revealed confirmed reports of natural signs foreboding a disaster. According to reports from the village, big eels and shrimps surfaced on the river and the water level diminished. They did not know where the water had gone. She mentioned also that rare birds which usually hide from people in the thick forest of the mountains flew into the open view of local people. These events happened three to four days before the 17 February 2006 Guinsaugon landslides. That a vagabond woman had gone from house-to-house warning neighbours in Guinsaugon and adjacent villages was confirmed by her to have reached the office of the mayor. They dismissed it as a false prophecy which should be ignored by the local people. This explained why the local officials pushed through with Guinsaugon's hosting of the inter-barangays' Women's Day on 17 February 2006. She mentioned that most local officials, like the Municipal Health Officer and the wife of the Municipal Agricultural Officer, attended the affair. All of them perished in the disaster.

The principal of the elementary school in the town proper in Saint Bernard explained why their co-teachers in Guinsaugon returned to their classes when the rains abated. Public storm warning over the area was downgraded by the weather bureau to normal conditions except for intermittent rains.

4.1.1.2 Landslide Impact Assessment. The Municipal Planning and Development Officer said that they were all in a state of shock and paranoia, they did not know what to do, whom to call for help, and were thinking of friends and loved ones they knew who were in the disaster site. Some of their colleagues like the Municipal Health Officer and wife of the Municipal Agriculturist were in Barangay Guinsaugon attending the Women's Day when the landslide struck at about 10 a.m. That day, 17 February 2006 was a normal working day for all the employees of the municipal hall. Service providers and workers were present at that time in the municipal hall. The activation of the Disaster Operations Center (DOC) based in the municipal hall of Saint Bernard was not done immediately. Inexperienced, nobody knew how to coordinate disaster operations and mobilize emergency resources. They lacked knowledge and skills on how to man an actual disaster operation of that magnitude. Instead, an ad-hoc Committee to takeover the disaster operation was formed by the municipal mayor to deal with the management crises. Confusion and miscommunication compounded the situation because the newly-appointed disaster managers were as inexperienced as those already designated leaders in the functional committees shown in Figure 5-18. Miscommunication and discordant instructions and actions resulted from these management flaws. Local people perceived this as incompetence and this eroded their confidence for their local government officials to handle emergency situations effectively.

Rescue operations for the first three (3) hours after the impact were hampered by the lack of manpower, communication and logistics which rendered the MDCC and DOC non-functional and incapacitated. Help from nearby municipalities were limited by the road cuts and landslide affected highways besides the slippery condition and softened road surface due to continuous heavy rain.

The Provincial DCC of Southern Leyte which was supposed to take over the responsibilities of the incapacitated Saint Bernard MDCC was not able to do so due to the circumstances it also had to surmount. It came late to the rescue of the municipality owing to the more than 10-km distance, and travel time due to bad road conditions. At about 2 pm on Friday, 17 February 2006, dump trucks and rescue teams arrived from the Southern Leyte PDCC. Initial rescue operations commenced with difficulty because digging in soft mud had raised the risk of further landslides as shown in Figure 5-18. Few survivors were rescued in the afternoon of Friday, and the rescue had to halt because of darkness and continuous rain.

Figure 5-18. Overview of Guinsaugon Village showing search and rescue operations, 24 February 2006. Sources: UP-Ateneo Team and NDCC (2006).

On the next day, Saturday 18 February 2006, the Philippine Army's 43rd Infantry battalion, based in Southern Leyte was the first to arrive at the disaster site, but was hampered by the fact that only rooftops and broken trees could be seen where the Barangay Guinsaugon once stood, as shown in Figures 5-19.

Figure 5-19. Wreckage and rooftops of destroyed houses in a 100-feet mudslide covering a 3.5-mile area. Source: NDCC (2006).

Rescue workers from other countries, including U.S. marines dispatched from the annual military “Balikatan” exercises began arriving from late Saturday afternoon onwards. Rescue operations had to be regulated and stopped due to the driving rain and because the previous day’s digging in the soft mud had raised the risk of further landslides. In fact, at one time, U.S. marines had to helicopter seven Taiwanese rescue workers to safety after they got stuck in the mud, which was 30 metres (100 feet) deep in some places and covered a 9 km^2 (3.5 mi^2) area. Figure 5-20 shows difficulty faced by heavy equipment in staying operational in the water-soaked mud.

Figure 5-20. Difficulty of heavy equipments clawing into the thick mud with rescue workers assisting for body retrieval of casualties in Guinsaugon village. **Source: NDCC (2006).**

4.1.1.3 Post-Landslide Assessment. The recovery and rehabilitation phase comprised the site development of resettlement areas and mode of construction. It also includes food-for-work scheme and other employment arrangement with local people. The influx of international rescue and relief teams in Saint Bernard caused institutional strain in the capability of the MDCC to regulate and monitor competing NGOs and private do-gooders who go directly to the affected communities without prior coordination with the MDCC focal points. As confirmed by the action officer of the MDCC, philanthropic big shots offer resettlement housing on their own terms and conditions, and demand rights to be the sole benefactor in the project. This is where politics undermine the communities' ability to shape their solutions to address their own problems, in a way disempowering them of their disposition and self-reliant choices.

4.2 Institutional Strategies for Improving Community Resilience

Experiences with flash-floods and landslides on Panaon Island brought about by the heavy rainfall of Inter-Tropical Convergence Zone in 2003 resulted in some positive actions in Southern Leyte Province. The Provincial Disaster Coordinating Council (PDCC) of Southern Leyte was in full-swing and on track with the on-going reconstruction and rehabilitation of Lilo-an, San Francisco and San Ricardo resettlement areas based on their rehabilitation plan, “Bangon, Panaon” (or “Rise Up, Panaon”). When the 17 February 2006 Saint Bernard landslide occurred, the coverage of the plan expanded and transformed it into the current Southern Leyte Master Plan for the Rehabilitation of Disaster Affected Areas.

4.2.1 Community Reconstruction and Development

The strategic interventions in rebuilding affected communities comprise the following:

1. Identification of communities at risk in the Province of Southern Leyte for complete and partial relocation based on geo-hazard assessment by the Mines and Geosciences Bureau and hazard risk mapping, sample of a matrix is shown in Figure 5-21.

2. Development of relocation sites in safe areas as recommended by the Mines and Geosciences Bureau. Design and colour of the resettlement houses bear the insignia of the donor agency and differentiate the groupings of resettled communities, as shown in Figure 5-22.

3. Donor and sponsoring agencies divide project components and involve the recipient evacuees in a `house-for-work’ arrangement. The identified recipient, together with other neighbours, help each other in laying the foundation, and building each house one after the other in a `bayanihan’ system. Labour comes from the community, pre-fabricated materials are supplied by the donors, and implementation is monitored by the local government.

SAINT BERNARD

TYPE OF HAZARD

BARANGAY	STATUS	IDENTIFIED HAZARDS	MGB RECOMMENDATION
Guinsaugon		Mass movement- Landslide	**Change of land use**
Hinabian	Evacuated	Mass movement- Landslide	**For Relocation**
Sug-angon	Evacuated	Mass movement- Landslide	**For Relocation**
Ayahag	Evacuated	Mass movement- Landslide	**For Relocation**
Magatas	Evacuated	Mass movement- Landslide	**For Relocation**
Nueva Esperanza	Evacuated	Mass movement- Landslide	**For Relocation**
Mahayahay		Mass movement- Landslide	**Partial relocation**
Kauswagan	Evacuated	Mass movement	**Partial relocation**
Lower Bantawon	Not evacuated	Mass movement, flooding	**Partial relocation**
Mahayag	Not evacuated	Mass movement	**Partial relocation**
Panian		Mass movement	**Partial relocation**
Tambis I	Not evacuated	Mass movement, flooding	**Partial relocation**
Tambis II	Not evacuated	Mass movement, flooding	**Partial relocation**

Figure 5-21. Hazard risk mapping and courses of action to be implemented in Saint Bernard, Southern Leyte. Source: NDCC (2006).

Figure 5-22. Resettlement houses donated and built by various International Humanitarian Aid Agencies. (a) Houses built by Japan International Cooperation Agency-Department of Social Welfare and Development. (*b*) Elementary school donated by philanthropic groups. (*c*) Houses built by Gawad Kalinga. (*d*) Houses built by AusAID-Philippine National Red Cross. Source: NDCC (2007).

The food is supplied by the local government in a community style kitchen. Other projects like canals, slope protection, and water systems are subjected to the same `bayanihan' system, as shown in Figure 5-23.

Figure 5-23. Structural protection measures and infrastructures built by community volunteers such as, (a) construction of slope protection in New Guinsaugon village, (b) housing built by "bayanihan" in Napantao, San Francisco, (c) drainage canal construction in Gawad Kalinga neighbourhood, and (d) construction of the San Francisco water supply system. Source: NDCC (2007).

4.2.2 Disaster Mitigation Capability-Building Activities

In conjunction with other hazard risk maps, geo-hazard information, workshops and seminars were conducted by various government agencies and private organizations.

On the part of the Department of Environment and Natural Resources (DENR), the following activities were conducted:

1. A workshop on geo-hazards was conducted in Lilo-an in December 2004 by the DENR-MGB, with support from the UNDP as shown in Figure 5-24. Representatives from the local governments, including mayors and other officials from Sogod, Lilo-an, Maasin, San Francisco, San Ricardo, Tacloban, and San Juan municipalities attended the workshop.

Figure 5-24. Field Observations and geo-hazard on-site inspections by the Local Chief Executives and local trainees. **Source: NDCC (2007).**

2. The CENRO of DENR based in San Juan, Southern Leyte (which has jurisdiction over St. Bernard) received copies of maps from the DENR-MGB VIII and conducted geohazard awareness lecture series some time in March 2005.
3. As part of the nationwide program of the NDCC-OCD geohazards awareness program, a workshop forum was conducted in April 2005 in Cebu, where participants from Southern Leyte were invited to attend. In this workshop-forum, resource persons were invited from the DENR-MGB and DOST-PHIVOLCS and PAGASA, as Resource Speakers/Persons.

On the part of the DOST-PHIVOLCS, the agency also conducted a series of information and education campaigns. Among these were the following:

1. Upon the initiative of the Provincial Government of Southern Leyte, a seminar on hazard risk assessment was conducted in Sogod in February 2005. Copies of the presentation materials were provided to the Provincial Government and other officials.
2. In coordination with the "Safe Ka Na Ba?" information drive of NDCC-OCD, a seminar-workshop on geohazards was conducted in Cebu on April 19, 2005, and was attended by participants from Southern Leyte. As shown in Figure 5-25, this seminar was conducted in cooperation with DENR-MGB and DOST-PAGASA.

Figure 5-25. Local Chief Executives (LCEs) attending the "Safe Ka Na Ba?" workshops where they were briefed on the understanding and use of geo-hazards maps. Source: NDCC (2007).

3. Through the National Research Council of the Philippines (NRCP) and the Philippine Council for Industrial Energy Research and Development (DOST-PCIERD), an outreach

seminar was conducted in Sogod, Southern Leyte in July 2005. The DENR-MGB and DOST-PAGASA were also present as Resource Persons at the seminar.

On the part of Non-Government Organizations, on April 21-22, 2007, CARE Philippines conducted a 2-day Disaster Preparedness and Contingency Planning Workshop for the local officials and members of Saint Bernard Disaster Coordinating Council which output is a comprehensive MDCC Preparedness Plan for all the barangays in this town.

4.2.3 Anti-Disaster Agro-Forestry Project and Conservationist Practices

The DENR of the Philippines launched a property rights-based forest management and anti-disaster disaster strategy known as “Puno ng Buhay” or “Tree of Life” (Figure 5-26).

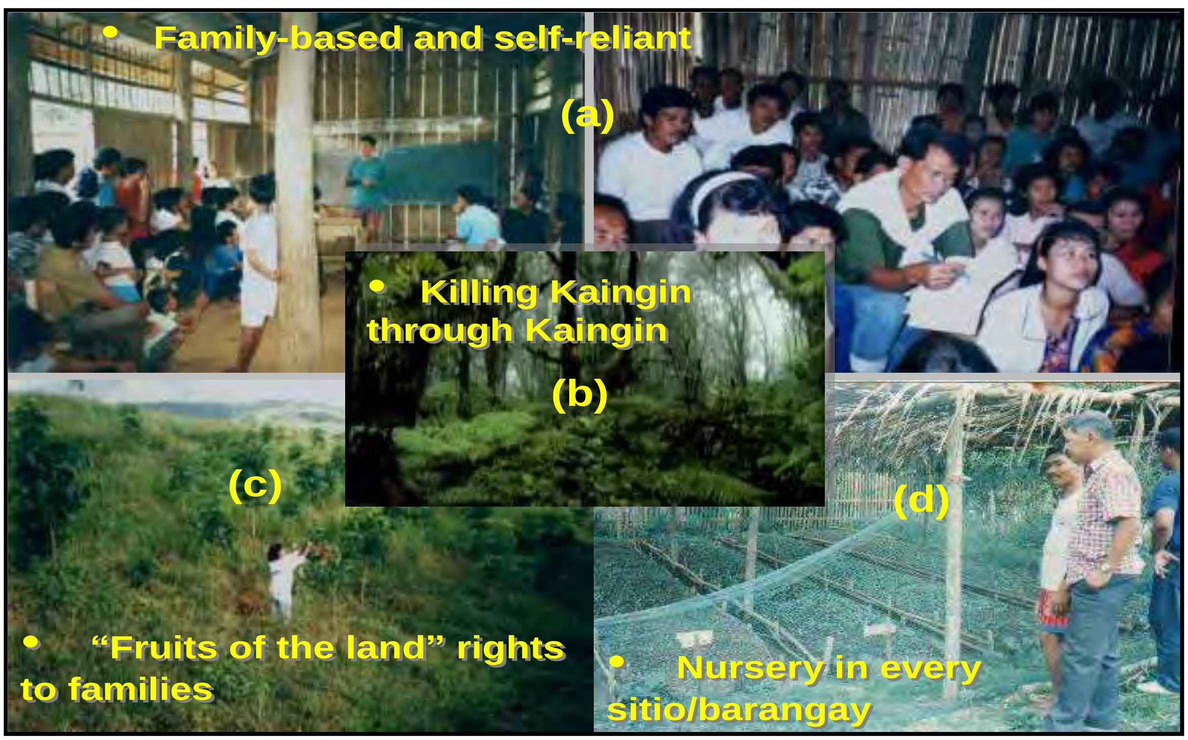

Figure 5-26. “Puno ng Buhay” strategy integrates disaster resilience and development by sustainable agro-forestry management. through the following activities: (a) mobilizing people’s organization and training them; (b) protecting forest areas by people patrol; (c) cultivating fruit-bearing trees and vegetable crops, and (d) a nursery in every village. Source: NDCC (2005).

This forestry project integrated disaster resilience and development addressing underlying causes of vulnerability, like livelihood marginalization, land tenure insecurity, unsustainable farming practices, and others. Southern Leyte is one of the project sites supported by national government funding. Under the scheme, participants form a local people's organization and are allocated individual parcels of (government-controlled) land of up to five hectares. For each plot, 80% was planted with designated types of seedling trees, and the remaining 20% set aside for growing cash crops or vegetables.

Once the trees have fully matured in 20 to 25 years, participants will be allowed to harvest them. For each plot, 70% of the logging proceeds will go to the people's organization; the remaining 30% belongs to the government. Of this 30%, half is to be invested in expanding the program into new areas, while the national treasury will claim the remainder. Participants in the project may also be periodically paid to plant seedlings provided by DENR in designated areas, for a normal daily labouring wage. Members of the people's organization are expected to patrol the project area to deter illegal logging activities. The Department of Agriculture provides agricultural training that includes prevention of soil erosion through "alley farming" techniques and the establishment of hedgerows and terraces. Organic farming methods and health service provision have also been included.

Another region where towns and provinces are exposed regularly to flash floods and landslides, especially during wet season, is the Cordillera Mountains. Figure 5-27 shows the conservationist practices pioneered by the farmers in Philippines' Central Cordillera, the rice and vegetable garden of the country, supplying produce for markets in the regional centre of Baguio and the capital Manila. In this indigenous farming system the flow of water coming down from the mountain is regulated through the irrigation `terraces'. Overflowing due to intense rain that can cause flooding is controlled and minimized.

Terraces are built following the contours of the mountains using rocks, clay and wood can also stabilize slope protection. These terraces are planted with rice and vegetables which provide the livelihood economy to the local people. In contrast, uncontrolled drainage and irrigation water can have devastating consequences on the sustainable use of the mountain region for agriculture.

Figure 5- 27. Ancient rice terraces of Banaue, located in the Central Cordillera. **Source: NDCC (2007).**

4.2.4 Preparedness Skills Development and Self-Protection Upgrading

During disasters, emergency and survival skills are equally important in saving lives and helping others. Community resilience is enhanced by capability-building activities like First-Aid skills, [11]rappelling, leadership, etc. As part of the disaster preparedness capability-building in the province, the Southern Leyte Emergency Response Team (SOLERT) was organized as the disaster response arm of the Southern Leyte Provincial Disaster

[11] Rappelling refers to the mountaineer's descent of a vertical cliff or wall made by using a doubled rope that is fixed to a higher point and wrapped about the body.

Coordinating Council and undergoes refresher courses and skills development as shown in Figure 5-28. It is a group of 42 provincial government employees and volunteers which was created by the provincial governor to respond to emergency situations. The team was deployed during the 2003 landslides in Panaon Island, the 2006 Saint Bernard-Guinsaugon landslide and the 2007 Albay-lahar avalanche.

Figure 5-28. Preparedness skill development and self-protection upgrading activities. (a) Rope ladder rescue simulation exercise; (b) Basic Life Support techniques, and (c) Run down rappelling skills by the SOLERT team. Source: NDCC (2007).

Conclusion

This chapter reports the results from the questionnaire survey, non-prompted and open-ended interviews, survivors' stories and discussions or interviews with officials and service providers. Appropriate methods of analysis were used in each source of results as follows: The survey questionnaire employed SPSS version 15 for quantitative analysis. For open-ended and non-prompted interviews, the capacity and vulnerability matrix suggested by

Anderson et al. (1998) was employed to analyse the qualitative data. Content analysis of the survivors' stories used the author's modified self-empowerment technique adapted from Lord (1991). Program-based review and assessment technique based on the author's checklist outline was used for analysing results from the discussion and interview with officials and service providers. Results revealed people's vulnerability to natural disasters. Most of this vulnerability stemmed from geographical, cultural and socio-economic conditions already existing before the disaster happened, which include conditions such as residents living at the toe of the mountain, big family size of more than 7 members per family, limited income base, lack of early warning system for rapid onset disasters. On the other hand, some coping capabilities were evident in the community such as strong social networks, religion and beliefs and an indigenous warning system that needed to be tapped into by service providers. The outcomes and issues implied by these results can be used to construct the building blocks of the Landslip-Disaster Quadrant Model on community resilience.

Discussion of the five natural disaster case studies and results from the community studies will be presented in the next chapter.

CHAPTER 6

DISCUSSION AND IMPLICATIONS OF THE STUDY

Introduction

This chapter discusses the results from the five case studies of flash flood and landslide disasters in the Philippines from 1991 to 2006. Discussion also includes the findings from surveys of the communities affected by the February 17, 2006 landslides in Saint Bernard, Southern Leyte. One of the purposes of this chapter is to present discussions of the combined results in Chapters 4 and 5 using the six building blocks of the Landslip-Disaster Quadrant Model on community resilience proposed in Chapter 2 (see Figure 2-7) as discussion points. Issues and implications of these results were drawn, identified and cross-referenced with the findings of similar studies. Another purpose is to synthesize and summarize these issues of vulnerability and resilience in tabular form. The table will show cross-cutting issues that influence which building block will be used to test and refine the Model. Lastly, this chapter will present the modified version of the Model as validated by this study.

The first component covers discussions about the building blocks on ecological resilience, human health and wellness, economic base and livelihood sufficiency, cultural values and local norms, social structures and institutional arrangements, and political will and priorities. The next component presents the refinement process of the Model. The third component is the modified visual presentation of the Model.

1. Building Block Discussion of Study Results

Findings of the natural disaster case studies and results of community surveys are extensively discussed using the six building blocks of the Landslip-Quadrant Model on Community Resilience as points of integration. Discussion points are constructed to highlight the building of the Models' six blocks via issues implied from the study results. The purpose of this approach is to achieve the objectives of the whole study by synthesizing not only the natural or physical causes but also the root causes of human vulnerability to natural disasters.

1.1 Ecological Resilience

1.1.1 Interaction of natural forces is changing and natural hazards are becoming more destructive and frequent. Changes in the natural processes related to the meteorological and geophysical conditions of Philippine communities have influenced frequent flash flood and landslide disasters in recent years. Very strong typhoons of more than 200 km/hr regularly pass over the Philippine archipelago between five and seven times out of the total 22 typhoons that manifest in the region each year (PAGASA and NDCC, 2007). The number of typhoons that impact the country is increasing from the past average of three typhoons every month (World Bank, 2004) to about four typhoons nearly every fortnight or in less than a month, as revealed in this study. Typhoon winds are no longer the sole hazardous natural force that communities at risk have to contend with; it is more the rain associated with typhoons. This study has shown that the weaker typhoons have killed many people because of the accompanying heavy rains or the cumulative amount of rainfall over longer days, which has induced flash floods and landslides in hazard-prone communities. High mountains and volcano-mountains can be barriers for windward rain-bearing clouds from the ocean. Barriers can force these clouds to lift over these mountains (orographic effect) and intensify rainfall in the sloping areas. This interaction of natural forces was strongly suggested by local geologists to have happened in the 2001 Camiguin Island event (JICA–DPWH, 2001) and 2006 Saint Bernard event (Lagmay et al, 2006).

Other than typhoons, monsoons and depressions like the Inter-Tropical Convergence Zone and La Nina phenomenon recorded a maximum event rainfall of more than 750 mm/day. This resulted to flash floods and landslides in the 2003 Panaon Island event and the rockslide-debris avalanches of the 2006 Saint Bernard event. As a slow onset natural hazard, rainfall could start as a seasonal and normal process but could progress and intensify into a threatening condition such as natural damming in upstream watersheds and inundation in floodplains.

This study has also revealed that cumulative rainfall over a period that culminated in peak flows has preceded the disaster event. These continuous rains have been associated with ground saturation that loosens the soil, weakens slope resistance, and may cause natural-dam formation and/or log jam. The failure of these natural dams or breakouts of log jams can trigger rapid onset flash flood and mudslide disasters like the 1991 Ormoc City, 2001 Camiguin Island, 2003 Panaon Island and 2004 REINA, Quezon events. Also, continuous rains and overflowing rivers can seep into fractures and cracks formed due to previous earthquakes and can lubricate slip planes. This latter explanation was strongly suggested by local geologists to have caused the disastrous rockslide-debris avalanches of Saint Bernard, Southern Leyte in 2006. Two months before the landslides of Saint Bernard, an earthquake was reported by local mountain tribesmen who also noticed cracks in the ground. Also, about three days before the 17 February 2006 landslides, local people of Barangay Guinsaugon had reported that the water level in the river had receded in between the base of the fault scrap and the Barangay had dried up. Unbeknown to the people, this would have occurred due to water seepage into the cracks and fractures.

1.1.2 Hazard exposure of vulnerable communities is changing and disaster impacts are differentiated and site-specific. Not only the strength, frequency, and resultant effects of typhoons are changing. The trajectory of typhoons is also changing which increases the physical vulnerability of communities to natural disasters. The same communities were impacted by a series of typhoons passing along almost the same path to that in the 2004 REINA, Quezon, disaster case. In addition, communities rarely exposed to typhoons have recently been impacted by this natural disaster as in the 2001 Camiguin Island case.

Geomorphologic characteristics of where communities are situated may exacerbate their vulnerability to natural disasters. In the 2001 Camiguin Island case, materials that cascaded from the volcanic mountain were comprised of mudflows and lahars, boulders and logs. Soil types, particularly those coming from a volcano, are easily affected by ground saturation due to intense rain. Also, communities situated in harm’s way, like those lying in between river channels and in a fan-like delta (1991 Ormoc City case); along or downstream of river systems and those at the toe of the mountains or hills (2001 Camiguin, 2003 Panaon Island, 2004 REINA, Quezon and 2006 Saint Bernard, Southern Leyte cases) were the hardest hit by flash floods and landslides. Preventative measures in these cases comprised the construction of flood-control dykes in Ormoc City and the relocation of whole communities in Camiguin, Panaon, REINA and Saint Bernard to new sites. These new sites were inspected and evaluated by local geologists by conducting a geohazard assessment of the areas. Once declared safe and secured, development of these relocation sites commenced.

Development projects can either exacerbate vulnerability to natural disasters or prevent disaster impacts. The absence of a development project like a flood-control structure in the 1991 Ormoc City flash flood disaster made the impact unchecked and undiminished such that people and properties were swept away into the open sea. Constructing a massive flood control dike after the disaster event has secured Ormoc City from the recurrence of the same event (World Bank, 2005). In contrast, a development project like the Infanta-Nakar Bridge contributed to the clogging of the Agos River in 2004 with a large quantity of logs and uprooted trunks which came cascading down during a flood. This forced the river to overflow and be redirected towards channels of the floodplain which subsequently submerged Real, Infanta, and Nakar under four to six metres of flood waters. Another was the location of the evacuation centre in Barangay San Francisco during the 2003 Panaon Island event. About 105 local people were temporarily sheltered and protected there from an earlier mudslide when a bigger landslide trapped them inside at midnight. These evacuees were then killed when another bigger landslide cascaded through the evacuation centre. Presumptions that physical instability in the area had ended and the evacuation centre was situated out of harm's way indicate the lack of anticipation and risk evaluation by the local people.

1.1.3 Human activities in hazard-prone areas can induce natural disasters. The insufficient forest cover on the upper slopes of Ormoc City in 1991 was found to aggravate the peak flows that triggered flash floods and debris flows. Thin forest cover was reported to have been caused by deforestation and logging in the watershed area upstream. Another example is the encroachment of Anilao River by [12]squatter settlement which

[12] Squatter settlement refers to an area of usually unauthorized, makeshift housing, generally at the edge of a Third World city, often forming up to three-quarters of its area. Local terms include *barrio*

constricted the water channels. Accumulating debris clogged the pathway that caused a damming effect upstream. Devastating flash floods swept through Ormoc City when this natural dam broke. Illegal logging and timber-cutting activities was strongly suggested by Gaillard (2004) as having contributed to the largest decrease in forest cover in the REINA area. Landslides and flash floods were greatly exacerbated by the paucity of trees. As a consequence there was insufficient vegetation to hold the soil already oversaturated by the intense rainfall in the area.

1.2 Human Health and Wellness

1.2.1 Rehabilitation of survivors' health and mental conditions needs to be holistic and complete. The handling of survivors has reflected inadequacies in medical facilities, supplies, services and personnel that were available in Saint Bernard, Southern Leyte during rescue and retrieval operations. Nonetheless, most of the survivors rescued from the landslides were given adequate medical treatment in nearby hospitals to keep them alive. However, they need further medical attention in terms of surgical operations to restore normal skin and mobility from deformations, scars and limps. Few have the resources to afford the high cost of these surgical operations. Restoration of their normal physical appearance and body reflexes can facilitate the healing of their memories and emotions if they no longer see or feel such physical marks and impediments daily. According to these survivors they are always reminded of past tragic experiences that affect their thoughts and aspirations in facing the future.

The trauma of the landslides was still lingering in the minds and feelings of the survey respondents. What they feared most was closely linked to what they had experienced of the physical impacts of the landslide disaster. The meaning of disaster to them also

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(Spanish-Latin America), *favela* (Portuguese—Brazil), *bustee/bastee* (India), *kampong* (South-East Asia).

strongly suggests the physical or natural descriptions of the events such as the unexpectedness of the event, the adverse impact on them, and it being God's way of chastising them. The latter definition of disaster was emphasized in the survivors' stories and by survey respondents as a way of accepting their fate as God's purpose and good for them which they readily put to rest in their hearts and minds. Submission to God's will and putting what had happened in the hands of God made community respondents more accepting of the past, and more confident to move on and face their problems with a stronger faith in God.

1.2.2 Disaster education can be built upon the high literacy rate of local people. Saint Bernard municipality has a high literacy rate with most of the respondents having completed their elementary and high school education. Saint Bernard, Southern Leyte has an 83.6% literacy rate. In terms of facilities and services, there are three high schools, 38 high school teachers and 33 high school classrooms. There are 14 elementary schools and 13 primary schools (Municipal Statistics, 2007). Similar study observations by DevMan (1993) were found in Ormoc City in 1991 after the flash flood disaster. The City had a high literacy rate of 91% as of 1990 which is comparable to the total country rate of 90%. It has 77 elementary schools, 10 high schools and college institutions. Education is related to disaster awareness. Well-informed communities usually have higher preparedness and better response capacity to natural hazards. But why in these two disaster areas have many people been killed, despite the high literacy rate? This could suggest that disaster awareness may be limited only to familiar and more common natural disasters they have experienced in the past. Respondents expressed that they were caught unaware by the rapid onset of the flash flood and landslide events, short of admitting that they did not know how to respond appropriately to this kind of natural disaster.

In Saint Bernard, however, one draw back respondents mentioned was education as one of the reasons they were stretching their household income to afford to send their children to adequate schooling. With some respondents also earning college units, this establishes a better capacity to understand surrounding issues and problems regarding disaster risk reduction. The majority of the respondents could recall history of past disaster experiences such as typhoons, floods, earthquakes and the recent the killer landslides of Barangay Guinsaugon. This indicates the local peoples' changed view about natural disasters. In fact, the subject matter or topic about disaster preparedness was strongly suggested by respondents as something that should be incorporated in their regular community seminars. The series of community seminars and training in Southern Leyte was well-attended by the local people including their barangay leaders and local government officials.

1.2.3 Capacity building of communities enhances disaster preparedness. After the disaster, most respondents have adapted preventative measures while recovery and reconstruction were underway. Acquisition of emergency assets such as torches or flashlights, ropes and communications equipment had been a household priority. Some respondents had acquired transport vehicles for mobility and faster evacuation during an emergency. These are indicative of improving their responsiveness to natural disasters. In order to mitigate food and livelihood insecurity, most respondents resorted to raising farm animals such as poultry, livestock and swine.

Skills development of community respondents comprised organizing and mobilizing people for emergency response. Training for First-Aid techniques and other emergency medical skills were availed of by community respondents in order to upgrade their capabilities for securing personal safety and helping others during disasters. One of the survivors who was trained to administer stress-debriefing sessions by the Catholic nuns was able to impart the same services to his friends and community. This was a multiplier effect of self-empowerment by a survivor in connecting and relating to other disadvantaged members of his community.

1.3 Economic Base and Livelihood Sufficiency

1.3.1 Disaster and Poverty are closely linked and mutually reinforcing. Poor and economically disadvantaged groups are usually the most vulnerable to natural hazards. Disasters are a source of temporary hardship and distress and contribute to poor day-to-day conditions. When strong typhoons and flooding destroy standing crops, the opportunity for a good harvest and high profit is lost. Recovering from such loss and damages may mean more loans and “belt-tightening” days. Poverty is commonly a rural economic condition in the Philippines. It accounts for about 77% of the poor population in 1997. Agriculture, fishing and forestry sector alone have accounted for two-thirds of the poor (World Bank, 2004). Ormoc City in 1992 has a total population of 132,840 with a growth rate of 1.2% per year. It had a population net density of 952 persons per hectare with 39,550 people in the urban area concentrated into one small portion of the city resulting in congestion. Out of the 51,443 people in the labour force, agriculture employed 48%. Out of the total population, 55% or 65,600 were sugar workers who were receiving salaries way below the minimum wage prescribed by law (DevMan, 1993). Growing population is associated with poverty incidence. People in an area usually compete for more resources than are available. There is a tendency to practice unsustainable use of natural resources when family survival is at stake. Poor people expose themselves to high-risk areas in order to eke out a living. These characteristics of poorer conditions and a limited income base are persistent in an agriculture-based economy.

In contrast, Saint Bernard municipality has a total population of 27,768 with a birth rate of 31.6 and a death rate of 4.6%. It has a population density of approximately three persons per hectare. Household income at the time of this study was less than A$77 per month. This is far below the poverty line and a root cause of high socio-economic vulnerability. Where poverty in rural farming communities is persistent, the occurrence of a natural disaster can destroy all their hard work and savings in just one or two days. Adverse impacts can exacerbate their vulnerable economic conditions in the days that follow..

1.3.2 Income insufficiency stems from low economic vitality of the area. Where communities are heavily dependent on agriculture, poverty is widespread. Saint Bernard municipality relies on an agriculture-based local economy. The majority of people are farmers and farming skills characterize the household means of livelihood. Having similar job skills may limit employment opportunity. When majority have the same employment skill, low wages can also be the end result. Oversupply of agricultural labour can exceed the demand for work that is available. This could be the reason why most respondents were engaged in piece-rate or low paying work because profitability of farming in the area is decreasing. Doing piece-rate agricultural work like pulling weeds in rice farms, firewood and charcoal-making can be seen as a stop-gap measure by poor farmers to increase household income. But such desperate measures can also mean farming practices that involve unsustainable use of natural resources in the area. While no respondents have admitted that they or their neighbours were engaged in such practices, these are implied in the preventative measures which were strongly suggested by them to reduce disasters. Among these suggestions were the enforcement of forestry and anti-logging laws, cessation of tree cutting, and reforestation projects which need to be observed and strictly implemented.

Other than farming, local industry and trade in the area is less vibrant. According to the 2006 Annual Report, this municipality has an unemployment rate of 60% which means that there are many people within the productive age who are not employed or not engaged in any form of economic activity. The respondents' age group of 20 years old and below confirmed this observation that a younger and growing population do exist in the study community. These are mostly dependent on farming parents. Local business is also dependent on limited poor local customers. Local businessmen may have difficulty in gaining profit in a reasonable period of time. If the market base is limited, this can induce mark up prices of goods so as to sustain their business. At some level, this can explain why respondents said the prices of commodities in their area are high and that is what they perceived makes them poorer. Changes in local economic conditions also redefine the employment ambitions of the local people. This explains why some respondents mentioned that they have family members working outside their locality, in nearby cities, Manila or working overseas. Moreover, such changes from a traditional household livelihood, like farming, to other labour skills can diversify the family's employment and productivity. This can reduce economic vulnerability to disasters. This group of people had easily recovered from the disaster because they have other income sources not influenced by the local economic conditions.

1.3.3 Livelihoods of disadvantaged people are vulnerable. Findings of community surveys show significant emphasis on livelihood insecurity. Inequitable land tenancy arrangements in farming reinforce livelihood insecurity. Many farmers were marginalized despite their hard work and industry because they had lived all their lives as tenants and did not have secured land titles. More than half of their earnings from farm produce go to the landowner's share. The remaining had to be split into loans for the production costs of pesticides and fertilizers and labour as well. Break-even earning or a little profit can end up being squeezed into daily food on the table and the schooling of children. If a natural disaster destroys farm produce in a cropping season, a loan is the most likely solution which makes farmers sink deeper in debt and loan borrowing.

In this study, most respondents who are farmers staying in the evacuation centres go back from time to time to their former farm lots which have been cordoned off as high-risk areas by local authorities. The main reason for doing so was to salvage some farm produce and provide food to their families partly suffering from limited relief supply. During difficult times, many Filipino households change their eating habits too. They eat cheaper home-grown produce such as bananas and root crops, rather than more valuable crops such as rice and fish (World Disasters Report, 2004:112). Most respondents mentioned keeping their houses well-stocked with bananas and root crops. Other than rice, they had planted coconuts, bananas and vegetables to become self-sufficient when typhoons and floods occurred. Mandatory evacuation was enforced by government authorities after the landslide and their communities and farms with standing crops were declared unsafe and strictly prohibited areas. Food insecurity drives local people to search for alternative, sometimes desperate ways of getting food, even cultivating and working in hazard-prone areas. There were similar findings by Heijmans (2001) of marginalized farmers continuing to live and tend the slopes of Mount Mayon because it provided them an opportunity to produce food without secured land titles. People ignore evacuation orders, typically obeying only when the highest level of alert has been reached.

This behaviour of flirting with danger characterizes poor peoples' attitude at times of disaster due to economic and livelihood reasons. Surviving the day-to-day needs is more pressing for them than being cautious when natural disasters strike. A survey of 90 respondents of the 1991 Ormoc City flash flood found that 30 remained on the riverside after the disaster event; 80% had returned to this location because they had no other place to live. This is despite the fact that two-thirds of them recognized the dangers of living on the riverside. Although 60% were awaiting resettlement at the time of the survey, 50% of respondents indicated that they were happy to remain at the riverside because of ease of access to their place of work and markets (DevMan, 1993).

However, some respondents were able to find alternative income-generation activities like the home-based retail store of Survivor E and her husband. Small catering services or restaurants were initiated by some local residents, particularly at the height of disaster operations and rescue mobilization where new customers stirred up local economy. Though temporary, the situation did provide some cash to others to start with as capital for a small business. Others raised fowls, animals and livestock to buffer their coping capacity and self-sufficiency, though these are also vulnerable to natural disasters. Respondents have indicated that cattle and animals have to be secured by them in safe places during natural disasters.

1.4 Cultural Values and Local Norms

1.4.1 Harnessing community beliefs, traditions, values and aspirations can build up local coping capacity. Value formations and prayer meetings held in various places in the affected communities build solidarity and a sense of commonality among the local people. This is an important ingredient in rebuilding lives and communities after disasters. Most respondents emphasized the need to be consulted about plans and interventions regarding reconstruction projects in their communities. Service providers need to work within this value system of the communities so as to ensure success in the implementation and sustainability of locally-based projects. Local people have recognized the importance of not only consulting them but also the long-term implications of any development project that will involve their lives and future. This consensus building approach can ensure all sectors are involved in the problem solving and decision-making processes that can increase local stakeholders' support.

Indigenous people and their traditional ways of predicting natural disaster can function as an alternative method for locally-based early warning. Though this cannot replace the more scientific and modern technique, however, reports from indigenous people dwelling in mountains should at least be validated and inspected by concerned local government agencies. Mamanua tribesmen interviewed in this study felt an earthquake two months before the landslide event. These upland tribesmen had noticed cracks in the ground after the earthquake when they gathered [13]rattans in the mountains. Most of them fled that part of the mountain on seeing the cracks. Believing what they had seen was precarious, most of them transferred to safer grounds. Reports from these natives reached local officials but had been ignored as uneducated folklore. In similar documented Philippine disaster experiences (Tima 2006), the Aeta aborigines dwelling in Mount Pinatubo before its June 1991 eruption strongly objected to a Philippine government geothermal power plant project in that area. These natives also consider Mount Pinatubo the home of their departed ancestors. They have a way of relating with their spiritual heritage and knowing future events that may affect them. Village elders warned officials from the Philippine National Oil Company about a tragedy that would befall them once the tranquility of the mountain was disturbed. Despite objections from these indigenous people, the project continued in the late 1980s. Three sites around the mountain volcano were drilled and long pipes reached the bowels of the 500-year dormant volcano. After the 1990 7.7-magnitude Luzon

[13] Rattan is a name for a number of plants of the genera *Calamus, Daemonorops,* and *Korthalsia* climbing palms of tropical Asia, belonging to the family Palmae (palm family). Rattan leaves, unlike those of most palms, are not clustered into a crown; they have long, whip like barbed tips by which the plant climbs to the tops of trees. From the stem, noted for its extraordinary length (often several hundred feet) is obtained the rattan cane of commerce, a slender, flexible tough cane of uniform diameter, usually split for wickerwork, baskets, and chair seats and left entire for walking sticks, e.g., the Malacca cane.

earthquake, Mount Pinatubo started to rumble and smell of sulfur permeated the surroundings. Aeta elders took this as signs of an impending disaster. Local officials quickly dismissed the talk as rubbish. Three geothermal explosions in the summer of 1991 rocked Mount Pinatubo and were found to have occurred in the three sites where the geothermal power plant pipes were drilled. Then, in June and July of 1991, Mount Pinatubo had huge eruptions throwing millions of tons of ash and volcanic materials 15 km into the air, killing up to 700 people, displacing tens of thousands and destroying property worth millions of dollars (Newhall et al., 1996).

Another story in Saint Bernard landslide-affected villages, was the house-to-house warning carried out by a vagabond woman mentioned by Survivor B, which scared some of her neighbours. It caused some of them to evacuate, thus escaping the disaster event. The same vagabond story was confirmed by the Municipal Social Welfare and Development Officer as reported by the school principal of Barangay Magatas (adjacent village to the mudslide covered Barangay Guinsaugon) to the mayor of Saint Bernard five days before the landslides. Local authorities pacified the warning of the vagabond woman that a tragic event would happen within three days in Barangay Guinsaugon. Apathy toward this kind of superstitious belief was typical for most of the local people who did not believe and later perished in the landslides. The issue is not the accuracy and reliability of vagabond woman's warning but the failure of the local government to check out this information. The authorities should have conducted on-site inspection for verification. A preliminary geo-hazard assessment in the reported barangays where unusual stories or natural observations were happening could have been undertaken. Local residents also reported that the river upstream had dried up three days before the landslides. Respondents and local officials had also reported that eels and big prawns surfaced on the river, possibly due to something happening underneath the riverbed. Local geologists in a post-disaster study strongly suggested that the water in the river had seeped into the cracks and fractures formed by the earthquake in the area two months earlier (Lagmay et al, 2006).

1.4.2 Gendered roles in the evacuation centres can help family and neighbourhoods avoid the consequences of emerging risks and problems. Most of the problems cited by the respondents regarding their stay in the evacuation centres highlighted some gendered concerns that are important in disaster resilience. Women have identified those that were related to their vulnerability associated with healthcare, hygiene and sanitation. These can result from overcrowding, noise, inadequate drinking water supply and breeding mosquitoes, which were identified as very important by the respondents. Most mothers were apprehensive of their crowded conditions and the lack of basic facilities in the evacuation centers. These resulted in vomiting, fever and diarrheal diseases in some of their children. In rare instances, two children were rushed to the hospital for dengue observation and treatment. Watson et al. (2007) found that communicable diseases after a natural disaster are common in displaced populations that have poor access to basic needs such as safe water and sanitation, adequate shelter, and primary healthcare services. The role of women can be tapped by service providers of healthcare services to monitor disease outbreak, immunization and vaccination and food preparation in the evacuation centres. This would ensure avoidance of an epidemic or rapid transmission of communicable diseases.

Regarding the problems of men, these concerns were related to their vulnerability associated with livelihood security, food sufficiency and psychological stability. Most of them were worried about having no work and no income, availability of food on the table and prolonged disaster. Food-for-work schemes or related volunteering works like those implemented by the government agencies in the relocation housing projects can be availed of by men. This could be an incentive for them to help fast-track resettlement houses which would be awarded to them as soon as they were completed.

1.4.3 Familism strengthens community spirit for response to and recovery from disasters. The family as a unit in various disaster behaviours has been argued by Kirschenbaum (2006) to be central and critical for the survival of individual members. Respondents emphasized their role obligation within their families as crucial for weaker members or dependents. The stories of father's saving a grandchild's life at the expense of his daughter's, of mothers dying in their attempts to save their children or property, of wives organizing help and care for the sick and injured and of husbands leaving their families to join disaster search and rescue units, demonstrate variations in family gender roles in times of disaster. For the most part, disaster gendered roles are the foundation of mutual help among family members. Kirschenbaum (2006) argued that these types of mutual help, based on the interdependent gender roles of family members, are aimed at preserving the integrity of the family unit.

Respondents are strongly disposed to keep peace and unity in the community for faster recovery. Surviving family members become a source of renewed strength and comfort. Other survivors still linger on nostalgic feelings of departed loved ones who were lost in the disaster. Those members of the family that were left alive became closer with their surviving siblings and have shown more care and concern for each other. Family bonding in Filipino communities had been very strong when loved ones are faced with difficulty and mishaps. This `pulling together' of relatives provides the social network for relief and support, not only during natural disasters but also in daily living. It is a social pattern in which the family is given a position of ascendance over individual interests. This explains why survivors have to work with their family needs first rather than individual ambitions like the youthful Survivor D. Survivor F and her husband had been sustained by their parents lending them money to meet their daily needs. Survey respondents were also expressive of their renewed concern for their neighbours' welfare by extending assistance whenever the need arises. They can understand and relate to one another better after the disaster because of the shared experiences and ordeals they have gone through. This empowering process was also emphasized in the studies conducted by Lord (1997) that vulnerable citizens can benefit from the dialogue, and the exchange of respect that is part of a "sense of community", and from the participation or involvement where they belong as "community as place". These community values were strongly considered by service providers and government agencies when they decided to relocate whole neighbourhoods to their new relocation sites.

1.5 Social Networks and Institutional Arrangements

1.5.1 Strengthening the local disaster management system can increase responsiveness to disasters. Respondents perceived that their local government officials, through the municipal disaster coordinating council (MDCC), were ineffective in managing the effects of the landslide disaster. The same view was admitted in the interviews of local officials and service providers in Saint Bernard, Southern Leyte. The MDCC of Saint Bernard, Southern Leyte, needs to be reinforced by staff development, skills upgrading and funding to make it effective in delivering counter-disaster services. Most officials have admitted that they were not trained on how to handle emergency services other than their regular government functions in a normal situation. Duplication of functions occurred during the disaster operations due to good intentions to help. Such redundant roles led to mixed information and instructions that resulted in discordant actions. The issue of who should be doing what is critical in emergency and rescue operations vis-à-vis limited resources. A ballooning effect in resource use can take place if imprudent management continues due to untrained disaster workers and officials. This can result in wasted resources and become a drain on the coffers of local government where funds may be earmarked for other villages also. This is a crucial issue because local government officials were aware of the limitations of using regular funds in cases of disaster. If funds for such emergencies do exist, they may not be enough to cover the massive ill-effects of a landslide disaster. There is no way they can escape the strict accounting and auditing procedures that can be exacted against them after the disaster. Doing nothing because the law does not legally allow them access to funding resources can be very damaging to a political career or party alliance, particularly, if incumbent officials are running for reelection Any issue of graft and corruption can be very counter-productive for their political careers. International donors or sponsors and national government agencies can be the messiahs of local officials in addressing the immediate needs of the affected communities. Again, local government has to wield political charisma to woo these donors and sponsors to channel funds and other resources, as much as possible, through the local government system. More often than not, the local government is reduced to a clearing desk only. The NGOs, national government agencies and civic-oriented groups go directly to the affected local people and deliver their services. Problems arise when the affected local people start to rival, compete and become jealous of what others have received from other service providers which give bigger and far better services. These problems of coordination and communication were also confirmed by the findings of Leone et al. (1999) in the post-Mt. Pinatubo disaster. Different agencies and service providers involved tended not to work together and did not adhere to the institutional co-ordination mechanism of the DCC. This resulted in a slow rehabilitation process, so that many families affected were forced to stay longer than expected in the evacuation centers. This is exactly what was happening in the case of Saint Bernard's post-landslide recovery.

Most respondents have expressed dissatisfaction about the poor management of these situations because neighborhoods were also affected. They were concerned that their solidarity and camaraderie be protected from the exploitation of selfish politicians and do-gooder private groups. Local officials interviewed strongly suggested that they should be trained also in disaster management, particularly in managing emergency operations and disaster contingency planning. At the time of the fieldwork, the training of the MDCC officers and disaster workers of Saint Bernard, Southern Leyte, was underway.

1.5.2 Integrated and coordinated approach of service delivery to vulnerable communities by service providers optimizes resource use. A convergence approach to service delivery of various service providers, both government agencies and NGOs, can be effective in managing disasters. There are existing inter-agency strategies of integration for community-based disaster risk management in the Philippines. However, in relation to flash flood and landslide disasters or upland conservation management such a strategy may be an exception. The "Anti-Disaster Agro-Forestry Project" of the Department of Environment and Natural Resources (DENR) is a good example aimed to address the land tenancy problem of poor farmers in a long-term development approach. Most vulnerable during natural disasters, poor farmers in high-risk areas becomes the focal point of integrated disaster projects. In this Project, the DENR is the lead agency with a local people's organization as implementer, usually the farmers themselves collect into a cooperative-type organization. DENR provides the capital funds or seedlings and land, the organized farmers labour and dedication to the project. The scheme allows the farmers to profit and at the same time qualify to own part of the land once they are involved in the Project. Part of the farmers' mandatory role is to patrol the forest for illegal activities as a way of curbing tree harvesting through local policing. Another agency, the Department of Agriculture can provide the skills and farming techniques in growing these tree seedlings.

1.5.3 Upgrading early warning systems, communications and transport service increases timely evacuation and responsiveness of communities at risk. Community respondents have indicated strong confidence about typhoon and flood warnings coming from the national weather bureau, PAGASA through television and radio. When these warning alerts became community evacuation and precautionary actions, respondents preferred their local authorities to take initiative for the house–house dissemination. Natural observation of changes in the weather or seasons and environmental conditions remains an acceptable traditional mode of knowing typhoons and flooding events are going to happen among the respondents. Respondents strongly believed that typhoons were precursors of flooding events. Flooding can be detected by the sounds of the river flow, wind coming from the mountain, monitoring the increase in water level in the river. Though not totally abandoned by the local people, respondents agreed that these traditional modes of early warning and communication can complement those public alert messages from modern sources. Similar findings in the disaster prevention study of the 2001 Camiguin landslides done by JICA-DPWH (2001) support the foregoing discussion. More than half of the 150 respondents in Camiguin considered verbal warning by barangay officials and neighbours patrolling house to house as the most effective way of warning. The same respondents indicated that flooding will occur when there is continuous rain or when there is a typhoon. Observing natural conditions like increasing water level or overflowing of irrigation canals was also practised by more than one-fifth of the respondents.

However, respondents from Saint Bernard, Southern Leyte, strongly suggested improving the early warning and communications capability in the communities at risk when referring to their landslide experience. This has strong implications for the trust and confidence of the local people in government agencies and local officials regarding preparedness, evacuation and disaster response. Communication of a threatening situation to the local people requires an interactive relationship between the communicators and the vulnerable residents. Respondents highlighted this issue when reports about the vagabond woman's premonition, stories of the Mamanua tribe, and the unusual appearance of big eels on the surface of the river which had reached local officials, particularly the mayor's office. No course of action was taken by local authorities, so most of the local residents in the high risk areas did not move to safer ground. According to Wray et al. (2004), emergency risk communicators should provide the public with clear, accurate, and timely information. Effective communication during an emergency can provide the public with action steps to prevent death, injury and illness, reduce anxiety levels and facilitate evacuation and relief efforts. In spite of this institutional weakness, some of the respondents took the initiative of procuring new mobile phones for personal and family preparedness. Respondents were quick to strongly suggest that new megaphones and other communications equipment for community use during disaster operations should be provided by the municipal government. Respondents and local officials have also reported that school children buried inside school buildings who had mobile phones were able to send text messages to their loved ones some time after disaster impact. This indicated that those schoolchildren were still alive underneath the mudslides for sometime.

Mobility is another critical aspect for mass evacuation and resource transport. Respondents strongly suggested that upgrading of transport and rescue equipment was needed to improve community response to natural disasters. They were reminded about the unavailability of public rescue equipment and forklifts stationed at the municipal hall at the time of rescue mobilization and emergency operations for hours after the landslide impact. Some officials interviewed mentioned periodic mock drills or simulation exercises which could be conducted in the community to improve warning systems and evacuation procedures. This could lead to proper actions and steps which the local people could follow in times of crisis.

1.6 Political Will and Priorities

1.6.1 Political agenda can influence rehabilitation plans, fund allocation and area prioritization. Politics and economy have strong influence in shaping reconstruction and development efforts in disaster-affected communities. The Provincial Government headed by the Governor of Southern Leyte Province is the center of power in the rehabilitation projects of the whole province, the so-called "Rehabilitation Master Plan of Southern Leyte Province." The majority of the funds and services pass through the Governor's office. It oversees on-going rehabilitation projects in Panaon Island affected by the November 2003 landslides. When the landslides also occurred in Saint Bernard in 2006, the Plan had to be expanded, as well as the power and decision-making clout of the Governor who oversees and manages the implementation of the Plan. The municipal government of Saint Bernard was perceived as subordinate by the respondents which explained why the majority of decisions and resource access took some time. The Governor's Office is a few kilometers away from Saint Bernard. The national and local elections campaign was at its height during the fieldwork. The elections were set for May 14, 2007. The incumbent Governor was in her 3rd term of public service and there would be no more reelection for her as stipulated by law. Her daughter who was new in politics was the official candidate of the Governor's ruling party. The political maneuverings and image build-up provided by the reconstruction and development programs in the province to boost her daughter's chances for election victory did not work as expected. Respondents and local officials interviewed mentioned the distrust of local people resulting from the mismanagement and political favouritism in the distribution and prioritization of disaster funds. Local people were aware of inequitable release of funds as well as diversion to other uses or other localities for political causes. This politico-administrative issue was also mentioned by Leonie et al (1999) as persistent in the 1998 national and local election campaigns. Some political candidates described themselves as lahars' fighters, or promised free housing for the victims of Mt. Pinatubo eruption. This can stir up trouble among the evacuees or local residents who support rival political candidates. In Saint Bernard, Southern Leyte, the opposition candidate developed a comprehensive rehabilitation and development plan for the municipality as a political platform. He made use of the issue of the local government's ineffective response during the landslide disaster that killed many people. Though a neophyte in local politics and very young, in his late twenties, he was elected as municipal mayor.

1.6.2 Transparency of policies and funding of non-government organizations (NGOs) and civic-oriented groups in the reconstruction efforts. In a prolonged disaster recovery, local people in the evacuation centres have to sustain their day-to-day living for a longer duration. This means they have to compete for scarce resources and dwindling relief assistance. Staying more than one year in the evacuation centres, most respondents were already impatient about the slow-paced reconstruction projects. Construction of relocation houses was hampered by the delay in the delivery of supplies and pre-fabricated materials. These raw materials were specified after the design was chosen by the donors and sponsors. In this situation, local government was perceived by the local people as being in a subordinate role to the donors who have the money. While these conditions are prerogatives of donor NGOs to account for expenses properly at some point, they can also marginalize the local people in terms of their options in recovering faster. Respondents expressed that full disclosure of the scope and funding of the projects be made known to their local leaders by the NGOs so they could execute corresponding economic strategies on how to equitably spread the resources to cover the whole community. A case was cited by respondents coming from Barangay Sug-angon because they lacked four resettlement houses which the NGO donor could not afford due to lack of funds.

1.6.3 Coalition-building and partnership governance. When perception of trust and confidence in local government by the local people is marred by partisanship, corruption and complacency, governance is also affected. Where religious beliefs are strong in a community, religious leaders can be potential focal points or co-implementers for rural reconstruction and development projects. Church-based donors and organizations both foreign and local were channeling their relief and rehabilitation assistance through local parish or ministry counterparts in Saint Bernard, Southern Leyte. While this is an alternative strategy to regain public trust, the local government can delegate some implementing functions to these credible private organizations. The MDCC of Saint Bernard has regular coordinative meetings on the 1st and 3rd Tuesdays of every month to monitor progress of all service providers in the disaster-affected communities. The leaders of these church-based organizations were appointed as team leaders of a committee under the MDCC, for example, Relief and Rehabilitation Service Team or Stress Debriefing and Counseling Team by the Municipal Mayor as concurrent Chairman of the MDCC.

2. Refinement Process of the Model

The proposed Model (see Figure 2-7) in Chapter 2 is composed of six building blocks that are considered equally important and of equal footing. A test was needed to determine which of these building blocks causes or influences community vulnerability or resilience most. This was done by the development of survey questionnaire and interview guidelines which were implemented in the fieldwork to validate findings of the case studies'. An integrated discussion of the whole study is done in this chapter to elicit significant issues regarding vulnerability or resilience of communities at risk. These issues are going to flesh out the six building blocks. The degree of influence or "building" can be determined by the number of square blocks accumulated under each building block. A square block is formed by a significant issue that cuts across the six building blocks either by implication or direct relationship. A summary of these issues raised in the foregoing discussion points is shown in Table 6.1.

The cross-cutting implication of each issue is marked by a square block through the building blocks it influences most. The `most' will be interpreted by considering the first three building blocks which have a direct effect or stronger association with the stated issue. The shaded block indicates where the issue originated from among the six building blocks. The block not shaded indicates a cross-cutting issue to other building blocks. One block is equivalent to one point. The number of squares either shaded or not shaded under each column will be totaled at the end. This will be used to modify the visual model as proposed in Chapter 2.

Table 6.1 Summary of issues of vulnerability or resilience gleaned from the discussion points.

Issues of Vulnerability or Resilience	Model's Building Blocks					
	1	2	3	4	5	6
1. Average of 3 typhoons per month was changed to 4 typhoons in less than a month	■	□	□	□		
2. Series of typhoons passing by same trajectory have affected same areas.	■	□	□	□		
3. Two typhoons with 150-220 km/hr maximum wind have land fall 9 days apart	■	□	□	□		
4. Intense rainfall and/or cumulative rainfall over a longer duration were associated with weaker typhoons and have larger death tolls	■	□	□	□		
5. Mountain and volcano-mountain barriers induced orographic effect that intensifies rain in sloping areas	■	□	□	□		
6. Inter-Tropical Convergence Zone and La Nina episodes have recorded maximum rainfall of < 750 mm/day	■	□	□	□		
7. Geological features i.e. soil types; delta, river systems, etc were found to aggravate flash floods and landslides.	■	□	□	□		
8. Natural dam and/or log jam formation preceded dam failure or water breakout resulting in flash floods and landslides.	■	□	□	□		
9. Fractures and cracks in the ground due to previous earthquakes were susceptible to seepage from intense rain or overflowing rivers.	■	□	□	□		
10. Absence or presence of development projects influences vulnerability of communities at risk.	■	□	□	□		
11. Location of refuge shelters or evacuation centres influences safety or susceptibility to natural disasters.	■	□	□	□		
12. Insufficient forest covers due to deforestation and logging activities.	■	□	□	□		
13. Constriction of river channels by the encroachment of squatter settlements.	■	□	□	□		
14. Inadequate medical treatment for survivors who suffered bad bruises and scars.		■	□	□	□	
15. Continuous rehabilitation services to overcome traumas and psycho-social stressors of local people must be extended for as long as possible.		■	□	□	□	
16. Self-confidence in local people was made stronger by their faith in God.	□	■	□	□		
17. Commitment of local people in sending their children to get a good education builds high literacy.	□	■	□	□		
18. Residents' demand for disaster preparedness to be taught in their regular community seminars was strongly suggested.		■		□	□	□
19. Local peoples' initiative in buying their own emergency assets and undergoing survival skills capability training was evident.	□	■	□	□		
20. Poverty in pre-disaster conditions was persistent in rural	□		■	□	□	

farming communities.						
21. Squatter settlements usually situated in denser populated areas were built from light makeshift housing materials; along hazard-prone byways.	□	□	■			□
22. Unsustainable resources use was a desperate solution for economic survival by poor families.	□		■	□	□	
23. Low household income was prevalent among disadvantaged people due to growing population and having many dependents.	□	□	■	□		
24. Cultivating root crops, bananas, coconuts and vegetables other than rice farming and fisheries can make local people self-sufficient	□	□	■	□		
25. Harvesting and stockpiling root crops, bananas and other farm produce to cope with natural disasters	□	□	■	□		
26. Local unemployment was high due to limited non-farming trade and industries.	□	□	■	□		
27. Other members of households were working overseas, or near capital cities which increased capital base.	□	□	■	□		
28. Diversification of working skills due to local or overseas jobs and non-farming employment outside their hometown.	□		■	□	□	
29. Alternative local income generation like retail stores and catering services, etc.	□		■	□	□	
30. Raising fowls, swine, animals and livestock can provide alternative income and cash	□	□	■	□		
31. Value formations and prayer meetings boost community morale and solidarity in recovering from natural disasters.	□	□		■	□	
32. Consensus building with community residents has to be observed by development managers to assure local involvement and support.			□	■	□	□
33. Traditional knowledge and folklore of indigenous people can be alternative sources of warning for natural disasters and can complement modern means.	□			■	□	□
34. Natural observations reported by local residents need to be investigated by local authorities and experts as preventative measures.	□			■	□	□
35. Addressing community needs with regard to gender considerations can protect households from emerging risks in temporary shelters.	□			■	□	□
36. Voluntarism of local people to work in reconstruction projects optimizes limited resources in recovering from disasters.			□	■	□	□
37. Strengthening local disaster management committees by fund allocation, staff development and upgrading of disaster response capabilities	□			□	■	□
38. Coordinative and integrative policies and practices on service delivery must be adapted by various institutions and service providers.	□			□	■	□
39. Early warning systems and equipment for rapid onset natural disasters at the local communities was inadequate	□			□	■	□
40. Mock drills and simulation exercises need to be						

conducted to synchronize communication and evacuation procedures	□			□	■	□
41. Local adaptation of warning messages can simplify action steps and reduce negative effects of disasters.	□	□		□	■	
42. Partisanship and political economy may erode public trust and confidence in local government authorities which can affect the recovery of vulnerable people in the community.			□	□	□	■
43. Good governance can facilitate community-based support by sharing functional powers with religious leaders and trusted organizations.		□		□	□	■
44. Transparency in all undertakings by both public and private organizations can prevent corruption and the erosion of good values of affected communities		□		□	□	■
Total Block Points	36	30	32	43	21	15

Legend:

1 = Ecological Resilience (refers to biophysical resources available in the community which may expose a community to potential hazard risk. Geophysical tangibles like land, climate, environment, infrastructure, lifelines, physical technologies, housing, etc. with its perceived risks can be defined by the knowledge-base of an individual or household living or working in hazardous habitat like steep mountains or near river channels. Historical data of disaster events can provide trends, emerging issues and suitable interventions for mitigating ecological hazards.)

2 = Human Health and Wellness (defined by health condition, literacy, self-sufficiency, skills, and psychological conditions of an individual before and after a disaster event. It includes also emotional and mental coping mechanism for recovery in the wake of a disaster. A person's resilience may relate to a predisposition to self-reliance and survival capability.)

3 = Income Base and Livelihood Sufficiency (refers to stable growing population, economic activity, income-generation skills, welfare benefits, and income-earning assets. It is also a measure of capacity of an individual and/or household to recover from disaster towards normalcy by reinstating earning or livelihood pattern sufficient for an individual of household consumption on a day-to-day need basis.)

4 = Cultural Values and Local Norms (encompasses sense of purpose, self-reliance, local preparedness, risk awareness, goals and aspirations of the people, common interests, religion, informal and formal groups, `*community spirit*' or social capital, gendered roles which can influence decision, action and capacity of people in preparing for, responding to and recovering from disasters).

5 = Social Networks and Institutional Arrangements (refers to established networks, support systems, partners and stakeholders, organizational linkages committed to initiate protection and recovery from disaster risks. National and local governments, non-government organizations and locally-based initiatives comprise the capacity of communities for disaster preparedness and mitigation).

6 = Political Will and Priorities (characterized by power or authority structure, leadership attributes, decision-making and policymaking processes which can influence development and disaster risk reduction programs being adopted and implemented in a locality.)

3. Modification of Landslip-Disaster Quadrant Model on Community Resilience

Figure 6-1 shows the modified Model on Community Resilience as tested and refined by the author. It presents that the building block on cultural values and local norms influences most the resilience of the study community to natural disasters with 43 points. It is followed by the building block on ecological resilience with 36 points. The building block on income base and livelihood sufficiency comes in 3rd with 32 points. It is followed by the building block on human health and wellness with 30 points. The building block on social networks and institutional arrangements comes in 5th with 21 points. Lastly, the building block on political will and priorities comes in 6th with 15 points. This is indicative that the issues and concerns enumerated under these blocks, particularly those with the most cross-cutting implications, need to be prioritized in improving community resilience to natural disasters.

The 4th quadrant is highlighted in the figure which means positive development versus negative disaster risk management. One of the findings from the five disaster cases has something to do with development projects like the Infanta-Nakar Bridge constructed across Agos River that contributed to the diversion of floodwaters into the communities. It can be construed that the bridge may have been designed shortly before the impact of the flash flood and landslide disaster in 2004. Another was the urban development of Ormoc City which failed to consider disaster risk reduction measures in hazard-prone communities, particularly those communities encroaching river channels which were impacted greatly by the flash flood disaster in 1991, due also to the absence of a flood control dike. These issues correlate sustainable development with disaster risk reduction as complementary strategies for improving community resilience.

In the same figure, the line of vulnerability or resilience is indicated by the broken yellow line drawn at the tip of each building block. This means that the Model is workable and can show the existence of relationships among the building blocks and the degree of "building" necessary to make a community disaster-resilient. This is important because the theories and concepts on disaster risk management in previous studies and related literature can now be quantitatively and qualitatively measured, and this is the first attempt. This approach can be further refined using other statistical analysis which this study was limited in doing due to constraints of funding and time.

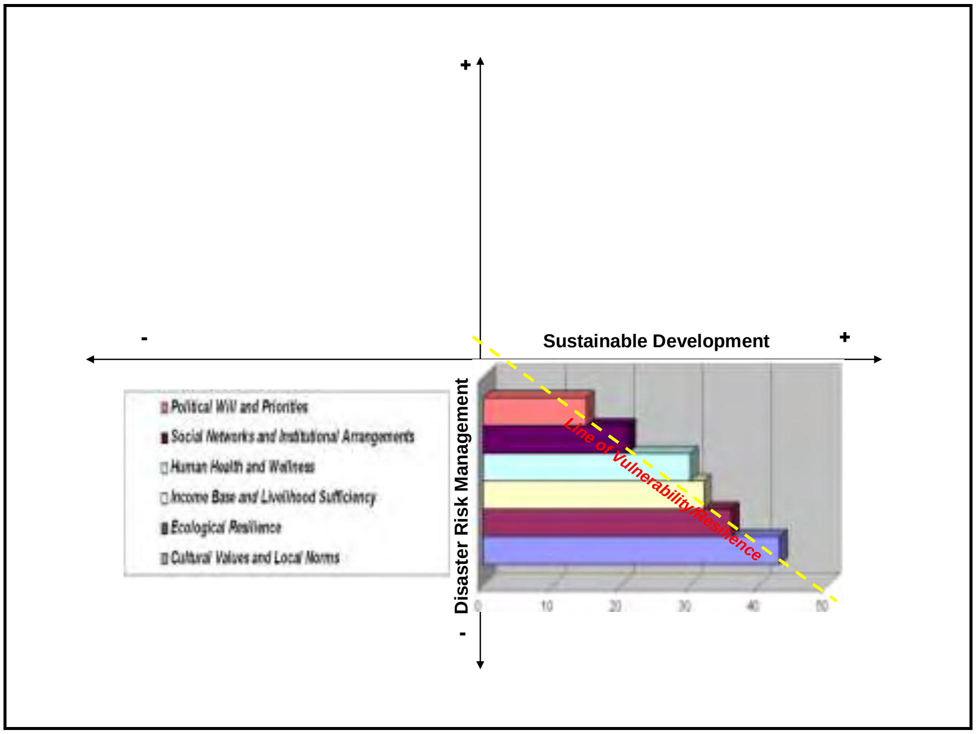

Figure 6-1. Modified Landslip-Disaster Quadrant Model on Community Resilience (author's version)

Conclusion

This chapter presents the discussion of the results of the five case studies and community surveys using the six building blocks of the Landslip-Disaster Quadrant Model on Community Resilience as discussion points. A summary of the issues on community vulnerability or resilience have shown the cross-cutting implications of these issues. This determines which among the building blocks most influences community resilience to natural disasters. A modified Model on community resilience is the result of this refinement process. The same Model has rearranged the six building blocks as to their level of importance. This indicates that the top three building blocks are the cultural values and local norms, ecological resilience, and economic base and livelihood sufficiency. Issues on the other building blocks are of equal importance which will also form part of the study recommendations. The next chapter will present the conclusions and recommendations of this study.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter summarizes various aspects of this thesis and its major findings. It contains the following: an overview of the thesis and major findings, implications, conclusions, limitations of the study, and recommendations. The latter covers specific action steps and research directions for target groups. This thesis addresses the following main objectives, 1) gain understanding of the causes, behavior, distribution and biophysical impacts of the various natural hazards, (2) examine the physical, biological, and socio-economic attributes of the communities under investigation, (3) review recommendations and remediation measures implemented for affected communities by government institutions and other service providers, and (4) recommend strategies and a model for reducing vulnerability and improving community resilience to disasters.

Resilience is the inverse of vulnerability. A community-focused model is proposed by the author to achieve the foregoing objectives and also to determine which of the various natural forces and human aspects influence vulnerability or resilience most. This model is called the Landslip-Disaster Quadrant Model on community resilience and is composed of six building blocks. A community assessment toolkit using a survey questionnaire and interview guidelines was developed to test and refine the Model. The findings and implications from the five natural disaster case studies and community surveys were used to flesh out the six building blocks. The survey questionnaire and interview guidelines were used in the affected barangays (villages) of the February 17, 2006 landslides in Saint Bernard, Southern Leyte.

1. Overview of the Study Chapters

In chapter 1, the global scenario in relation to the rising number of people being killed and the damage being wrought by natural disasters was presented. The Philippine's high exposure and vulnerability to natural hazards is due to its geographic location in the Pacific Ring of Fire known for seismic and volcanic activities. This same location also accounts for the usual path of about 22 typhoons formed in the Pacific Ocean every year (PAGASA and NDCC, 2007).

Chapter 2 presented a literature review of the various views, concepts and theory models of disaster risk reduction and vulnerability assessment. The framework of the study focuses on the author's theory of community resilience called the Landslip-Disaster Quadrant Model. It is comprised of the following six building blocks: ecological resilience; health and wellness; economic base and livelihood sufficiency; cultural values and local norms; structural networks and institutional arrangements, and political will and priorities.

The methods and procedures utilized to collect and analyze data for this study were presented in Chapter 3. Both quantitative and qualitative research methods were utilised in this thesis. A case study approach and document analysis was used for the five natural disaster events. The February 17, 2006 landslide disaster in Saint Bernard, Southern Leyte was selected as the study area for the community surveys of four disaster-affected barangays. A questionnaire survey and interview guidelines were formulated and used to test and refine the author's Model of community resilience.

Chapter 4 presented the physical aspect of vulnerability via the five case studies of natural disasters in the Philippines. It covered a fifteen year period from 1991 to 2006. Flash floods and landslides have been frequent hazards because of the intense rainfall resulting from typhoons, the Inter-tropical Convergence Zone, La Nina episodes and orographic effect. These changes in meteorological and hydrological conditions, when combined with a vulnerable geographic location and the built environment of human settlements, can significantly increase the risk of disaster occurrence. Disaster triggering processes like landslide-formed dams and log jams in upstream river channels have usually preceded flash floods and debris flows.

The human dimension of vulnerability is discussed through the results of the community studies of Chapter 5. The vulnerability of people and communities stem from the geographic setting, cultural and socio-economic conditions that already existed among the local people before the disaster happened. Many local people were living at the toe of the mountain. Family size of more than seven members per family affected circumstances through a limited income base. Lack of early warning and community preparedness for rapid onset disasters were evident. On the other hand, some coping capabilities were also existent in the community such as strong family and social networks, religious beliefs and an indigenous warning system that could have been tapped by service providers.

Chapter 6 discussed the results of the whole study. Tabulation of issues shows the cross-cutting implications for the six building blocks of the Landslip-Disaster Quadrant Model. This also indicates which among these building blocks most influence community resilience to natural disasters. A modified Model of community resilience is the result of this refinement process. The six building blocks of the Model have been rearranged according to level of importance, to ensure responses to natural disaster will be successfully managed. Findings indicate that the top three building blocks are the cultural values and local norms, ecological resilience, and economic base and livelihood sufficiency. Issues of the other building blocks are also of equal importance and this discussion forms part of the study recommendations.

2. Conclusions

The thesis answers a basic argument about natural disasters and their differentiated impacts on people and communities. Whether it is natural forces that cause adverse effects or human conditions or actions that aggravate these effects, both sides of argument are valid and should be viewed as part of a single coin. Disaster is usually precipitated by a natural event. Impacts of natural disasters are expressed in fatalities and losses depending on the degree of vulnerability. Different conditions of vulnerability are thought to result from people who live in harm's way. Vulnerability can also be generated by socio-economic and political structures and processes (Heijmans, 2001). However, assessments at the community level focusing only on needs and vulnerability conditions may not help local people to develop resilience to disasters. Resilience is embedded in the coping capacity of threatened communities. This is usually expressed in terms of what vulnerability is from their perspective. Conventional vulnerability assessments can render people's perspectives invisible. Oftentimes, stop-gap and short-term remediation of service providers could subvert these perspectives. This becomes a pitfall for most of the government and non-government programs on community capacity-building. The capacity for resilience of communities at risk usually requires medium to long-term development building approaches (UNDP, 2004). Local people know what they can do, what they cannot do and what can be done. This sets the premise for this study, which is the assessment of both the capacity for and vulnerability to disasters, not simply the recurrence of natural hazards.

Flash floods and landslides in the Philippines have been frequent due to changing climatic patterns and greater interaction of natural processes. Extreme weather conditions can result in intense rainfall that seeps through fractures and cracks on the ground, saturates and loosens soil particles, weakens slope resistance, triggers landslides and forms natural dams. Failure of these natural dams or log jams causes flash floods and debris flows. The rapidity and destructiveness of these hazards can be influenced by the angular position of sliding materials, slope resistance, type of cascading materials caught in the flow, river channels configuration, and human structures that can obstruct and/or intensify overflow. These are the physical conditions of vulnerability to disasters. Findings from the five disaster case studies confirmed these aspects of physical vulnerability.

Threatened communities or people at risk have different levels of vulnerability when impacted by these landslides and flash floods. Geographic location and built environment of human settlements indicate greater impacts for those situated in harm's way such as at the toe of a hill, near a river or in between two river systems, and in a coastal area. Added to this is the house design and materials used to construct the dwelling places of people. Lighter housing materials can easily give way to initial impact. Congestion of residents in a high-risk area increases its potential for loss of lives and properties. More family dependents, mostly young in age, have greater exposure to precarious situations when impacted by disasters. Unstable livelihood and income sources, which are common to poor people, offer no immediate relief or recovery from disasters. Little or no diversity in job skills among household members can limit employment opportunities and other income generation activities. These constitute the significant socio-economic vulnerability that characterizes most of the local people in Saint Bernard, Southern Leyte, affected by the landslide disaster.

The psycho-social vulnerability of the local people stems from the lack of knowledge or poor understanding of the mechanism of landslides and flash floods. With no or little anticipation of the hazards associated with heavy and/or continuous rains on the part of the local people can breed complacency and an attitude of unpreparedness. This can result in confusion and indiscriminate actions or behaviours during the landslide disaster. Casualty and damages end up in significant figures. Medical services extended to survivors extricated from the mudslides must not be confined to just reviving or keeping them alive. Health and well-being treatment of survivors, particularly those suffering from mental and emotional stressors, must be holistic and complete. Contributing to the failure of this was the inability of the local government to handle crises pressure at a manageable level. Service providers did not know how to cope with the demands of the emergency situations due to an absence of knowledge or training in disaster operations and management. Miscommunication, overlapping functions and discordant actions by disaster workers and leaders persisted at the height of the emergency. Saving lives and rescue operations were hampered by these behavioural weaknesses within the organization of Saint Bernard MDCC.

Local people seemed to have adequate preparedness and better response behaviours to typhoons, coastal flooding and earthquakes that could had been enriched by their previous disaster experiences of these natural hazards. The reliance on and confidence in the typhoon alerts issued by the weather bureau, PAGASA was evident. Receiving warning messages through television and radio enhanced the actions of the local people in prompt evacuation and safety precautions. Preference for house-to-house warning by neighbours and local officials indicates that the credibility of authorities and the familiarity with messengers was important in terms of trust for local residents. Local people strongly agree for the use of natural observation (i.e. rains, water level rising, sound of the river etc.) and traditional means of communication (i.e. church bells and sirens) in warning them of impending threat. These are some aspects of institutional capacity that local people believe can sustain them in avoiding and reducing the impact of disasters.

In relation to the socio-cultural aspect of disaster management, strong family ties and community bonding are core values strongly held by local people in overcoming vulnerability to disasters. Findings which directly implicate the family as a unit in disaster behaviour show that family members tend not to evacuate or run for safety until all its members are present. The decision to relocate is commonly taken within the context of the family or household unit. Putting family welfare above individual interest or ambition indicates strong belief in family solidarity and the collective aspirations of the local people. Prayer meetings and religious processions aimed to ward off bad luck or evil spirits in the area are also expressions of the sharing of common burdens and encouragement for one another. Family relatives helping one another to overcome economic difficulties can have a strong impact on community recovery. Recognizing gender roles in disasters can facilitate recovery and optimize the use of resources, particularly in evacuation centers. One important strongly held value on the part of local people is that the consultation process should involve them and must recognize their contributions or suggestions.

Reconstruction and resettlement development were often influenced by political interests. Power holders, particularly incumbent elective officials in charge of the rehabilitation funds, have prerogatives exercised in favour of political allies and electoral campaigns. Non-observance or lack of transparent policies regarding the use and allocation of funds for rehabilitation and development of disaster-affected communities can erode public trust in government officials. Non-government organizations have filled this vacuum, particularly those which channel their resources through church-based programs and civic-oriented groups, because they tend to be successful in gaining the trust and confidence of the local people. Saint Bernard MDCC has recognized this and they have allocated religious and civic leaders key roles in the committees under the MDCC. This is a good way of consolidating governance and building partnerships with other disaster service providers.

3. Limitations of the Study

Although sufficient information is contained in government and non-government reports regarding the five natural disasters used in this study, time constraints limited the application of the author's Model on community resilience to each case study. Application to each site would have been a good replication technique to validate the workability of the Model as well as to determine which of the six building blocks best predicts community resilience. This would also help to establish which physical and human aspects of vulnerability have most influenced the five case events. Certain limitations were also observed in the conduct of the discussions and interviews with officials and service providers. Disaster issues and problems that have political implications were avoided in the discussions by staff associated with incumbent local government officials. This stance was due to the electoral campaigns going on at that time which are often detrimental for the image of political candidates. Insurgency and political killings are rampant during electoral campaigns especially in hotspot areas. On the other hand, those critical of the current administration at that time were generous enough in providing details of what was happening in their municipality and province. This is the reason why the views of the current administration would have been preferred such that they could shed light on the concerns raised by the opposition and thus present a more balanced view of the real issues. When real issues are properly discussed, appropriate recommendations and action steps can be suggested.

4. Agenda for Further Research

The use and testing of the Landslip-Disaster Quadrant Model (see Figure 2-7, Chapter 2) on community resilience with other natural disaster cases are strongly suggested. Inclusion of other indicators or sets of information under the six building blocks of the Model is recommended. This may increase efficiency in measuring community issues or problems related to capacity for resilience. Quantitative tests can also include statistical significance between and among the six building blocks to ascertain the degree of the interrelationship. Regression analysis is one of these correlation tests. Another application of the Model is to use it as a toolkit for training and research in the review and assessment of disaster cases or events. This could be called a Participatory Assessment Review Technique (PART) that can be useful for academia, policymakers, managers and disaster workers. The Hurricane Katrina case discussion in Chapter 2 shows how this Model can be applicable to processing issues, policy gaps and strategy options.

In terms of the physical science aspect of disasters, further research on the effect of antecedent rainfall and daily rainfall on land slides should be conducted by local scientists and engineers. This can test and advance the threshold 'line' depicted in the Model (see Figure 2-7, Chapter 2) to determine the point of possible land sliding and no land sliding as suggested by Fell et al. (1998). By doing so, engineering solutions can be reinforced by the results of these future studies.

5. Recommendations

This section has a two-fold set of recommendations. First, recommendations for those issues and concerns gleaned from the five case studies of natural disasters and the survey of communities in Saint Bernard, Southern Leyte. Since most of these issues are already being addressed by various international, national and local organizations through their mandated functions in disaster-affected communities, a simple `categorization of action steps' is devised to clearly present the list of recommendations. Second, are the suggested action steps for the National Disaster Coordinating Council to undertake in reinforcing its current national program on disaster preparedness and mitigation programs.

5.1 Building Capacity for Resilience to Disaster Risk. What follows are the recommendations for the target groups about disaster risk management and community resilience which were synthesized from the key issues identified and summarized from Table 6.1 in Chapter 6. These recommendations are categorized in a 'grid' of action steps and level of involvement required from both the community people and the officials/service providers. Also presented are the key institutions and agencies involved in the disaster risk management and vulnerability assessments of the threatened communities. These are shown in Table 7.1.

Table 7.1. Summary of Recommendations and action steps that can be undertaken by both community people and the officials and service providers to improve community resilience to natural disasters.

Recommendation	**Action Steps Required from**		*Institution/Agency involved*
	Community people	Officials and Service Providers	
• Simplification and local adaptation of warning advisories and scientific information about weather conditions and hydrological information.	S and M	A, I and M	LGU, PAGASA, PHIVOLCS, DA, NDCC
• Increase the number of rainfall-monitoring stations and equipment in hazard-prone areas.	S and M	A, I and M	LGU, PAGASA
• Intensify public awareness of communities at risk about natural hazards associated with ITCZ, La Nina phenomenon and orographic effect	S and M	A, I and M	LGU, PAGASA, DILG, OCD-NDCC, MGB-DENR, PHIVOLCS
• Production and distribution of flash flood and landslide susceptibility maps to include map literacy and usage program for end users.	S and M	A, I and M	LGU, MGB-DENR, OCD-NDCC, DILG
• Periodic geo-hazard surveillance and inventory of infrastructures like bridges, roads	S and M	A, I and M	LGU, DPWH, DILG, DepEd

and buildings situated in harm's way			
• Construction standards for school-buildings used as evacuation centres	S and M	A, I and M	LGU, DepEd, DPWH, AFP 51st Bde-DND, BFP-DILG, DSWD
• Strict enforcement of anti-logging ban, deforestation and patrolling of logging activities	S and M	A, I and M	LGU, DENR, PNP-DILG, AFP-DND
• Reforestation projects and replication of "Puno ng Buhay" community program	S and M	A, I and M	LGU, DENR, DILG
• Enforcement of anti-squatting law, prohibition of encroachment of river channels and land-use plan implementation	S and M	A, I and M	LGU, HLURB, DENR, DOJ, PNP-DILG
• Enforcement of Building Code and inspection of housing structures and design	S and M	A, I and M	LGU, DPWH, BFP-DILG
• Complete rehabilitation medicine for survivors and disaster victims and improved medical services in the community	S and M	A, I and M	LGU, DOH, AFP-DND, PNRC, DSWD
• Dialogue between local scientists, experts and spiritual leaders for harnessing local values and beliefs for disaster reduction and recovery	S and M	A, I and M	LGU, PAGASA-PHIVOLCS-DOST, MGB-DENR, DSWD, local churches and religious sects
• Scholarship program for poor but smart and self-motivated children and young people	S and M	A, I and M	LGU, DepEd, DOST, DAR, DSWD, local churches and religious sects
• Intensify disaster preparedness programs i.e. household capability training, school materials and school-based mock drills	I, S and M	A, I, M and S	LGU, DILG, DSWD, DepEd, DOST, OCD-NDCC, PNRC, NGOs
• Incentives, tax rebates and safety insurance for local residents procuring family-owned emergency equipment and upgrading their safety protection	A, I and S	S and M	LGU, DILG, OCD-NDCC
• Eco-tourism projects to stir local economic vitality and improve livelihood base	S and M	A, I and M	LGU, DILG, DOT
• Practice sustainable upland farming systems i.e. `alley' farming	I, S and M	A , S and M	LGU, DA, DENR, DAR

• Optimize use of natural resources	I, S and M	A, I, M and S	LGU, DENR, DA, local traders, local churches and religious sects
• Family planning and healthcare programs	I, S and M	A, I, M and S	LGU, DOH, DSWD, DepEd, local churches and religious sects
• Crop diversification i.e. intercropping, interval planting dates, rice-fish farming systems	A, I, M and S	A, I, M and S	LGU, DA, DENR, DAR, Farmer's Association
• Post-harvest technology and food processing techniques i.e. preserving farm produce, banana or taro chip production, cassava flour making, fish or meat drying, etc.	A, I, M and S	A, I, M and S	LGU, DA, TLRC, DOST, NGOs, DepEd, local churches and religious sects
• Employment skills' diversification i.e. machinist, electrician, car or aircon. mechanic	A, I, M and S	A, I, M and S	LGU, TESDA, DOLE, DepEd
• Alternative income generation projects i.e. piggery, poultry, livestock raising, retail stores, catering or cooking	A, I, M and S	A, I , M and S	LGU, DA, DAR, DTI, NGOs, local churches and religious sects
• Consensus-building activities i.e. planning, decision-making process, consultation forum, policy formulation, development funding	I, M and S	A, I, M and S	LGU, DILG, DSWD, PNRC, OCD-NDCC, DBM
• Mainstream gendered roles in disaster preparedness, response, rehabilitation and mitigation	I, M and S	A, I, M and S	LGU, DILG, DA, DOH, DSWD, OCD-NDCC, PNRC, NGOs
•Integrate traditional mode of warning and communications into existing local DCC systems	I, M and S	A, I, M and S	LGU, PAGASA-PHIVOLCS-DOST, MGB-DENR, DOTC, OCD-NDCC, DSWD, PNRC
• Implement people's voluntarism and community-sharing schemes in all rehabilitation and development projects	I, M and S	A, I, M and S	LGU, DSWD, PNRC, OCD-NDCC, DPWH, local churches and religious sects
• Revitalize local disaster management committees with funding support, staff	I, M and S	A, I, M and S	LGU, DILG, OCD-NDCC,

development, and equipment upgrading			DBM, COA
• Development and upgrading of locally-based rescue teams equipped with emergency and safety tools	I, M and S	A, I, M and S	LGU, DILG, OCD-NDCC, DBM, COA
• Improve coordination and service delivery with transparent policies and procedures, and adherence of all concerned	I, M and S	A, I, M and S	LGU, DILG, DSWD, PNRC, OCD-DND, Foreign Aid Agencies, NGOs, local churches and religious sects
• Good governance in the allocation and distribution of disaster funds, resources and projects to communities at risks.	I, M and S	A, I, M and S	LGU, Foreign Aid Agencies, DILG, OCD-NDCC, DSWD, PNRC, NGOs, local churches and religious sects
• Manage political economy of disaster relief and rehabilitation with respect for community values and cultural norms.	I, M and S	A, I, M and S	LGU, Foreign Aid Agencies, OCD-NDCC, DILG, DSWD, PNRC, NGOs, local churches and religious sects

Legend: **Action Steps (AIMS)** = **A** – Allocate (funds and resources)
I – Initiate (lead the project or activity and/or commitment)
M – Monitor (manage and feedback)
S – Support (participate, co-ownership of activity)

The acronyms and abbreviations used in the foregoing table and other parts of this thesis can be read from a list on page xv.

5.2 Way Forward Action Steps. It is recommended that the National Disaster Coordinating Council of the Philippines undertake the following:

1. Re-formulate (if existing) or develop (if not existing) a Comprehensive Flash Flood and Landslide Disaster Risk Assessment Plan. This will include development of guidelines and measurement tools that will integrate hazard risk and community vulnerability assessments.

2. Conduct both national and local workshops to refine this Plan and the Guidelines for its implementation.

3. Allocate funds for this activity.

BIBLIOGRAPHY

Abigania, M.I.T., Alanis, P. & Javier, D. V. (2001). *Report of Investigation: Landslides, Lahars and Flash-flooding Associated with Typhoon "Nanang" November 6-8, 2001, Camiguin Island, Philippines.* Unpublished PHIVOLCS report, 11p with 31 figures.

Abramovitz, J. (2001). *Unnatural Disasters*. Worldwatch Paper 158, October 2001. Worldwatch Institute. Washington DC. www.worldwatch.org

Aday, L. (1996). Designing and Conducting Health Surveys: Comprehensive Guide. 3rd edition. Jossey-Bass Incorporated, Publishers. x+518 pp.

Aldridge, A. and Levine, K. (2001). Surveying the social world: principles and practice in survey research. Great Britain. Open University Press

Anderson Mary B. and Woodrow Peter J. (1989). Rising From the Ashes: Development Strategies in Times of Disasters. London: Intermediate Technology

Asian Disaster Preparedness Center (2005). Asian Urban Disaster Mitigation Program. www.adrc.or.jp/.../PDF_Presentations/10-1_ADPC_Urban-**Disaster**-Risk-Management_Arambepola.pdf

Atienza, Guillerma Jayne T. (2004). *"Recent Trends and Measures for Sediment-Related Disasters in the Philippines"* in: International Sabo Network, International Sabo Association.

Atlas Consolidated Mining and Development Corporation (1991). Preliminary Report on Ormoc City Flooding based on November 12, 1991 Inspection.

Axinn, William G., Fricke, Thomas E., and Thornton, Arland (1991). "the Micro-demographic Community-Study Approach: Improving Survey Data by Integrating the Ethnographic Method." In: Sociological Methods and Research, vol. 20, pp. 187-217.

Babbie, Earl R. (1998). The Practice of Social Research. 8th ed. Belmont, CA: Wadsworth Publishing Company, Inc.

Banville, D., Desrosiers, P., & Genet-Volet, Y. (2000). Translating Questionnaires and Inventories using a Cross-cultural Translation Technique. *Journal of Teaching in Physical Education, 19,* pp374-387.

BBC News (2005)

i. Katrina damage blamed on wetlands loss, by Tim Hirsch, BBC News, UK, viewed on 1 November, 2005 from <http://news.bbc.co.uk/1/hi/americas/4593852.stm

ii. Home pledges for Katrina victims, (2005), BBC News, UK, viewed on 13 September, 2005 from <http://news.bbc.co.uk/1/hi/world/americas/4242512.stm

BBC (2005). Asia-Pacific at a Glance: Countries Hit by Tsunami Disaster in: BBC World News last updated, Thursday, 22 December 2005. http://news.bbc.co.uk/2/hi/asia-pacific/4126019.stm

BBC (2008). Hurricane Katrina – Impacts in: BBC Weather Centre, Understanding Weather http://www.bbc.co.uk/weather/feautures/understanding/hurricane_katrina_impacts.shtml

Beer, Tom , *CSIRO* Environmental Risk Network, *CSIRO* Atmospheric Research, Apendale, Victoria 3195 Australia, 2003. *"Environmental Risk and Sustainability"* in: Risk Science and Sustainability, Tom Beer and Alik Ismail-Zadeh (eds). Kluwer Academic Publishers, Netherlands. pp. 39-61.

Berg, B. L. (1989). Qualitative Research: methods for the social sciences. Boston: Allyn and Bacon.

Berke, P.R., Beatley, T. (1997). After the Hurricane: Linking Recovery to Sustainable Development in the Caribbean. John Hopkins University Press, Baltimore, x+212 pp.

Black, T. (1999). Doing quantitative in the social sciences: an integrated approach to research design measurement and statistics. London:SAGE

Blaikie, P., Cannon, T., Davis, I. and Wisner, B (1994). At Risk: Natural Hazards, People's Vulnerability and Disasters. London: Routledge. x+284 pp.

Boer, de (1992). *Women and Empowerment*. Master thesis, School of Social Work, Wilfrid Laurier University, Waterloo.

Brace, Ian (2004). Questionnaire Design: How to Plan, Structure, and Write Survey Metrial for Effective Market research. London: Kogan. x+289pp.

Brislin, R. W. (1970). Back-Translation for Cross-Cultural Research. Cross-Cultural Psychology, 1, pp 185-216.

Brown, K.W., Cozby, P.C., Kee, D.W., & Worden, P.E. (1999). *Research Methods in Human Development,* 2d ed. Mountain View, CA: Mayfield. ISBN 1-55934-875-5

Brown, Malcolm (2002). Australia's Worst Disasters: The Newcastle Earthquake of 1989." Griffith Press.

Brown, James Dean (1996). Testing in language programs. Upper Saddle River, NJ: Prentice Hall Regents.

Buckle, Philip (1999). *"Re-defining Community and Vulnerability in the Context of Emergency Management"* in: The Australian Journal of Emergency Management vol. 13, no.4 summer 1999. Australian Emergency Management Institute. Mt. Macedon, Victoria 3441

Buckle, Philip, Marsh, Graham and Smale, Sydney (2001). Assessing Resilience and Vulnerability in the Context of Emergencies: Guidelines. Available at www.proventionconsortium.org/themes/default/pdfs/CRA/EMA_2001_meth.pdf

Buckle, Philip (2000). *"New Approaches to Assessing Vulnerability and Resilience"* in: The Australian Journal of Emergency Management vol. 15, no.2; pp8-14 March 2000. Australian Emergency Management Institute. Mt. Macedon, Victoria 3441

Buckle, Philip (2000). *"Community Vulnerability and Resilience to Disasters and Emergencies"* in: The Australian Journal of Emergency Management vol. 15, no.7 winter 2000. Australian Emergency Management Institute. Mt. Macedon, Victoria 3441

Burton, I., Kates, R., White, G.F. (1993). The Environment as Hazard. 2nd Edition. The Guilford Press, New York, NY. x+290 pp.

Cannon, Terry (2000). *"Vulnerability Analysis and Disasters"* in: Flood Hazards and Disasters, Dennis J. Parker (ed). London: Routledge.

Carter, W. Nick (1991). Disaster Mitigation in Asian and the Pacific. Asian Development Bank. Manila, Philippines, 1991. x+392 pp.

Carter, W. Nick (1992). Disaster Management: Disaster Manager's Handbook. Asian Development Bank. Manila, Philippines. X+425 pp.

Centre for Research and Epidemiology of Disasters (CRED, 2006). Catholic University of Louvain, Belgium. www.cred.be

Chester, David K. (2005). Theology and Disaster Studies: The Need for Dialogue. Journal of Volcanology and Geothermal Research. vol. 146, issue no. 4, September 1, 2005, pp. 319-328, Elsevier.

Costanza, R. *et al.* (1997). *"The Value of the World's Ecosystem Services and Natural Capital"* in: Nature 387, 253-260.

Costa, J. E., Schuster R. L. (1988). The Formation and Failure of Natural Dams. Geological Society of America Bulletin: vol. 100, no. 7, pp. 1054–1068.

Creswell, John W. (2003). *"Research Design, Qualitative, Quantitative and Mixed Methods and Approaches."* 2nd edition. Thousanna Oaks, Sage Publication.

Crudens, D. M. and Fell, R., (1997). Landslide Risk Assessment, Proceedings of the International Workshop on Landslide Risk assessment. Honolulu, 19-21 February 1997 (Rotterdam: Balkema).

Daag, Arturo S., Tungol, Norman, Peralta, Maximo and Cruz,Oskar (2006). Landslide and Flash flood Critical Rainfall Threshold Determination and Hazard Mapping: Terminal Report of the Study in Panaon Island, Southern Leyte and Surigao City. Department of Science and Technology, Philippines.

Darkoh, Michael and Rwomire, Apollo (2003). *Human Impact on Environment and Sustainable Development in Africa.* Ashgate Publishing Limited. England, x+530 pp.

Dunst, C. J., Trivette, C. M., & Deal, A. G. (1988). *Enabling and Empowering Families: Principles and Guidelines for Practice.* Cambridge, MA: Brookline Books.

Durnham, Ken (2001). "*The Application of Risk Management Principles to Municipal Emergency Practice"* in: The Australian Journal of Emergency Management, vol. 6, no. 2 Winter 2001. Australian Emergency Management Institute. Mt. Macedon, Victoria 3441.

Delaney, Patricia *et al*. (2004). "Weathering Natural Disasters – Refocusing Relief and Development through Improved Agriculture and Environmental Practices," Future Harvest Foundation and CARE, June 2004.

Development Management Inc. (DevMan, 1993). Disaster Management: The Ormoc City Experience. A Final Report in cooperation with Japan International Cooperation Agency (JICA).

Dey, Ian (1999). Grounding Grounded Theory: Guidelines for Qualitative Inquiry. San Diego, California: Academic Press. x+282pp.

Dey, Ian (1993). Qualitative Data Analysis: A User-friendly Guide for Social Scientist. London: New York, N.Y>: Routledge. x+282 pp.

Emanuel, K. (2005). "Increasing Destructiveness of Tropical cyclones over the Past 30 Years" in: Nature 436 (2005), pp 686-688.

Erskine, Wayne D. (2005). *Mass Movement Hazard Assessment Associated with Harvesting of the 1962 Age Class of Monterey Pine (Pinus Radiata D. Don) in Canobolas State Forest, New South Wales.* Forest Resources Research, Research Paper No. 39. NSW Department of Primary Industries, Sydney.

Etkin, David (1999)."Risk transference and related trends: driving forces towards more mega-disasters", in: Environmental Hazards 1 (1999) 69}75

Falk, Knud (2004). *"Building Community Resilience to Disaster in the Philippines,"* in: World Disasters Report 2004. International Federation of Red Cross and Red Crescent Societies; pp. 100-119.

Fischetti, M. (2001). Drowning New Orleans, Scientific American, October, 77-85

Fell R., P.J. Finlay, and P.K. Maguire (2000). The Relationship between the Probability of Landslide Occurrence and Rainfall. *Canadian Geotech. Journal*, *34*, pp. 811–824.

Fordham, Maureen (1999). "The Intersection of Gender and Social Class in Disaster: Balancing Resilience and Vulnerability" in: International Journal on Mass Emergencies and Disasters, vol. 17, no. 1.

Fraenkel, Jack R. and Wallen, Norman E. (1996). How to Design and Evaluate Research in Education. 3rd edition. New York: McGraw-Hill, Inc. (1996)

Frey, James H. (1989). “Chapter 2: Comparing Survey Methods,” in: Survey Research by Telephone. 2nd edition, pp. 27-55. Newbury Park, CA: Sage Publications

Gaillard, Jean-Christophe (2006). “Traditional Societies in the Face of Natural Hazards: The 1991 Mt. Pinatubo Eruption and the Aetas of the Philippines” in: International Journal of Mass Emergencies and Disasters. March 2006, vol. 24, no. 1, pp. 5-43. jean-cristophe.gaillard@ujf-grenoble.fr.

Gaillard, Jean-Christophe, Liamzon, C. C. and Villanueva, J. D. (2006). “Natural Disaster?” A retrospect into the causes of the late-2004 typhoon disaster in Eastern Luzon, Philippines. Environmental Hazards 7(2007) pp 257-270. www.elsevier.com/locate/hazards.

Gilbert, Claude (1995). *“Studying Disaster: A Review of the Main Conceptual Tools”,* in: International Journal for Mass Emergencies and Disasters. Vol. 13, no. 3 (November 1995): pp231-240.

Godillano, E. C. (2004). “*Gaano Kadalas ang Minsan?” Geospatial Technology in Disaster Prediction and Agriculture-Natural Resource Management.* Department of Agriculture-Bureau of Agricultural Research. x+26 pp. Manila, Philippines.

Handmer, John (2006). “American Exceptionalism or Universal Lesson? The Implications of Hurricane Katrina for Australia” in: The Australian Journal of Emergency Management, vol. 21, no. 1, February 2006. Australian Emergency Management Institute. Mt. Macedon, Victoria 3441.

Heijmans, Annelies (2001). ‘Vulnerability’: A Matter of Perception. Disaster Management Working Paper 4/2001. Benfield Greig Hazard Research Centre. University College of London. November 2001.

Hewitt, K. (1997). Regions of Risk: A Geographical Introduction to Disasters. Longman Harlow, London. x+ 387pp.

Inter-Agency Commmittee – Department of Environment and Natural Resources (2006). The17 February 2006 Barangay Guinsaugon, Southern Leyte: Report to the President of the Philippines. Malacanang Palace, Manila, Philippines.

International Federation of Red Cross and Red Crescent Societies (2004). Focus on Community Resilience: World Disasters Report 2004. x+233 pp. Kumarian Press Inc.

International Strategy for Disaster Reduction (2003). Living with Risk: Turning the Tide on Disasters towards Sustainable Development. A World Disaster Reduction Campaign Day, x+45 pp.

Japan Development Institute, Engineering Consulting Firms Association Japan and Development Management Inc. (1993). Final Report on Disaster Management: The Ormoc City Experience. February 1993. x+ pp.

Japan International Cooperation Agency – Department of Public Works and Highways (JICA-DPWH, 2001). Basic Study for Non-structural Disaster Prevention Measures for the Province of Camiguin, Philippines: Final Report. x+85 pp.

Japan International Cooperation Agency Survey Team (1992). Survey Report on Ormoc City Flood, 05 November 1991. Manila, Philippines.

Keiffer, C. (1984). Citizen empowerment: A developmental perspective. *Prevention in Human Services*, 3:16. pp. 9-35.

Kirschenbaum, Alan (2006). Families and Disaster Behaviour: A Reassessment of Family Preparedness" in: International Journal of Mass Emergencies and Disasters. March 2006, vol. 24, no.1, pp. 111-143.avik@tx.technion.ac.it

Krathwohl, D.R. (1993). Methods of educational and social science research: An integrated approach. New York: Longman.

UP-Ateneo Team (2006). *"Learning From A Thousand Lives: Lessons from the Guinsaugon Landslide."* Power-point presentation in the 19 April 2006 NDCC Meeting by the University of the Philippines-Manila Observatory Team. Camp Aguinaldo, Quezon City, Philippines.

Lagmay, A.M. A., Ong, J. B. T., Fernandez, D. F. D., Lapus, M. R., Rodolfo, R. S., Tegonciang, A. M. P.,Soria, J. L. A., Baliatan, E. G., Quimba, Z. L., Uichanco, C. L., Paguican, E. M. R., Remedio, A. R. C., Lorenzo, G. R. H., Valdivia, W. and Avila, F.B. (2006). *"Scientists Investigate Recent Philippine Landslide"* in: Eos, American Geophysical Union, vol. 87, no. 12, 12March 2006, pp 121-128.

Lay, T., Kanamori, H., Ammon, C., Nettles, M., Ward, S., Aster, R., Beck, S., Bilek, S., Brudzinski, M., Butler, R., DeShon, H., Ekström, G., Satake, K., Sipkin, S. (2005). The Great Sumatra-Andaman Earthquake of December 26, 2004, Science, 308, 1127–1133, doi:10.1126/science.1112250, 2005

Leone, Frederic and Gaillard, Jean-Christophe (1999). *"Analysis of the Institutional and Social Responses to the Eruption and the Lahars of Mount Pinatubo Volcano from 1991 to 1998 (Central Luzon, Philippines)"* in: GeoJournal 49: pp. 23-238. Kluwer Academic Publishers, 2000. The Netherlands.

Likert, R. (1932). *"A Technique for the Measurement of Attitudes".* Archives of Psychology. Volume 140 pp. 1-55

Lloyd, Julie (2007). Weather: The Forces of Nature that Shape Our World. A Paragon Book. Atlantic Publishing.

Lord, John (1997). Empowerment: Self in Community. A paper presented to the Empowerment Practice in Social work Conference. Faculty of Social work. University of Toronto, Canada. September 1997.

Lord, John and Hutchison P. (1993). The process of empowerment: Implications for theory and practice. *Canadian Journal of Community Mental Health*, 12:1. 5-22.

Lord, John (1991). *Lives in transition: The process of personal empowerment*. Ottawa: Secretary of State.

Lord, J. and McKillop-Farlow (1990). A Study of Personal Empowerment: Implications for Health Promotion. *Health Promotion*, 29(2): 2-8.

Massey, Douglas S., Alarcon, Rafael, Durand, Jorge, and Gonzalez, Humberto (1987). Return to Aztlan: The Social Process of International Migration from Western Mexico. Berkeley: University of California Press.

McDonald B. and Walker, R. (1975). Case Study and the Philosophy of Educational Research. Cambridge Journal of Education, vol. 5, no. 1, pp 2-10.

McMichael, A. J. (1997). *"Global Environmental Change and Human Population Health: Impact Assessment, Population Vulnerability, Research Priorities,"* in: Ecosystem Health, vol. 3, pp 200-210.

Mileti, D. (1999). *"Disasters by Design: A Reassessment of Natural Hazards in the United States".* Joseph Henry Press. Washington, D. C.

Miller, K. S. and Simile, C. (1992). They Could See Stars from Their Beds: The Plight of the Rural Poor in the Aftermath of Hurricane Hugo, Disaster Research Center, University of Delaware, Paper presented at the Society for Applied Anthropology Annual Meetings, Memphis, TN, March, 1992.

McEntire, David A. (1999).*"Sustainability or Invulnerable Development?"* in: The Australian Journal of Emergency Management, vol. 15, no. 1 autumn 1999. Australian Emergency Management Institute. Mt. Macedon, Victoria 3441.

Morales, Emilio, Camaclang, Marissa and Reyes, Gilberto (2001). The Cherry Hills landslide Tragedy. The 2nd Civil Engineering Conference in the Asian region, Tokyo, 2001.

MPC (1998). 1997 Mount Pinatubo Commission Annual Report. Life after Mt. Pinatubo: New Life, New Future. Clark Field, Pampanga, Philippines.

Municipal Planning and Development Office (2007). 2006 Annual Report of the Municipality of Saint Bernard, Southern Leyte.

Municipal Planning and Development Office (2007). Municipal Statistics and Profile of the Municipality of Saint Bernard, Southern Leyte.

Munich, Re. (1999). Reinsurance Company Website/ http://www.munichre.com.

Munich, Re. (1999). Flooding and insurance. Munich Reinsurance. x+77 pp.

National Disaster Coordinating Council (2007). Data Compilation on Philippines' Natural Calamities and Disasters from 1990 to 2006. Office of Civil Defense, Camp Aguinaldo, Quezon City, Philippines.

National Disaster Coordinating Council (2006). Data Compilation on Philippines' Natural Calamities and Disasters from 1990 to 2006. Office of Civil Defense, Camp Aguinaldo, Quezon City, Philippines.

National Disaster Coordinating Council (2006). Final Report on the Guinsaugon Landslide Incident in St Bernard, Southern Leyte dated March 22, 2006. Office of Civil Defense, Camp Aguinaldo, Quezon City, Philippines.

National Disaster Coordinating Council (2005). Final Report on the After-Effects of Destructive Tropical Cyclones "Unding", "Violeta", "Winnie"and "Yoyong"; Summary of Emergency Management Activities and On-going Rehabilitation Operations in regions 3 and 4 vol. 1. National Disaster Management File.

National Disaster Coordinating Council (2004). Philippines' Disaster Losses and Damages from 1970 to 2002. Office of Civil Defense, Camp Aguinaldo, Quezon City, Philippines.

National Disaster Coordinating Council (2004). "The Philippine Report on Disaster Reduction for the UN International Strategy for Disaster Reduction." August 2004. x+ 41 pp. Manila, Philippines.

Newhall, Christopher G. and Punongbayan, Raymundo S. (1996). Fire and Mud: Eruptions and Lahars of Mount Pinatubo, Philippines. PHIVOLCS, Quezon City. University of Washington Press, Seattle and London.

Ormoc Task Force Scientific Study Group-Department of Science and Technology (1991). Scientific Assessment Report of Ormoc City Flood Report on 05 November 1991.

Oxley, Marcus (2005). A Conceptual Framework for Disaster Risk Reduction: Turning Practice into Policy. A power point presentation to the UN World Conference on Disaster Reduction, 18-22 January 2005, Kobe, Hyogo, Japan.

Parahoo, K (1997). Nursing research: principles, process and issues. London: McMillan Basingstoke.

Philippine Institute of Volcanology and Seismology (2004). *Hibok-hibok Volcano*, www.phivolcs.dost.gov.ph\Hibok-hibok Volcano.htm.

Philippine Atmospheric, Geophysical and Astronomical Services Administration (2007). Satellite Photographs of Typhoons, www.pagasa.dost.gov.ph.

Philippine Atmospheric, Geophysical and Astronomical Services Administration (2004). Satellite Photographs of Typhoons, www.pagasa.dost.gov.ph.

Philippine Atmospheric, Geophysical and Astronomical Services Administration (1991). Status Report on Typhoon "Uring" as of November 30,1991.

Punongbayan, R.S., Tungol, N. and Daligdig, J. (2004). Flash Floods in the Philippines. A *powerpoint presentation in the 21 December 2004 NDCC-Technical Management Group Meeting*. Manila, Philippines

Rapport, D.J., Costanza R., and McMichael, A. J. (1998). "*Assessing Ecosystem Health"* in: TREE vol. 13, no. 10 October 1998. Elsevier Science Ltd.

Republic of the Philippines (1978). Presidential Decree 1566, *"An Act Establishing the Philippines' National Disaster Control Program and Community Disaster Preparedness.* Manila, Philippines.

Republic of the Philippines (1991). Republic Act 7160 or known as "*The Local Government Code of 1991"*. Manila, Philippines.

Rapp, C. A. (1993). Theory, principle, and methods of strength model of case management. In M. Harris & H. Bergman (Eds.), *Case management: Theory and Practice*. Washington, D.C.: American Psychiatric Association

Rappaport, J. (1987) Terms of empowerment/Exemplars of prevention: Toward a theory for community psychology. *American Journal of Community Psychology,* 15(2): 121-148.

Robson, C. (1996). Real world research. Oxford: Blackwell.

Salter, John (1999). *Risk Management in the Emergency Management Context* in: Risk Management for Safer Communities, Smith, D, J. (ed). Melbourne.

Schmuck, Hanna (2000). "'An Act of Allah': Religious Explanations for Floods in Bangladesh as Survival Stratgey," in: International Journal for Mass Emergencies and Disasters. Vol 18, no. 1, March 2000, pp85-96.

Schutt, Russel K. (1996). Investigating the Social World: the Process and Practice of Research. Thousand Oaks, CA: Pine Forge Press.

Sekaran, Uma (2000). Research Methods for Business: A Skill-Building Approach. Third Edition. John Wiley and Sons, Inc. http://www.wiley.com/college.

Simon, Julian L. (1985). Basic Research Methods in Social Science. 3rd ed. New York: Random House.

Solomon, S., D. Qin, M.Manning, R.B.Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P.Whetton, R.A.Wood and D. Wratt (2007): Technical Summary. *Climate Change 2007: The Physical Science Basis. Contribution of WorkingGroup I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*

Streiner DL, Norman GR (1995). Health measurement scales: a practical guide to their development and use. 2nd ed. London: Oxford University Press; 1995.

Talbot, L. A. (1995). Principles and practice of nursing research. Sydney: Mosby.

Tima, Raffy Jr. (2006). "Lessons from History: The Philippine Experience of Mount Pinatubo's Eruption", in: Southeast Asian Press Alliance (SEAPA)

Times Picayune (2005)

i. Times Picayune Staff Journalist (2005), 'Hurricane Unemployment Tally Blitzes Louisiana Economy, 26 October 2005, accessed from http://bizneworleans.com/109+M53af711f49a.html

ii. Perstein, M (2005), '45 Cops AWOL in Storm are Fired', 29 October 2005, accessed from http://www.nola.com/news/t-p/frontpage/index.ssf?/base/news-4/1130573437302830.xml

Total Action Centre (2004). A Working Paper on Reducing Poverty in New Orleans, Total Community Action. New Orleans. http://www.totalcommunityaction.com/pdf/TCAPovertyReduction.pdf

Tungol, Norman. M. and Regalado, T. (1996). *"Rainfall, Acoustic Flow Monitor Records and Observed Lahars of the Sacobia River in 1992"* in: Fire and Mud, R. S. Punongbayan and C. G. Newhall (eds). University of Washington Press, Seattle and London, p. 435-447.

Twigg, John (2001). *"Physician Heal Thyself? The Politics of Disaster Mitigation"*. Disaster Management Working Paper 1. Available online at: http:// www.anglia.ac.uk/geography/radix.htm.

UNDP Report (2004). Reducing Disaster Risk: A Challenge for Development. United Nations Development Programme, Bureau for Crisis Prevention and Recovery. One United Nations Plaza. New York, USA. www.undp.org/bcpr

Vallerand, Robert J. (1989). *Toward a Methodology for the Trans-Cultural Validation of Psychological Questionnaires: Implications for Research in the French Language.* Canadian Psychology. October 9, 1989. Vol 30 (4), pp. 662-680.

Varnes, D. J., and Cruden, D. M. (1996). Landslide Types and Processes. In Turner, A. K. and Schuster, R. L. (Editors), Landslides: Investigation and Mitigation: Transportation Research Board, Special Report, Vol. 247, pp. 36–75.

Vaus de, D. A. (1991). Surveys in Social Research. London: George Allen and Unwin.

Vijver, Fons van de and Leung, Kwok (1997). Methods and Data Analysis for Cross-Cultural Research. Cross-Cultural Psychology. x+186 pp.

Washington Post Staff Journalist, (2005), 'Investigators Link Levee Failures to Design Flaws', Washington Post, accessed on 24 October, 2005 from http://www.washingtonpost.com/wpdyn/content/article/2005/10/23/AR2005102301200_pf.html

Watson, John T., Gayer, Michelle and Connoly, Marie A. (2007). Epidemics after Natural Disasters. Emerging Infectious Diseases Journal, vol.13, no.1, January 2007. Center for Disease Control and Prevention.

Watt, A. & S. Rodmell (1988). Community involvement in health promotion: progress or panacea? *Health Promotion*, 2(4): 359-367.

Weiss, Robert S. (1994). Learning from Strangers. New York: The Free Press.

White,G.F., R.W.Kates and I. Burton, (2001). Knowing Better and Losing Even More: The Use of Knowledge in Hazards Management. *Environmental Hazards*, **3**, 81-92.

Wongsri, N. Cantwell, R. and Archer, J. (2003). The strategic Flexibility Questionnaire- a survey in Thai tertiary students. Paper submitted at the 10th Conference of the European Association for research and learning and instruction, Italy.

Woodfields Consultants, Inc. and Earth Science Co., Ltd. (2003). *Final Report: Basic Study on Disaster Prevention and Reconstruction Project for Camiguin Island,* 57p with 29 figures

Woods, N. F. (1998). "Assessing nursing research measure reliability and validity," in: N. F. Woods and M. Catanzaro (eds.), Nursing research: theory and practice. St. Louis: Mosby.

World Bank (2004). *"Enhancing Poverty Alleviation Through Disaster Reduction".* Inkwell Publishing Company, Inc., Manila. x+80 pp

World Bank and Pacific Consultants International (2005). *Natural Disaster Risk Management in the Philippines, Reducing Vulnerability: Follow-On Study*. Manila, Philippines.

Wray, Ricardo, Rivers, Jennifer, Whitworth, Amanda and Clements, Bruce (2006). "Public Perceptions about Trust in Emergency Risk Communications: Qualitative Research Findings" in: International Journal of Mass Emergencies and Disasters. March 2006, vol. 24, no. 1, pp. 45-75. wray@slu.edu.

Yin, Robert K. (2003). Case Study Research: Design and Methods. Applied Social Research Methods Series. 3rd edition, volume 5. x+181pp.

APPENDIX 1

Flash Flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience

SURVEY QUESTIONNAIRE

Demographic Information

1. What is your gender? □ Male □ Female
(Interviewer may check appropriate box)

2. What is your age group? *(Please circle. If possible, please specify age in the space provided)*

Less than 20 years __________
21 - 30 years __________
31 - 40 years __________
41 – 50 years __________
51 – 60 years __________
Above 60 years __________

3. What is the highest level of education you have completed?
(Please check – include current studies)

□ none
□ Elementary
□ High School
□ Vocational
□ Some College
□ College Graduate
____

4. Do you have any dependents such as:
(Please check appropriate box - Indicate the number)

Parents □ ________
Grandparents □ ________
Spouse □ ________
Children: Boys □ ________
Girls □ ________
Others □ ________
None □ ________

What are the ages of your dependents? ____________________________

5. Which community do you live in now? *Barangay* _______________________
For how many years? *(Please circle and indicate the number of years of stay*)

1 year and below _________
2 to 4 years ________
Between 4 to 6 ________
Between 6 to 8 ________
Between 8 to 10 ________
More than 10 ________
No response _________

Geographic Location and Built Environment

6. What is the type of housing you dwell in?

(Please check appropriate box – indicate if others)
- □ Nipa & Bamboo
- □ Nipa & Wood
- □ Bungalow
- □ Apartment
- □ Others ________

7. How many floor levels does your housing unit have? *(Please check appropriate box)*
- □ One floor
- □ Two levels
- □Three levels
- □ No answer

8. What specific location describes your dwelling place? *(Please check appropriate box – indicate if* others)
- □ along road/highway
- □ Interior
- □ Flood-prone
- □ Riverside
- □ Slope or Toe of Hill
- □ Coastal area
- □ Rice field
- □ Others _______

9. What is the status of your housing tenure? *(Please check appropriate box – indicate If* others)
- □ Home-owner
- □ Renting
- □ Under lease
- □ Others

Livelihood Sufficiency and Economic Base

10. What is your major occupation or livelihood? ________________________
- □ None
- □ No response

10a. *Occupation/Livelihood of your spouse?* _____________________
- □ None
- □ No response

11. What are your other sources of income? *(Please check appropriate box – specify if –* other occupation)

□ other occupation __________________________________

□ Support of children	□ Laundrywoman
□ Sale of livestock/s	□ *Motorela* operator
□ Honorarium from barangay	□ Carpentry
□ Fishing	□ Agricultural labour
□ Small business	□ None
□ Coconut plantation	□ No answer
□ Catering/cook	

□ Farming, what is the tenurial arrangement *(if farm-lot not owned)?*____

____

12. What is your household *(HH)* income?
(Please circle appropriate answer and indicate closest estimates)

No answer □
PhP 3,000 or less __________
PhP 3,001 – 6,000 _________
PhP 6,001 – 9,000 __________
PhP 9001 – 12,000 _________
PhP 12,001 – 15,000 _________
Above PhP 15,000 _________

12a. Before the disaster, was your household income sufficient for your normal day-to-day consumption? If Yes or No, why? ____________________________________
____
____

Psycho-Social and Cultural Attributes

13. What household *(HH)* assets do you currently own? *(Please check appropriate boxes, and specify* if others)

- □ Vehicle
- □ Motorcycle
- □ Bicycle
- □ Television
- □ Transistor radio
- □ Landline Telephone
- □ Cell/mobile phones
- □ Hand radio
- □ Fire extinguisher
- □ Whistle
- □ Computer
- □ Internet connection
- □ *Salbabida*
- □ Flashlight
- □ Rope
- □ Life jacket
- □ Banca (canoe)
- □ Megaphone
- □ Axe or bolo
- □ Others ___________

14. What animals do you currently own? *(Please check appropriate box – if possible, indicate the number of animals)*

- □ Carabao _____
- □ Cow _____
- □ Chicken _____
- □ Ducks _____
- □ Geese _____
- □ Goat _____
- □ Dog _____
- □ Pigeon _____
- □ Quail _____
- □ Others _____

15. What skills do you possess? *(Please check as many apply – specify if* others)

- □ Swimming
- □ Life saving (drowning person)
- □ First-Aid
- □ Keeping documents
- □ Driving vehicle
- □ Mobilizing people
- □ Resolving conflict
- □ Public speaking
- □ Others ____________________

16. What are the fears of the family? *(Please check as many apply – specify if* others)

- □ getting sick
- □ Typhoon, flood, big waves,
- □ Landslide
- □ Family break-up/extra-marital affair
- □ Loss of housing; house collapsing
- □ Accident
- □ Loss of job/economic difficulty
- □ Logs hitting the house
- □ Family getting into trouble
- □ Children not being able to go to school
- □ Quarrel and conflict in the area
- □ volcanic eruption
- □ Lack of food/other needs
- □ Sorrow, sadness, worries
- □ Vices of husbands
- □ Damages to crops
- □ Death in the family
- □ others __________
- □ No answer

16a. After the disaster, how would you describe your `value system in life' in terms of material possessions and human life? ___________________________________

____
____
____

Community Counter-Disaster Capacity Assessment

For the next series of statements, please circle the most appropriate coded response:

(6) Strongly Agree
(5) Agree
(4) Neither Agree nor Disagree
(3) Disagree
(2) Strongly Disagree
(1) Don't Know

17. *"Understanding of Disaster"*

a)	Disaster is related to natural calamity	**6**	**5**	**4**	**3**	**2**	**1**
b)	Disaster means causing damage, danger, threats, tragedy	**6**	**5**	**4**	**3**	**2**	**1**
c)	Disasters are unexpected events	**6**	**5**	**4**	**3**	**2**	**1**
d)	Disaster is related to poverty, vulnerability	**6**	**5**	**4**	**3**	**2**	**1**
e)	Disaster is related to human-made activity	**6**	**5**	**4**	**3**	**2**	**1**
f)	Disaster is God's act or punishment	**6**	**5**	**4**	**3**	**2**	**1**

18. What disasters have you experienced in the last three years? *(Please check as many as apply – specify if* others).

- □ Typhoons/Strong wind
- □ Flooding/waves

□ Fire
□ Vehicular accident
□ Crop infestation
□ Earthquake
□ Others _________
□ No answer

19. What are the causes of disasters? *(Please check as many as apply – specify if* others).

□ Heavy rain, buhawi, natural force
□ Illegal logging/cutting of trees/denuded forest
□ God's will
□ Accidents, human-made
□ Poverty, inequity
□ Do not know
□ Others
□ No answer

19a. Any suggestion about disaster subject/s or topics which you want to be discussed or included in your barangay seminars or training? _________________
____
____

For the next series of statements, please circle the most appropriate coded response:

(6) Strongly Believe
(5) Believe
(4) Neither Believe nor Doubtful
(3) Doubtful
(2) Strongly Doubtful
(1) Don't Know

20. The following are reliable or effective sources of advisories and alert systems for incoming typhoon/s *(for St. Bernard, this refers to the disaster on 17 Feb 06):*

a) Radio	**6**	**5**	**4**	**3**	**2**	**1**
b) Television	**6**	**5**	**4**	**3**	**2**	**1**
c) Observation of the wind, rain, clouds, sea, thunder	**6**	**5**	**4**	**3**	**2**	**1**
d) Weather Bureau; PAGASA	**6**	**5**	**4**	**3**	**2**	**1**
e) Seasonality (July-September)	**6**	**5**	**4**	**3**	**2**	**1**
f) Animal behaviour; crows flying, birds on the shore	**6**	**5**	**4**	**3**	**2**	**1**
g) Through neighbours; warning by Barangay Officials	**6**	**5**	**4**	**3**	**2**	**1**

h) Newspaper/s	**6**	**5**	**4**	**3**	**2**	**1**
i) Information drive/s	**6**	**5**	**4**	**3**	**2**	**1**

21. The following are good warning indicators or alert systems for flooding:

a) Typhoon, continuous rain	**6**	**5**	**4**	**3**	**2**	**1**
b) Increasing water level, overflowing of the irrigation canal	**6**	**5**	**4**	**3**	**2**	**1**
c) Change in the colour of the water	**6**	**5**	**4**	**3**	**2**	**1**
d) River flowing with debris, the sound of rolling stones	**6**	**5**	**4**	**3**	**2**	**1**
e) The sound of the river	**6**	**5**	**4**	**3**	**2**	**1**
f) Soil smells muddy/bad odour	**6**	**5**	**4**	**3**	**2**	**1**
g) Changing colour of the sky	**6**	**5**	**4**	**3**	**2**	**1**
h) Verbal through Barangay Officials and neighbours	**6**	**5**	**4**	**3**	**2**	**1**
i) Crawling snails/molluscs	**6**	**5**	**4**	**3**	**2**	**1**
j) Seasonality (December-February)	**6**	**5**	**4**	**3**	**2**	**1**
k) Strong wind from the mountain	**6**	**5**	**4**	**3**	**2**	**1**
l) Radio	**6**	**5**	**4**	**3**	**2**	**1**
m) Television	**6**	**5**	**4**	**3**	**2**	**1**

22. The following are effective warning and communication systems:

a) Bandilyo or verbal warning by neighbours & Barangay officials; house to house	**6**	**5**	**4**	**3**	**2**	**1**
b) Handheld radio & telephone	**6**	**5**	**4**	**3**	**2**	**1**
c) Radio	**6**	**5**	**4**	**3**	**2**	**1**
d) Warning devices in danger zones	**6**	**5**	**4**	**3**	**2**	**1**

e) Television	**6**	**5**	**4**	**3**	**2**	**1**
f) Monitoring water levels/watchers	**6**	**5**	**4**	**3**	**2**	**1**
g) Keeping away from hazard-prone areas	**6**	**5**	**4**	**3**	**2**	**1**
h) Church bells	**6**	**5**	**4**	**3**	**2**	**1**
i) Red Cross	**6**	**5**	**4**	**3**	**2**	**1**
j) Meetings and consultative discussion	**6**	**5**	**4**	**3**	**2**	**1**
k) None	**6**	**5**	**4**	**3**	**2**	**1**
l) Waiting	**6**	**5**	**4**	**3**	**2**	**1**

*22a. Any suggestion/s about improving warning systems, advisories and communication mechanism so as to build safer communities?*_______________

____

____

For the next series of statements, please circle the most appropriate coded response:

(6) Strongly Agree
(5) Agree
(4) Neither Agree nor Disagree
(3) Disagree
(2) Strongly Disagree
(1) Don't Know

23. Preparedness Activities and Amenities for Tropical Cyclones.

a) Secure and prepare things	**6**	**5**	**4**	**3**	**2**	**1**
b) Supplies, equipment, save money *(means stockpiled firewood or cooking gas, drinking water, medicines, first-aid kits, flashlight/torches, batteries, ropes, cash on hand).*	**6**	**5**	**4**	**3**	**2**	**1**
c) Prepare for evacuation and keep family in safe place/s	**6**	**5**	**4**	**3**	**2**	**1**
d) Being alert, vigilant, calm, presence of mind, positive attitude	**6**	**5**	**4**	**3**	**2**	**1**

e) Pray	**6**	**5**	**4**	**3**	**2**	**1**
f) Do not sleep, observe and monitor the surroundings *(refers to psycho-social preparedness skills or required behaviour or household coping mechanism to an impending threat)*	**6**	**5**	**4**	**3**	**2**	**1**
g) Store food	**6**	**5**	**4**	**3**	**2**	**1**
h) Develop skills and awareness of disaster management and rescue operations	**6**	**5**	**4**	**3**	**2**	**1**
i) Secure banca/animals in safe places	**6**	**5**	**4**	**3**	**2**	**1**
j) Strengthen the house	**6**	**5**	**4**	**3**	**2**	**1**
k) Clear waterways/canal/install seawall	**6**	**5**	**4**	**3**	**2**	**1**
l) Warn neighbours, coordinate with Barangay officials	**6**	**5**	**4**	**3**	**2**	**1**
m) Active participation during disaster	**6**	**5**	**4**	**3**	**2**	**1**
n) Staying in the house	**6**	**5**	**4**	**3**	**2**	**1**
o) Having vehicle or transportation	**6**	**5**	**4**	**3**	**2**	**1**
p) Hazard mapping	**6**	**5**	**4**	**3**	**2**	**1**
q) Felling trees that can cause destruction	**6**	**5**	**4**	**3**	**2**	**1**

23a. Any suggestion/s to increase household and community preparedness?

____

____

____

24. Have you experienced staying in evacuation centres? □ Yes □ No
 If yes, when? ____________________ and where? ________________________

25. Duration of stay in the evacuation centres? _____________________________

For the next series of statements, please circle the most appropriate coded response:

(6) Strongly Agree

(5) Agree
(4) Neither Agree nor Disagree
(3) Disagree
(2) Strongly disagree
(1) Don't know

26. Problems of Women in the Evacuation Centres

a) None	**6**	**5**	**4**	**3**	**2**	**1**
b) cannot sleep, discomfort	**6**	**5**	**4**	**3**	**2**	**1**
c) worried about thieves, house, children	**6**	**5**	**4**	**3**	**2**	**1**
d) No food to cook, lack of food	**6**	**5**	**4**	**3**	**2**	**1**
e) Lack of sanitation facilities	**6**	**5**	**4**	**3**	**2**	**1**
f) Inadequate water	**6**	**5**	**4**	**3**	**2**	**1**
g) Children getting sick	**6**	**5**	**4**	**3**	**2**	**1**
h) Overcrowding, noise	**6**	**5**	**4**	**3**	**2**	**1**

27. Problems of Men in the Evacuation Centres

a) Worried about things left in the house	**6**	**5**	**4**	**3**	**2**	**1**
b) Cannot sleep; discomfort	**6**	**5**	**4**	**3**	**2**	**1**
c) Worries of prolonged disaster	**6**	**5**	**4**	**3**	**2**	**1**
d) No problem	**6**	**5**	**4**	**3**	**2**	**1**
e) Lack of clothes and personal belongings	**6**	**5**	**4**	**3**	**2**	**1**
f) Lack of food	**6**	**5**	**4**	**3**	**2**	**1**
g) No work and income	**6**	**5**	**4**	**3**	**2**	**1**

27a. Any suggestion/s about improving evacuation centres and management?

____
____
____
____

28. What were your losses due to disasters? *(Please check appropriate box – specify, if* others)

- □ Farmlands, crops, decreased production and income
- □ Animals & farm implements
- □ Housing assets
- □ *Banca*, machines, tools, fish nets, motorcycle
- □ Destroyed houses
- □ Clothing & personal effects
- □ Goods at sari-sari retail store
- □ Death of relatives
- □ Others ________________________________
- □ No answer

29. What measures were undertaken to recover the losses? *(Please check appropriate box – specify if* others)

- □ No answer
- □ No action done
- □ Having self-confidence and self-reliance
- □ Asked assistance from parents and relatives
- □ Engaged in alternative income
- □ Assisted by the Department of Social Welfare and Development
- □ Bought new items
- □ Neighbours helped each other
- □ Pray
- □ Save money
- □ Debris logs made into lumber
- □ Others _________________________________

29a. *Any suggestion/s to facilitate rehabilitation or recovery from the losses?*
____
____
____
____

For the next series of statements, please circle the most appropriate coded response:

(***6) Strongly Agree***
(5) Agree
(4) Neither Agree nor Disagree
(3) Disagree
(2) Strongly Disagree
(1) Don't Know

30. Suggestions to Reduce or Mitigate Disasters

a) Prepare, have tools and equipment **6 5 4 3 2 1**

b) Keep banca & things in safe places	**6**	**5**	**4**	**3**	**2**	**1**
c) Stop cutting trees, plant trees & raise environmental awareness	**6**	**5**	**4**	**3**	**2**	**1**
d) Keep people alert & monitor situation	**6**	**5**	**4**	**3**	**2**	**1**
e) Prayer & value formation activities	**6**	**5**	**4**	**3**	**2**	**1**
f) Clear and widen canals	**6**	**5**	**4**	**3**	**2**	**1**
g) Active involvement in planning & activities for disaster mitigation and preparedness	**6**	**5**	**4**	**3**	**2**	**1**
h) Regulate/Prohibit settlement along the coast/river	**6**	**5**	**4**	**3**	**2**	**1**
i) Sustainable farming & cropping systems	**6**	**5**	**4**	**3**	**2**	**1**
j) Repair & construction of flood control dikes	**6**	**5**	**4**	**3**	**2**	**1**
k) Establish safe & adequate evacuation centres	**6**	**5**	**4**	**3**	**2**	**1**
l) Organize and equip community for preparedness	**6**	**5**	**4**	**3**	**2**	**1**
m) Proper waste disposal and recycling	**6**	**5**	**4**	**3**	**2**	**1**
n) Enforce forestry & anti-logging laws	**6**	**5**	**4**	**3**	**2**	**1**
o) Strengthen the Barangay Disaster Coordinating Council; make functional with funding support	**6**	**5**	**4**	**3**	**2**	**1**

30a. Any further comment/s or suggestion/s to reduce or mitigate disasters in your community? ____

____

____

APPENDIX 2(a)

The UNIVERSITY of NEWCASTLE
AUSTRALIA

Form HE2:1/05

HUMAN RESEARCH ETHICS COMMITTEE

Certificate of Approval for a research project involving humans

Applicant

Chief Investigator/Project Supervisor: (First named in application)	*Professor Wayne Erskine*
Co-Investigators/Research Students:	*Dr Salim Momtaz* *Mr Edgardo J Ollet*
Project Title:	*Flash-flood and landslide disasters in the Philippines: Reducing vulnerabilities towards community resilience*

In approving this project, the Human Research Ethics Committee (HREC) is of the opinion that the project complies with the provisions contained in the *National Statement on Ethical Conduct in Research Involving Humans, 1999*, and the requirements within this University relating to human research.

Details of Approval

HREC Approval No: *H-365-0207*	**Date of Approval:** *21 February 2007*
Approval valid for: *5 years, or until project ceases, whichever occurs first.*	**Progress reports due:** *Annually*

NOTE: Approval is granted subject to the requirements set out in the attached document *Approval to Conduct Human Research*, and any additional comments or conditions noted below.

21 February 2007
Approved.
The Committee ratified the approval granted by the Chair on 14 December 2006, which was subject to further clarifications regarding the use of the general notice of invitation, Information Statements and Back-up Plan (Participant Distress). A response was subsequently received and accepted.

Signed for the Committee: ______

Ms Ruth Gibbins
Human Research Ethics Officer (Acting)

APPENDIX 2(b)

HUMAN RESOURCE SERVICES
UNIVERSITY SERVICES DIVISION
Mr Ian Pike
Director

Contact Person: Ms Melissa Musicka
Health and Safety
Telephone: (02) 4921 6846
Facsimile: (02) 4921 6982
Email: Melissa.Musicka@newcastle.edu.au

TO:	**Prof Wayne Erskine, School of Environmental and Life Sciences**
COPY TO:	Dr S Momtaz, School of Environmental and Life Sciences Mr E Ollet, School of Environmental and Life Sciences Ms R Gibbins, HREC (Human Research Ethics Committee) Ms J Humphris, Senior Contracts Officer, Insurance
FROM:	Ms M Musicka, Laboratory/Research Safety Officer
DATE:	13th December, 2006
SUBJECT:	SAFETY CLEARANCE

I wish to advise that the following Research Project has been granted safety clearance. Based on the information received with your application we are satisfied that appropriate controls have been implemented for the hazards identified. If there is any variation to the protocol that affects the safety outcomes an additional application for safety clearance is necessary.

PROJECT TITLE	HOME VISIT/ FIELDWORK	CHEMICAL	BIOSAFETY	RADIATION	GRANTING BODY
Flash-flood and Landslide Disasters in the Philippines: Reducing Vulnerability Toward Community Resilience REF NO 136/2006 (Research Office Ref - NA)	APPROVED (Philippines 2007)	N/A	N/A	N/A	Unfunded

In order to comply with the OHS Act 2000 Chief Investigators must ensure that all, reasonably foreseeable, occupational health and safety risks arising out of their research activities are effectively controlled. A risk assessment must be completed to achieve this control. Effective controls follow on through the elimination (preferable), or minimisation, of these risks. Risk assessments are only validated once they have been signed and dated by the author and authorising supervisor. They must be reviewed annually and the review process needs to be documented (signed and dated).

Where appropriate, suggested control measures include (but are not limited to):

- effective site orientation of all personnel to their work area and equipment, first-aid locations, and emergency procedures and equipment
- written standard operating procedures (SOP's) for all hazardous operations (with appropriate records)
- training in SOP's for all personnel engaged in hazardous operations (with appropriate records)

If you have any enquiries in relation to this safety clearance (implications) please do not hesitate to contact me.

Melissa J Musicka

MS M MUSICKA
LABORATORY/RESEARCH SAFETY OFFICER

rps2006(136)2006

The UNIVERSITY of NEWCASTLE AUSTRALIA

APPENDIX 3

The UNIVERSITY of NEWCASTLE
AUSTRALIA

Professor Wayne Erskine
Chair in Natural Resource Management

School of Environmental and Life Sciences
Ourimbah Campus, University of Newcastle
PO Box 127
Ourimbah NSW 2258
Australia
Telephone: 02 4348 4152
Fax: 02 4349 4565
Email: Wayne.Erskine@newcastle.edu.au

20 December 2006

(Ret,) MGen Glen N. Rabonza, AFP
Administrator, Office of Civil Defense and
Executive Officer, National Disaster Coordinating Council
General Camp Emilio Aguinaldo, Quezon City
Philippines

Dear Administrator Rabonza

Mr. Edgardo Jaucian Ollet is conducting research, entitled ***"Flash-flood and Landslide Disasters in the Philippines: Reducing Vulnerabilities and Improvements on Community Resilience,"*** as part of his Master of Science in Sustainable Resource Management under the supervision of myself and Dr. Salim Momtaz from the School of Environmental and Life Sciences of the University of Newcastle, Australia.

Studies on previous flash-flood and landslide disasters (Ormoc City in 1991, Camiguin Island in 2001, Panaon Island in 2003, and Quezon in 2004) have shown the vulnerability of Philippine communities from these natural hazards as influenced by man-made causes. The impacts and disaster recurrence are worth investigating particularly in the light of the February 17, 2006 flash-flood and landslides in the municipality of Saint Bernard, Southern Leyte. Understanding the causes, behaviour, distribution and environmental effects of these phenomena may reduce human casualties and protect lives and properties.

This study is concerned with enhancing community resiliency to disasters by identifying important issues, gaps, policy options and suggestions which may have effect on you and your community. It is also designed to identify the root causes of the ecological and human vulnerabilities to disaster; how can a community reduce its adverse impacts; what preparation can be done to respond adequately to such hazard risks. It is hoped that the results of this study may yield useful information and provide innovative strategies for policymakers, service providers and other communities in similar situations in the future.

Part of the whole study is a social survey to be conducted for the potential participants from *Barangays Guinsaugon, Ayahag, Nueva Ezperanza*, and *Sug-angon* of Saint Bernard, Southern Leyte which was affected by the recent flash-flood and landslides.

We would very much appreciate your support on this study by authorizing Mr. Ollet access to important data and reports related to the research project in your agency.

Also, your official endorsement of this undertaking to the other member- agencies of the National Disaster Coordinating Council (NDCC) can facilitate the gathering of valuable information and data to realize the objectives of this study. More importantly, Mr. Ollet will need your assistance for a workstation, some administrative and technical support in your Central Office, as well as, in the regional offices that cover the different study areas for security and monitoring purposes. Please find the enclosed fieldwork schedule of activities to be undertaken in the Philippines by Mr. Ollet.

Thank you for your valuable time and assistance. Please do not hesitate to contact me, should the need arise.

With warm regards.

Yours sincerely,

Wayne Erskine

Professor Wayne Erskine

APPENDIX 4(a)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

MAR 07 2007

DIRECTOR HORACIO RAMOS
Mines and Geosciences Bureau
Department of Environment and Natural Resources
Agham Road, Quezon City

Dear Director Ramos:

The NDCC through the Office of Civil Defense is initiating a project on disaster vulnerability index (DVI) on selected areas: Ormoc City, Panaon Island, Saint Bernard, Camiguin Island, and REINA. The initial output may yield scientific assessment, computation techniques and indicative vulnerability mapping vital for disaster operations and emergency management.

On this regard, may we request for shaped files and/or raster format digital maps to include among others, slope (elevation), geological data, lifelines, infrastructure and other necessary data of hazard vulnerability for these pilot areas.

Our researcher, Mr. **Edgardo J. Ollet**, a Civil Defense Officer of this Office will coordinate with you on these matters. Kindly assist him on necessary information and data that will ensure the success of this undertaking.

Your usual cooperation and support on disaster management and operations are highly appreciated.

With warm regards.

Very truly yours,

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
Telephone: (+632) 911-5061-64, 912-5668

APPENDIX 4(b)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

MAR 07 2007

DIRECTOR ROGELIO N CONCEPCION
Bureau of Soils and Water Management
Department of Agriculture
Elliptical Road, Diliman, Quezon City

Dear Director Concepcion:

The NDCC through the Office of Civil Defense is initiating a project on disaster vulnerability index (DVI) on selected areas: Ormoc City, Panaon Island, Saint Bernard, Camiguin Island, and REINA. The initial output may yield scientific assessment, computation techniques and indicative vulnerability mapping vital for disaster operations and emergency management.

On this regard, may we request for shaped files and/or raster format digital maps on the land use, cover, and vegetation to include among others, the soil type classification of these pilot areas.

Our researcher, **Mr. Edgardo J. Ollet**, a Civil Defense Officer of this Office will coordinate with you on these matters. Kindly assist him on necessary information and data that will ensure the success of this undertaking.

Your usual cooperation and support on disaster management and operations are highly appreciated.

With warm regards.

Very truly yours,

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
[illegible]

APPENDIX 4(c)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

MAR 07 2007

DIRECTOR RENATO U SOLIDUM
Philippine Institute of Volcanology and Seismology (PHIVOLCS)
Department of Science and Technology
C. P. Garcia Avenue, UP Campus
Diliman, Quezon City

Dear Director Solidum:

The NDCC through the Office of Civil Defense is initiating a project on disaster vulnerability index (DVI) on selected areas: Ormoc City, Panaon Island, Saint Bernard, Camiguin Island, and REINA. The initial output may yield scientific assessment, computation techniques and indicative vulnerability mapping vital for disaster operations and emergency management.

On this regard, may we request for shaped files and/or raster format digital maps to include among others, geo-seismological data, hazard risk assessment, landslides, rainfall, flooding and other necessary data for these pilot areas.

Our researcher, **Mr. Edgardo J. Ollet**, a Civil Defense Officer of this Office will coordinate with you on these matters. Kindly assist him on necessary information and data that will ensure the success of this undertaking.

Your usual cooperation and support on disaster management and operations are highly appreciated.

With warm regards.

Very truly yours,

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
Telephone: (+632) 911-5061-64, 912-5668

APPENDIX 4(d)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

MAR 07 2007

DIRECTOR MARTIN F. RELLIN JR
Philippine Atmospheric, Geophysical and Astronomical
Services Administration (PAGASA)
Department of Science and Technology
Agham Road, Quezon City

Dear Director Rellin:

The NDCC through the Office of Civil Defense is initiating a project on disaster vulnerability index (DVI) on selected areas: Ormoc City, Panaon Island, Saint Bernard, Camiguin Island, and REINA. The initial output may yield scientific assessment, computation techniques and indicative vulnerability mapping vital for disaster operations and emergency management.

On this regard, may we request for shaped files and/or raster format digital maps to include among others, hydro-meteorological data, rainfall, typhoons, flooding and other necessary data of hazard vulnerability for these pilot areas.

Our researcher, Mr. **Edgardo J. Ollet**, a Civil Defense Officer of this Office will coordinate with you on these matters. Kindly assist him on necessary information and data that will ensure the success of this undertaking.

Your usual cooperation and support on disaster management and operations are highly appreciated.

With warm regards.

Very truly yours,

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
[illegible] (+632) 911-5061-64, 912-5668

APPENDIX 4(e)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

MAR 07 2007

USEC. DIONY A. VENTURA
National Mapping and Resources Information Authority
Department of Environment and Natural Resources
Lawton Avenue, Fort Bonifacio, Taguig City

Thru : Director Jose Galo Isada
Director Jose C. Cabanayan Jr.

Sirs:

The NDCC through the Office of Civil Defense is initiating a project on disaster vulnerability index (DVI) on selected areas: Ormoc City, Panaon Island, Saint Bernard, Camiguin Island, and REINA. The initial output may yield scientific assessment, computation techniques and indicative vulnerability mapping vital for disaster operations and emergency management.

On this regard, may we request for shaped files and/or raster format digital maps to include among others, geo-seismological data, lifelines, river systems, hazard risk assessment, infrastructure, socio-demographic characteristics, and other necessary data for these pilot areas.

Our researcher, **Mr. Edgardo J. Ollet**, a Civil Defense Officer of this Office will coordinate with you on these matters. Kindly assist him on necessary information and data that will ensure the success of this undertaking.

Your usual cooperation and support on disaster management and operations are highly appreciated.

With warm regards.

Very truly yours,

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
Telephone: (+632) 911-5061 64; 912-5663

APPENDIX 4(f)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

MAR 07 2007

DIRECTOR-GENERAL CORAZON ALMA DE LEON
Philippine National Red Cross
Port Area, Manila

Thru. **Mr. Benjamin Delfin**
Disaster Management Service

Madam:

The NDCC through the Office of Civil Defense is initiating a project on disaster vulnerability index (DVI) on selected areas: Ormoc City, Panaon Island, Saint Bernard, Camiguin Island, and REINA. The initial output may yield scientific assessment, computation techniques and indicative vulnerability mapping vital for disaster operations and emergency management.

On this regard, may we request for shaped files and/or raster format digital maps to include among others, socio-economic data, infrastructure, roads & bridges, lifelines, development projects, and other necessary data and post-disaster reports for these pilot areas.

Our researcher, Mr. **Edgardo J. Ollet**, a Civil Defense Officer of this Office will coordinate with you on these matters. Kindly assist him on necessary information and data that will ensure the success of this undertaking.

Your usual cooperation and support on disaster management and operations are highly appreciated.

With warm regards.

Very truly yours,

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
Telephone: (632) 911-5061-64, 912-5668

APPENDIX 4(g)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

MAR 07 2007

DIRECTOR-GENERAL ROMULO L. NERI
National Economic and Development Authority
6[th] Floor, NEDA Bldg. Amber Avenue
Pasig City

Thru : **Asst. Director Marcelina Bacani**

Sir/Madam:

The NDCC through the Office of Civil Defense is initiating a project on disaster vulnerability index (DVI) on selected areas: Ormoc City, Panaon Island, Saint Bernard, Camiguin Island, and REINA. The initial output may yield scientific assessment, computation techniques and indicative vulnerability mapping vital for disaster operations and emergency management.

On this regard, may we request for shaped files and/or raster format digital maps to include among others, socio-economic data, infrastructure, roads & bridges, lifelines, development projects, and other necessary data for these pilot areas.

Our researcher, Mr. **Edgardo J. Ollet**, a Civil Defense Officer of this Office will coordinate with you on these matters. Kindly assist him on necessary information and data that will ensure the success of this undertaking.

Your usual cooperation and support on disaster management and operations are highly appreciated.

With warm regards.

Very truly yours,

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
Telephone: (+632) 911-5061-64, 912-5668

APPENDIX 5(a)

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF NATIONAL DEFENSE

OFFICE OF CIVIL DEFENSE

CAMP GENERAL EMILIO AGUINALDO, QUEZON CITY, PHILIPPINES

TRAVEL ORDER
No. 015 s. 2007

MAR 27 2007

TO: **Mr. Edgardo J. Ollet**

SUBJECT: **Authority to Travel to St. Bernard , Southern Leyte, Panaon Island and Ormoc City**

Relative to the research on **Disaster Vulnerability Index** (*DVI*) you are hereby authorized to travel to Saint Bernard, Southern Leyte, and Ormoc City on 10 April 2007 to 06 May 2007 to conduct social surveys, interviews, and on-site documentation of improvements of community resilience in the disaster-rehabilitated areas

Fare, meal allowance and per diem are authorized subject to the availability of funds and the usual accounting and auditing rules and regulations.

For guidance.

GLENN J. RABONZA
Administrator, OCD and
Executive Officer, NDCC

Camp General Emilio Aguinaldo, Quezon City, Philippines
Telephone: (+632) 911-5061-64, 912-5668
Fax: 911-1406, 912-2424
E-Mail: info@ndcc.gov.ph Website: www.ndcc.gov.ph

APPENDIX 5(b)

OFFICE OF CIVIL DEFENSE

NATIONAL DISASTER COORDINATING COUNCIL

B R I E F

F O R : CDA

T H R U : **Engr. Agnes T. Palacio** *(initials)*
Chief Operations, NDMC

F R O M : **Mr. Edgardo J Ollet**
Civil Defense Officer V

SUBJECT: **Disaster Vulnerability Index and Research Study on Flashflood/ Landslides**

D A T E : 07 March 2007

Reference: (a) Verbal discussion of CDA with Mr. Ollet dated 20 February 2007 regarding disaster vulnerability index (DVI) for determining disaster-prone areas.

(b) Post-graduate research study of Mr. Ollet re-"*Flashflood and Landslide Disasters in the Philippines: Reducing Vulnerability Towards Community Resilience*" presented to CDA during courtesy call dated 09 January 2007.

1) Sir, preparatory meetings were undertaken by the undersigned with PAGASA and MGB staff regarding the research study on five (5) landslide and flashflood disasters in ***Ormoc City, Camiguin Island, Panaon Island, REINA Quezon and Saint Bernard, Southern Leyte,*** covering a 15-year period. Staffs of the Natural Disaster Reduction Branch and Flood Forecasting Branch of PAGASA suggested about the use of GIS as a tool for disaster vulnerability mapping dubbed as ARITHMETIC OVERLAIN HEIRARCHY, a GIS technique *cum* spatial analysis. ***Hierarchal Parameters*** (hazard analysis) are expressed below which can be used in ranking vulnerability (weight overlay):

HAZARD ANALYSIS	Weighted Overlay	SOCIO-ECONOMIC VULNERABILITY	Weighted Overlay	RISK PERCEPTION/CROSS-CULTURAL VARIABLES	Weighted Overlay
Soil Type or Characteristics		Demographic Characteristics		Value of human life	
Slope gradient		Critical infra/lifelines		Context Cultures	
Vertical Elevation		Population density		Coping Capabilities	
Land use/ Vegetation cover		Housing Types			
Geographical Location/river systems					
Rainfall Threshold					

Mapping – Assessment? (Loss estimates) like UNDP's Human Development Index (HDI) i.e. income, education. Counterpart can be named as **Disaster Vulnerability Index** (*DVI*).

Requirements/Availability:

Flood Hazard Map, Flood-Typhoon Track Probability Map (Tabulated)
Composite Map - Overlay like √ rainfall threshhold (matching measures)
√ nearby stations

2) Also, discussions with the Chief Operations, NDMC and Ms. Amor B. Rosana revealed that the OPCEN need an updated version of indicative maps for identifying disaster-prone localities in the country using GIS technique. More importantly, determinant parameters need to be identified and scientifically treated in coming up with *DVI*.

3) Relatedly, discussions with the OCD Chief Training and Chief Plans regarding ***Disaster Vulnerability Index (DVI)*** proved to be highly related to some initiatives on disaster management like the READY project, and the need for *DVI* is imperative. Atty. Priscilla Duque highlighted the integration of the cross-cultural theory in the disaster management practices in the current trend. The undersigned complemented her comment by citing the social survey that will be administered in Saint Bernard, Southern Leyte for the disaster risk perception of the affected communities.

4) Dr. Espinueva of PAGASA recommended that digitized maps of the pilot areas in shaped files or raster format whichever available need to be accessed from member-agencies of the NDCC to ensure accuracy and reliability of the output.

5) In view of the above, respectfully request for the approval and signature of the enclosed:

5.1 Draft letters for selected member-agencies of the Council for shaped files or raster format maps of pilot areas for landslides and flashfloods.

5.2 Draft memorandum letter for the OCD Regional Directors of the pilot areas.

5.3 Draft letters for Governor Rosette Y. Lerias of Southern Leyte and Mayor Maria Y. Lim of Saint Bernard for the social survey, interviews and DCC metings on disaster risk perception re- Guinsaugon respondents.

5.4 Draft OCD memorandum for the undersigned to be officially under the OPCEN during the duration of the research study, January to July 2007, with the Chief Operations as oversight supervisor.

6) For the information and approval by the CDA on item 5. ok

O I L E T

APPENDIX 6(a)

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

09 January 2007

Flash Flood and Landslide Disasters in the Philippines:
Reducing Vulnerability and Improving Community Resilience

Survey Information Sheet

I am Mr **Edgardo Jaucian Ollet**, a student in the School of Environmental and Life Sciences of the University of Newcastle, Australia undertaking Master of Science in Sustainable Resource Management. As part of my studies, I am conducting a research project titled***, "Flash Flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience."*** You are invited to take part in this research project which examines the causes, behaviour, distribution and biophysical impacts of natural disasters. Understanding the ecological and human vulnerabilities of the affected communities in the February 17, 2006 Saint Bernard, Southern Leyte landslides can yield useful information and provide innovative strategies for policymaking, service provision, community preparedness and mitigation.

You are invited to participate in this research. If you consent to participate, this will involve:

- Attend an orientation briefing at the Barangay Hall to familiarise about the project.
- Fill-up the consent from for the survey questionnaire.
- Complete a survey questionnaire which will take approximately 15 to 25 minutes of your time
- Return the survey to your Barangay Captain inside the return mail envelope for collection and pickup by the researcher.

Participation in this research is entirely voluntary. You can withdraw at any time and there will be no disadvantage if you decided not to complete the survey. All information collected will be confidential. All information gathered from the survey interview will be stored securely by the researchers together with the original documents for ready reference and substantiation of this study. At no time will any individual be identified in any reports resulting from this study.

If you have any concerns or would like to know the outcome of this project, please contact my supervisors at the stated addresses.

Thank you for your interest,

Professor Wayne Erskine. Principal Supervisor, Ph. (02) 4348 4152
School of Environmental and Life Sciences. The University of Newcastle,

Ourimbah Campus, Brush Road, Ourimbah, NSW 2258, Australia
Telephone and Fax: +61 2 4348 4152 and 612 4349 4565
Email address: Wayne.Erskine@newcastle.edu.au

Dr. Salim Momtaz, PhD. Co-supervisor, Ph. (02) 4348 4131
Project Coordinator of the Community Study Project.
Telephone and Fax: +61 2 4348 4131 and +61 2 4348 4145
Email address: Salim.Momtaz@newcastle.edu.au

Mr. Edgardo J. Ollet, Student-Researcher, Ph 0432148542
(In the Philippines) Residence Telephone: +63 2 072 705 2073
Office of Civil Defense, Camp Aguinaldo, Quezon City
Chief Operations Division Tel # +63 2 911 1873
Email addresses: Edgardo.Ollet@studentmail.newcastle.edu.au
edgardo_ollet@yahoo.com

This project has been approved by the University Of Newcastle's Human Research Ethics Committee. HREC Approval No. 365-0207 and Safety Clearance No. 136/2006.

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, Telephone +61 2 4921 6333, email Human-Ethics@newcatsle.edu.au

APPENDIX 6(b)

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

09 January 2007

Flash Flood and Landslide Disasters in the Philippines:
Reducing Vulnerability and Improving Community Resilience

Survey Consent Form

I have read the information on the research project, ***"Flash flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving of Community Resilience"*** which is to be conducted by Mr **Edgardo Jaucian Ollet** from the School of Environmental and Life Sciences of the University of Newcastle, NSW, Australia, and all queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and give my consent freely. I understand that the project will be conducted in accordance with the Information Sheet, a copy of which I have retained.

I understand, I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I consent to:

□ Attend an orientation briefing at the Barangay Hall to familiarise myself about the project.
□ Complete a survey questionnaire which will take approximately 15 to 25 minutes of my time.
□ Return the survey to my Barangay Captain inside the return mail envelope for collection and pick-up by the researcher.

I understand that all information collected will remain confidential to the researchers. All information gathered from the survey interview will be stored securely by the researchers together with the original documents for ready reference and substantiation of this study. My identity will not be revealed without my consent to anyone other than the investigator conducting the project. Further, I have had the opportunity to have any questions answered to my satisfaction.

Print Name: ______________________________

Signature: ________________________________ Date: ____________________________

This project has been approved by the University Of Newcastle's Human Research Ethics Committee. HREC Approval No. 365-0207 and Safety Clearance No. 136/2006.

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, Telephone +61 2 4921 6333, email Human-Ethics@newcatsle.edu.au

APPENDIX 7(a)

THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

09 January 2007

Flash Flood and Landslide Disasters in the Philippines:
Reducing Vulnerability and Improving Community Resilience

Group Discussion Information Sheet

I am Mr **Edgardo Jaucian Ollet**, a student in the School of Environmental and Life Sciences of the University of Newcastle, Australia undertaking Master of Science in Sustainable Resource Management. As part of my studies, I am conducting a research project titled***, "Flash flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience."*** You are invited to take part in this research project which examines the causes, behaviour, distribution and biophysical impacts of natural disasters. Understanding the ecological and human vulnerabilities of the affected communities in the February 17, 2006 Saint Bernard, Southern Leyte landslides can yield useful information and provide innovative strategies for policymaking, service provision, community preparedness and mitigation.

Please read this Information Statement and be sure you understand its content before you consent to participate. If there is anything you do not understand, or you have questions, contact the researcher.

Participation in this research is entirely your choice. Only those people who give their informed consent will be included in this project. Whether or not you decide to participate, your decision will not disadvantage you in anyway. If you do decide to participate, you may withdraw from the project at any time without giving a reason or without penalty.

If you agree to participate, you will be asked to (*answers to this will emanate from your functional role or tasks in your respective disaster coordinating council*):

● ***Render evaluative assessment and update report on the counter-disaster and environmental risk program of your community (Province or Municipality or Barangay).***

● ***In terms of community preparedness, what are your capabilities on training and education; hazard and risk mapping, and resource inventory? What is the progress in this area?***

● ***In terms of response system, what are your existing warning and evacuation infrastructure; how about the monitoring systems? Do you have any progress on this component?***

● ***In terms of rehabilitation, what are the completed and on-going relocation projects? How do you restore community 'healing' in the affected households?***

● ***In terms of mitigation, what are the initiatives on policy and legislation in the aftermath of the landslide disaster? Any research and development program had been started or near completion?***
● ***Could you share some insights and recommendations on how to improve handling disasters? At the community level, in particular?***
● ***Can you show to the researcher these projects, reports? How about an on-site inspection, if permitted?***

At your preference, your participation can be carried through an interview with the researcher and/or a group discussion which will be conducted and hosted by the Chairman of the local disaster coordinating council in your area.

All information collected will be treated as confidential and will be stored securely. Once the information has been analyzed, the audio tapes and transcripts will be stored securely by the researchers for purposes of reference and substantiation of this study. Individual participants will not be identified in any reports arising from the project.

If you have any concern, or would like to know the outcomes of this project, please contact my supervisors at the stated addresses.

Thank you for considering this invitation,

Professor Wayne Erskine. Principal Supervisor, Ph. (02) 4348 4152
School of Environmental and Life Sciences. The University of Newcastle,
Ourimbah Campus, Brush Road, Ourimbah, NSW 2258, Australia
Telephone and Fax: +61 2 4348 4152 and 612 4349 4565
Email address: Wayne.Erskine@newcastle.edu.au

Dr. Salim Momtaz, PhD. Co-supervisor, Ph. (02) 4348 4131
Project Coordinator of the Community Study Project.
Telephone and Fax: +61 2 4348 4131 and +61 2 4348 4145
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Mr. Edgardo J. Ollet, Student-Researcher, Ph 0432148542
(In the Philippines) Residence Telephone: +63 2 072 705 2073
Office of Civil Defense, Camp Aguinaldo, Quezon City
Chief Operations Division Tel # +63 2 911 1873
Email addresses: Edgardo.Ollet@studentmail.newcastle.edu.au
edgardo_ollet@yahoo.com

This project has been approved by the University Of Newcastle's Human Research Ethics Committee. HREC Approval No. 365-0207 and Safety Clearance No. 136/2006.

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, Telephone +61 2 4921 6333, email Human-Ethics@newcatsle.edu.au

APPENDIX 7(b)

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

09 January 2007

Flash Flood and Landslide Disasters in the Philippines:
Reducing Vulnerability and Improving Community Resilience

Group Discussion Consent Form

I have read the information on the research project, ***"Flash flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving of Community Resilience"*** which is to be conducted by Mr **Edgardo Jaucian Ollet** from the School of Environmental and Life Sciences of the University of Newcastle, NSW, Australia, and all queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and give my consent freely. I understand that the project will be conducted in accordance with the Information Sheet, a copy of which I have retained.

I understand, I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I consent to:

□ Participate in a group discussion and/or consultative meeting that will take approximately (*length of group discussion or meeting*)
□ Attend the group discussion and/or consultative meeting which will be held at (*location of group discussion and/or consultative meeting*).
□ Audio-taping of my contribution to the focus group discussions
□ Review the transcript of the group discussion and/or consultative meeting to edit or erase part of or all of my contribution.
□ Share post-disaster reports, data, maps and photos

I understand that all personal information collected will remain confidential to the researchers. All information gathered from the group discussion and/or appointed interview will be stored securely by the researchers together with the original documents for ready reference and substantiation of this study. My identity will not be revealed without my consent to anyone other than the investigator conducting the project. Further, I have had the opportunity to have any questions answered to my satisfaction.

Print Name: ______________________________

Signature: ________________________________ Date: ____________________________

This project has been approved by the University Of Newcastle's Human Research Ethics Committee. HREC Approval No. 365-0207 and Safety Clearance No. 136/2006.

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, Telephone +61 2 4921 6333, email Human-Ethics@newcatsle.edu.au

APPENDIX 7(c)

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

09 January 2007

Flash Flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience

Information Statement for Local Officials

Mr **Edgardo Jaucian Ollet** is conducting this research as part of his Master of Science in Sustainable Resource Management under the supervision of Professor Wayne Erskine and Dr. Salim Momtaz from the School of Environmental and Life Sciences of the University of Newcastle, NSW, Australia.

Studies on previous flash flood and landslide disasters: Ormoc City in 1991, Camiguin Island in 2001, Panaon Island in 2003, and Quezon in 2004 have shown the vulnerability of Philippine communities from these natural hazards as influenced by man-made causes. The impacts and disaster recurrence are worth investigating particularly in the light of the February 17, 2006 flash flood and landslides in the municipality of Saint Bernard, Southern Leyte. Understanding the causes, behaviour, distribution and environmental effects of these phenomena may reduce human casualties and protect lives and properties.

This study is concerned of enhancing community resilience to disasters by identifying important issues, gaps, policy options and suggestions which may have effect on you and your community. It is also designed to identify the root causes of the ecological and human vulnerabilities to disaster, how can a community reduce its adverse impacts, what preparation can be done to respond adequately to such hazard risk. It is hoped that the results of this study may yield useful information and provide innovative strategies for policymakers, service providers and other communities in similar situations in the future.

Part of the whole study is a social survey to be conducted for the potential participants from *Barangays Guinsaugon, Sug-angon, Ayahag* and *Nueva Ezperanza* of Saint Bernard, Southern Leyte which was affected by the recent flash flood and landslides.

As officials and members of your respective local disaster coordinating councils (LDCCs) in your area of jurisdiction, we are seeking your official endorsement of this study and authorize also the sharing of information about post-disaster reports through and with your staff and focal person/s. Additionally, may we seek also your permission to conduct a consultative and/or discussion group to be chaired by you or your deputized chairperson with the researcher taking notes or audio tape the proceedings relative to the study. The participation and support to this study is voluntary and to be decided independently by the interested official and/or individual.

All information collected will be treated as confidential and will be stored securely. Once the information has been analysed, the audio tapes and/or transcripts together with the shared documents will be kept securely by the researchers for purposes of reference and substantiation of this study. Individual participants will not be identified in any reports arising from the projects.

We would very much appreciate it, if you could respond to the consent statement as enclosed within the week, and return it in the reply paid envelope inside as supplied. If you have any questions, difficulties or suggestions, please contact any of those below through the contact details as stated.

Thank you for your time and assistance.

Professor Wayne Erskine. Principal Supervisor, Ph. (02) 4348 4152
School of Environmental and Life Sciences. The University of Newcastle,
Ourimbah Campus, Brush Road, Ourimbah, NSW 2258, Australia
Telephone and Fax: +61 2 4348 4152 and 612 4349 4565
Email address: Wayne.Erskine@newcastle.edu.au

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Mr. Edgardo J. Ollet, Student-Researcher, Ph 0432148542
(In the Philippines) Residence Telephone: +63 2 072 705 2073
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edgardo_ollet@yahoo.com

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Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, Telephone +61 2 4921 6333, email Human-Ethics@newcatsle.edu.au

APPENDIX 7(d)

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

09 January 2007

**Flash Flood and Landslide Disasters in the Philippines:
Reducing Vulnerability and Improving Community Resilience**

Local Official Consent Form

I have read the information on the research project, ***"Flash flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience"*** which is to be conducted by Mr **Edgardo Jaucian Ollet** from the School of Environmental and Life Sciences of the University of Newcastle, NSW, Australia, and all queries have been answered to my satisfaction.

I agree to voluntarily participate in this research and give my consent freely. I understand that the project will be conducted in accordance with the Information Sheet, a copy of which I have retained.

I understand, I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I consent to:

□ Accept a courtesy call and visit of the researcher at (location and date of appointment)
□ Endorse and support the study through our local disaster coordinating council.
□ Agree to host a consultative and/or discussion group meeting with my staff and focal person/s
□ Authorize the sharing of information, post-disaster reports, maps, photos and other relevant documents related to the study.
□ Agree to chair the meeting with the researcher taking full coverage of the proceedings.
□ Delegate my functional role as chairperson to my authorized facilitator or administrator for the consultative and/or discussion group meeting.
□ Conduct on-site inspection and take photos of the projects in my area of jurisdiction.

I understand that all information that all information collected will remain confidential to the researchers. All in formation gathered from the survey interview will be stored securely by the researchers together with the original documents for ready reference and substantiation of this study. My identity will not be revealed without my consent to anyone other than the investigator conducting the project. Further, I have had the opportunity to have any questions answered to my satisfaction.

Print Name: ______________________________

Signature: ________________________________ Date: ____________________________

This project has been approved by the University Of Newcastle's Human Research Ethics Committee. HREC Approval No. 365-0207 and Safety Clearance No. 136/2006.

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, Telephone +61 2 4921 6333, email Human-Ethics@newcatsle.edu.au

APPENDIX 8(a)

THE UNIVERSITY OF NEWCASTLE AUSTRALIA

09 January 2007

Flash Flood and Landslide Disasters in the Philippines:
Reducing Vulnerability and Improving Community Resilience

In-depth Interview Information Sheet

I am Mr **Edgardo Jaucian Ollet**, a student in the School of Environmental and Life Sciences of the University of Newcastle, Australia undertaking Master of Science in Sustainable Resource Management. As part of my studies, I am conducting a research project titled***, "Flash flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience."*** You are invited to take part in this research project which examines the causes, behaviour, distribution and biophysical impacts of natural disasters. Understanding the ecological and human vulnerabilities of the affected communities in the February 17, 2006 Saint Bernard, Southern Leyte landslides can yield useful information and provide innovative strategies for policymaking, service provision, community preparedness and mitigation.

Please read this Information Statement and be sure you understand its content before you consent to participate. If there is anything you do not understand, or you have questions, contact the researcher.

Participation in this research is entirely your choice. Only those people who give their informed consent will be included in this project. Whether or not you decide to participate, your decision will not disadvantage you in anyway. If you do decide to participate, you may withdraw from the project at any time without giving a reason or without penalty.

If you agree to participate, you will be asked to (*recounting your story, of what you experienced, saw and heard during that 'tragic day'*):

● ***Before the disaster or landslide struck; can you tell vividly what you were doing? How about the people around you? Have you noticed any unusual in your surrounding at that time and/or in previous days?***
● ***How did you respond to the situation when the emergency arises? Can you describe what and how you feel, and what came into your mind at that instance? Were you aware of your condition, if hurt or what? How about other people around you that needs or crying for help? What did you do to calm yourself? Or helped others? Were you thinking other things at that time, family and loved ones?***
● ***Looking back now, what lessons have you learned? If given the time to return in the same crisis situation what would you change in what you have done already? Are you still upset or feeling guilt or haunted of these past events? Describe your emotions and what do think?***

● ***Could you share your some important insights and recommendations on how to improve handling disasters? at the household level, in particular?***
● ***Can you show to the researcher the places you mentioned in the story? (Only if allowed by the participant)***

At your preference, your valuable participation can be undertaken through a personal interview with the researcher in your house or chapel or barangay hall or at your most convenient place. You may also determine if you wish to be accompanied by someone you can trust and respect once you volunteered to participate. More importantly, this in-depth interview may take about 20 to 25 minutes of your precious time.

All information collected will be treated as confidential and will be stored securely. Once the information has been analysed, the audio tapes and transcripts will be kept securely by the researchers for purposes of reference and substantiation of this study. Individual participants will not be identified in any reports arising from the project.

If you have any concern, or would like to know the outcomes of this project, please contact my supervisors at the stated addresses.

Thank you for considering this invitation,

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APPENDIX 8(b)

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09 January 2007

Flash Flood and Landslide Disasters in the Philippines:
Reducing Vulnerability and Improving Community Resilience

In-depth Interview Consent Form

I have read the information on the research project, ***"Flash Flood and Landslide Disasters in the Philippines: Reducing Vulnerability and Improving Community Resilience"*** which is to be conducted by Mr **Edgardo Jaucian Ollet** from the School of Environmental and Life Sciences of the University of Newcastle, NSW, Australia, and all queries have been answered to my satisfaction.

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I understand, I can withdraw from the project at any time, without penalty, and do not have to give any reason for withdrawing.

I consent to:

□ Participate in an in-depth interview that will take approximately (*length of interview*)
□ Attend the in-depth interview or
□ Audio-taping of my contribution to the focus group discussions
□ Note-taking only of my in-depth interview
□ Review the transcript and/or audio tape of the in-depth interview to edit or erase part of or all of my contribution.
□ Photos can be taken from me in front of my/our new house or residence, together with my loved ones and/or with my 'friendly-link'.

All information collected will be treated as confidential and will be stored securely. Once the information has been analysed, the audio tapes and transcripts will be stored securely by the researchers for purposes of reference and substantiation of this study. My identity will not be revealed without my consent to anyone other than the investigator conducting the project. Further, I have had the opportunity to have any questions answered to my satisfaction.

Print Name: ______________________________

Signature: ________________________________ Date: ____________________________

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Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to the Human Research Ethics Officer, Research Office, The Chancellery, The University of Newcastle, University Drive, Callaghan NSW 2308, Australia, Telephone +61 2 4921 6333, email Human-Ethics@newcatsle.edu.au

APPENDIX 9

Compendium of Survivors' Stories

1. <u>Alicia Miravalles</u>

"I am Alicia Miravalles, 49 years old, one of the survivors of the landslide in Barangay Guinsaugon, Saint Bernard, and Southern Leyte.

Before the landslide struck, I was watching television inside our house because of the heavy rains outside. When I heard a sound like a roaring of an airplane, I went outside to look. When I looked up, I saw the mountain above us starting to crumble/collapse with a crashing sound and big stones/rocks starting to cascade down the mountain. I immediately went inside the house to close the TV, then hurriedly went outside and ran as fast as I could as the mudslides are fast approaching. I had not gone far when the landslides overtook me.

I fell down and fainted. When I came to my senses, I discovered that I was already buried in the mud but it was still shallow as I was still able to lift my hands freely above the mud. What I did was to push myself up the best I could. I successfully delivered myself from being buried completely, and the rescuers carried me to the Health Center. They gave me First-Aid treatment. After which, they brought me to Anahawan Hospital where I stayed for two (2) months. I had many wounds, cuts and bruises all over my body.

At present, by the mercy of God, I am completely healed and fully recovered. I am thanking the Lord that He gave me a second life on this earth. My advice to the people is to have a closer relationship with God, for we never know what will happen to us. Just like what happened in Guinsaugon, we never knew why that tragedy happened, it just happened."

2. Arlene N. Banez

"I am Arlene N. Banez, 22 years old, one of the survivors of the Guinsaugon Landslide on 17th February 2006.

Before the tragedy happened, I just came from the hospital where I gave birth to a healthy child. When we arrived home, my father was surprised to see us and expressed concern because he thought I should have stayed longer in the hospital and rested awhile to regain my strength from childbirth. My father said that it would had been better if we had proceeded to my aunt's place in Saint Bernard and stayed there for a while because of the heavy rains and besides, there were only few bus trips due to the rain-damaged road going to our place uphill in the mountains. That day, my sister did some laundry for us. After an hour, a woman beggar came to our house begging for rice. My sister cautioned us not to give anything to the beggar since she doesn't look like one. She was fat and not haggard-looking nor pitiful in countenance. But I gave the woman myself the rice she needed. The beggar told me that we ought to pray because after three (3) days a tragedy would happen. After two (2) days, some of our neighbors had evacuated for fear of the warning. But our barangay captain encouraged us not to be frightened and anxious because we are safe in our location uphill against any floodwaters rising. We never thought that it would be the mountains over us that will topple down and cause the landslide tragedy.

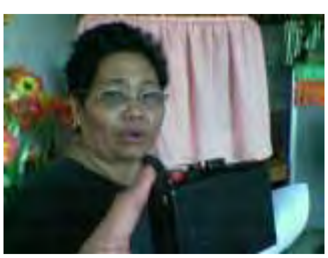
When the tragedy occurred, I saw the mountain came crumbling down toward us. I was so confused and frightened and I did not know anymore what to do. The only thing I did was to get my baby from the crib to save him and ran for our lives. My father was looking for us because we ran ahead of him out of the house. When my father reached us, he got the baby from me because he knew that I was still weak, barely one week after I gave birth. I was so afraid and anxious, and crying at the same time. While running I kept looking back at my father with my baby in his arms, and I saw them overtaken by the mudslide, and then it overtook me and I lost my consciousness.

At that time, the people around me had run for their safety together with their children and other kids in the neighborhood. All of them were crying with so much fear and paranoia all around, and they did not know what to do anymore.

Yes, I remembered the care and concern that my father and my siblings showed to my baby. I did pray at that critical moment that God would forgive me for all my sins thinking that I had already died and had never survived.

The lesson I had learned is to show respect to beggars and listen also to them. Most importantly, is for us to be always prepared and pray everyday, so that whatever will happen or trial that might come our way, we have the strength to face them. Yes, until now, even after one year, things are still very fresh in my memory. It is really very difficult to lose our families. I do not know what first step should I take; my life is difficult now because we have to look for our everyday livelihood. I am always praying to God, for me and my sister's good health and whatever trial in life will come my way, I will be ready."

3. <u>Irinea Velasco</u>



"I am Irinea Velasco, 57 years old, one of the landslide survivors that tragically struck on February 17, 2006. Today, I will narrate how I survived the ordeal. Perhaps, I was able to survive because of my strong faith in God, and that He had heard me and saved me. I know He has a purpose for all of these and He wanted to use me in His Kingdom. How I was rescued, I do not know how. At that time, I was calling only the name of God; I had nobody to cling on but Him. Why I was able to survive then, perhaps even before it happened, because I had already committed and entrusted myself to Him, and it is up to Him whatever He wants to do with my life; yes, while am alive, I will stick with Him. The tribulations I went through, why He gave it to me, I think because I can handle them, like losing my ten (10) grandchildren. It was very painful, but what can I do about it? All I know, we are but temporary dwellers in this earthly life, we are only stewards here on earth. All of these were only lent to us by God. That is why all my trials, I gave them back to Him. If my attitude won't be like this, I think I would lose my sanity. I need to open up and tell all the pain I am feeling inside, and the heavy burden which I felt at that time when I lost all of my loved ones. But now, I am able to cope up and I thank God because He still left me with two (2) sons who take care of me. But if I have lost all of them and nobody was ever left alive, there is no reason why should I still want to live here. At the height of the crisis, I felt wanting to die also, because I feared I might not able to handle such grave loss. But Praise God, the will of God still prevailed over my life.

At that time, I cannot do anything, as though I heard them shouting for help, I cannot see them and even though I see them, I cannot do anything as my whole body was in pain, full of wounds and bruises. All I could do was to pray, pray and pray, then I recalled by memory Psalms 23 and that's it, there is the living Christ who is able to save me. Because the Bible says, "whoever calls upon the Name of the Lord will be saved". My strong faith which I received from Him was instrumental for my salvation. I shouted also for help. Rescuers found me and they brought me to the Anahawan Hospital. This is how I perceived them now. Today, here we are facing current trials and testing in life. Not only those trials we had in the past, but even now, we are being tried, since most people who are still here rely on relief assistance. What if there would be no more relief aid? What would the people do in this situation? They should pray and act, because it is not true that when people ask, God will give one sack of rice automatically. We must work also, so He can release what we had asked from Him. We need not worry, however, what to eat, to wear, whatever need, He will surely provide them if we ask in faith and trust Him. Right now, I am still blessed because I have a son working, supporting me. My old practice of borrowing my tithes from the Lord and not giving it to Him on time; I am not doing it anymore. Even if it is small, I would set the tithe apart, for the Lord, and I am not borrowing it anymore, that is why all my needs are supplied now by Him. The Lord Jesus said, "Give unto Caesar what belongs to him, and give unto God, what is due to Him." This is what I practice now. I think it is time for people who have not known or accepted the Lord Jesus Christ to acknowledge Him in their lives and accept Him while they are still alive. We should not wait for the stones to cry out to Him, instead."

4. **Jeffrey Boniza**

"I am Jeffrey Boniza, 16 years old, and studying in Guinsaugon, Saint Bernard. Before the tragedy occurred, I stopped going to school because of poverty. We scarcely have even our daily meals. When I stopped schooling, I worked at a passenger's bus. I was one month old in this job when the landslide struck. That morning of 17 February 2006, we transported students to Christo Rey High School. When we returned back to our village, Guinsaugon that was the time we ate our breakfast and did some repairs on the bus afterwards. While I was helping in the bus repair, my lady owner shouted that the mountain toppled. When I saw it, I immediately ran as fast as I could towards sitio Bodloy. I even passed by a friend, Gaga Velasco, and urgently urged him to run for safety. But he was looking for his wife and children, so I left him. A lot of people ran for their lives and everyone was scared to death. I saw some of them were overtaken by the mud rampage and were buried alive. When the mud engulfed me, I completely fainted. When I regained my consciousness, I was already under the thick mud. I was thinking it was only a bad dream because I was hearing a noisy honking of a truck. I thought it was our bus, but I heard screaming and hammering sound all around. When I turned in front of me, I saw a victim's dead body. It seemed like I was holed inside a collapsed house, and I saw a light from a small hole. I noticed some people were coming to my direction, so I screamed for help. Loloy, Alai and Sir Larry helped me out by digging me from beneath. I felt excruciating pain due to body cuts, wounds, and I was really grimacing in pain. They carried me and I thought what could have happened also to my loved ones whether they are alive or dead altogether? I felt scared that they all died, and am the only one left alive, totally orphaned. When we reached the Health Center in the town proper they brought me immediately to the Anahawan Hospital and operated me there. After my surgical operation, the doctors gave a 24-hour survival observation. When I made it for 3 days, I was transferred to Maasin Provincial Hospital because my wounds and cuts were deep in the arms, and there were no more medicines in Anahawan. Once I arrived in Maasin City, they treated me until all my wounds got healed. The doctor said that I need plastic surgery to cover the ugly deep scars in my arms. We do not have money, and I appeal for some kindhearted person to help me for the plastic surgery of my ugly arms.

The death toll in my family was five (5), two were my nephew and niece, two were my siblings, and my mother. Today, my father and I live in New Guinsaugon Relocation Site, together facing a new life. My plan is to continue my schooling if someone would support me until I finished college. I am missing the physical presence of my departed loved ones.

I know I will never see them again. I wish that the government will give us more attention especially we do not have livelihood here in New Guinsaugon Village, and give us a brighter future. I learned to drink booze already just to forget the tragic memories, but it is really difficult. Whenever I see children, I remember my mother, siblings, nephew and niece. That is why I frequently weep and cry until now. I hope we can be helped to forget those horrible experiences. It is not a joke, particularly losing one's family, my mother, siblings and the rest whom I loved and cherished. My father, nowadays drink liquor just to forget and sobbing every now and then. Whenever my father has some money, he would spend it for some drink. Today, I still go with a passenger's bus and work for a salary of 1,000 pesos (A$27) per month. I just make myself happy.

For now, this is all I can tell about the tragedy, because whenever I talk about it, it only reminds me of what happened."

5. Loretta C. Marqueda

"I am Loretta C. Marqueda, 45 years old, married and a survivor in the Guinsaugon landslide. That morning before the tragedy struck, I and my sister were having a conversation at a breakfast meal we shared at around 8:00 a.m. on the 17th February 2006. While waiting for my son, who was then working as a passenger motorcycle driver, I was quite worried, because he had not eaten breakfast yet, including his younger sister, who also did not come home during the recess time in her school. So while waiting for my son, I went to watch first an on-going Women's Parade and the people were very happy at that time. When my son arrived, we went home and just nearly entering our house, there was a sudden tremor accompanied with a big bang coming from the mountain which at that time had already collapsed. I and my son were very frightened. My son told me, “Run now for your safety, mom”, so I ran together with my sister. I saw my son ran towards the school where his younger sister was. While running, I looked behind and saw my son went back inside our house. All the people around were so frightened, and all of us were overtaken by the mudslide. After that, I had lost consciousness and was no longer aware of what was happening. When I regained my consciousness, I saw the whole of our village Guinsaugon covered by rocks and mud. I prayed to God, and said “Help me, Lord, I cannot do anything without Your help, give me strength and good courage” because my two children were gone and both were buried in the mudslide. Until now, I can still feel the pain brought by this tragedy. I always pray to God that this painful feeling will be gone and help me forget the horrible memories from the tragedy.

My town mates were crying, and were deeply in pain and they cannot accept what had happened. They no longer know what to do because they had lost their loved ones, especially those lone survivors who had lost all the members of their household.

I tried to save myself by crying out for help from other people, and I saw them coming over to rescue me. I am really grateful, first of all to God, and then to the people who had helped and rescued me.

All of us now need to change for good. Through this tragic event, God is reminding us to repent of our sins and return back to Him, and we need to humble ourselves before God. Let us help our fellowmen and love one another.”

6. Marianita Siega

"I am Marianita Siega (in black shirt with hat), 32 years old, a farmer in Barangay Guinsaugon. I am married and had two (2) daughters, one was 11 years old and the youngest, was 8 years old.

Before the tragedy happened, I went to the town proper at my mother's house to borrow money for my children's school allowance that day. My mother gave me some money which I gave to my daughters. I told my daughters to buy their snacks because I will accompany their father to the mountain farm. I was feeling down and lonely that day while on our way to the mountain. I gave some instructions to my youngest daughter telling her to tie the key of the house around her neck so that it will not be lost. She responded, "Yes, mother". Then I and my husband went on our way to the mountain where we gathered coconuts. At around 10:45 a.m., there was an earthquake. Then, we saw the mountain toppled with a great crashing sound. Helpless, we just wept. Everything was gone. I was crying yet no tears were coming out from my eyes. After that, my husband and I started to go down from the mountain, and when we were already at the highway, I started crying and shouting and became hysterical. We headed towards the town proper and passed though the fields that were not covered with mud. As we passed by, we heard somebody shouting, "Help". My husband wanted to help the victim but I hindered him because I was afraid that water and mud might be flowing still. We proceeded to the village of Sug-angon, unreached by the debris flows. At Sug-angon, we rode on a dumped truck going to the town hall of Saint Bernard. There, my husband answered a mobile phone call from a relative in Manila asking if the landslide occurrence that was in the news was true and which we confirmed. It was already late afternoon and we still did not know where to sleep for the night. I remembered I have a sibling in Cabalian and so we spent the night there. We were evacuated the following day to Christo Rey High School where we temporarily resided. My two daughters died in the tragedy, and we had never seen their corpses. I went through a lot of nightmares and dreams after that. In one of my dreams, I saw my two daughters clothed in white and they comforted me saying, "mother, please do not cry, we are in a secured haven." Today, while I narrate this story, as much as possible, I don't want to talk about it anymore because it only reminds me of my two (2) daughters who were lost in the tragic event, and I cannot help but cry.

I have just given birth to a healthy baby boy this month, April 2007 through caesarian delivery. He is a blessing from the Lord. After the February 17, 2006 landslides, I became closer to God and my faith became stronger and I can now face the future with so much hope.

I do not know how to read signs or unusual precursors of a natural calamity. All I had observed that time was the intermittent heavy rainfall for about two (2) weeks. Then there was an earthquake and then we saw the mountain seemingly erupted emitting out smoke followed by debris with rocks and sand cascading down the steep slope towards our village.

7. Sherwin Lobaton

"I am Sherwin Lobaton, 28 years old, a bachelor and a survivor of Guinsaugon tragedy/mudslide on February 17, 2006. My father was the barangay captain of Guinsaugon in 2006. What I was doing before the tragic event happened was that, I was managing a small business, buying and selling palay, abaca, coconut and a rice mill. We also had a passenger's vehicle. I survived the tragedy on that day because our rice mill which I was operating ran out of petrol and I was about to go to the town proper. At that time, however, I stayed a little bit longer because there was an on-going community program in celebration of the Women's Day. Since they were using my amplifier together with the amplifier owned by the village council, I had to help in installing them for good musical sound and acoustic. Also, I waited first for my father's return to our house having accompanied my sister in going to her school in town. It was about 9 a.m. when my father arrived but he was also in a hurry to leave again as he was officially needed in the program being the village chieftain. Before my father arrived though, I was already feeling restless and bothered inside. I didn't know why I was feeling that way and why I did not want to leave immediately.

Since I cannot yet leave as I was waiting for my father's return, I twice kept coming back and forth the house, to and from the rice mill, because I want to use the motorcycle. When he had not turned up as I had expected, I went again to my uncle's place who was grilling pork for the occasion. My uncle jokingly told me not to leave immediately so we can have some viand for lunch especially so for the operators of the amplifier. I just chuckled in response.

When my father arrived, I got my motorcycle and drove it to our rice mill and picked up a container for petrol and some cash. I didn't know why I was behaving unusually that time because when I got some cash amounting to 20,000 pesos (A$510), I went back to the house and returned back the money in the wallet and took only 4,000 pesos(A$105) out of it, for payment of electric bills and other household needs. I left the village, and it was showering at that time. I bought petrol at the town proper of Saint Bernard, 7 kilometers away from our village. Then, I proceeded to pay the electric bills in Cabalian, a town 6-km away. Then I spent some time in Saint Bernard's terminal where I heard that a `tragedy' struck our village Guinsaugon. So, I hurriedly went back and saw everything was gone, all rocks and mud. I cannot do anything, I was so helpless. All I did was to weep and cry. Rescue operation was forbidden because of the soft ground. I called up one of my brothers working in Manila, and told him that our father, mother and three siblings were dead. My brother urgently replied to come back home. Then, I remembered my sister studying in the town, I went to her and she was crying too. I brought her to the disaster site. We could not do anything. We just waited for news and those that were rescued alive. We looked for another sister named Suzette, she was found dead, and I saw her body full of wounds. Among my loved ones lost in the tragedy, she was the only one we saw whose corpse had been retrieved from the mud. Her remain was pitiful to look at. We do not know until now where the others had been buried in the mudslides, we just hoped they rested in peace.

What I had observed around me at that time was that the rains already stopped. So, we brought out again the abaca hemps to be sun-dried, but as soon as we are outside, it started again to shower. The rain showers were on and off at that time and we kept bringing inside and outside the abaca hemp as well. Because of this, we decided not to dry the abaca hemp outside anymore, and just stored them in the barn. On the other corner, I spotted a businessman who bought abaca and whose workers were also sun-drying abaca before I left. I told the businessman not to bring out the abaca hemps anymore for sun-drying because it's going to rain and suggested that they better rest already. Then I left for town. So, that was what I had observed, that what I said came to pass or…I don't know if what I just said came to pass or not.

At that time, as if I had lost all hope and wanted to die also, and be with my departed loved ones. I did not know where to get our means of livelihood. Life then, seemed meaningless for I lost my parents, all of them were gone. I was worried where to get our source of living…me and my other sibling? Very unfortunate, our farmland, rice field and coconut farm where we usually get our livelihood, were all buried in the mudslides. So at that time, I also wanted to die. I was so hopeless, and I never thought that others would even care to give us food, wares, clothes. I just wished I was buried along with my loved ones too. When I went home that afternoon, some good people gave us clothing, some gave us food. The Lord was really good…there were kindhearted people who helped us.

The affected people around me looked pitiful. They were missing their lost loved ones. I had no material things to offer them except moral support. Some nuns approached me for stress-debriefing sessions with them where I let out my emotional stress and pent-up feelings, and it did help. I thanked them for this. I was able to recover and I did the same thing to some of my friends. I talked with them and told them, " let us now slowly accept what had happened, no matter how painful it may be, so that we can already start to look ahead for things that will help us rise from this tribulation or maybe God has a plan for us why we survived." I talked with them, encouraged them to leave behind the tragic memories. We tried playing volleyball, basketball to release our emotional stresses. Yes, it was not easy because of the pain and trauma it impacted our lives. What I could advise to my fellow survivors, while helping some of them to get over their trauma, is to help one another and share whatever one has. With what happened to us, we have seen that there were many people who were willing to share their food, rice, viand and some money.

My suggestion/advice is to stop abusing our food sources and natural resources. We should not abuse our environment. Stop cutting trees. For whatever we do, whether good or bad, our God will measure it back to us."

APPENDIX 10

RESEARCH DIVISION
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THE UNIVERSITY OF NEWCASTLE AUSTRALIA

9 December 2008

Student No: 3040518

Mr Edgardo Ollet
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Dear Mr Ollet

Your thesis entitled "*Flashflood and Landslide Disasters in the Philippines: Reducing Vulnerabilities and Improvements in Community Resilience*" for the degree of Master of Science in the School of Environmental and Life Sciences at this University was examined by

> Dr Shahalam M. N. Amin, Department of Geography and Geosciences, Bloomsburg University of Pennsylvania, Bloomsburg, PA, USA and
> Dr Emmanuel Mirabel Luna, Professor of Community Development, Department of Community Development, College of Social Work and Community Development, University of the Philippines, Diliman, Quezon City, Metro Manila, Philippines.

The Research Training Sub-Committee recently considered your examiners' reports and determined your thesis be classified as passed. The Committee now requires you to correct any errors of presentation pointed out by the examiner/s to the satisfaction of your supervisor. Upon receipt of the hard bound copy of your thesis, the Committee will recommend to the President of Academic Senate (on behalf of Academic Senate) and the Vice-Chancellor (on behalf of the Council of the University) that the thesis be accepted for the award of the degree. I enclose a copy of comments made by examiners.

A hard bound copy of your thesis for lodgement with the University Library must be submitted to the Office of Graduate Studies within one month of the date of this letter.

Within one month of the ratification of the award, you can expect to receive a letter confirming that the degree has been awarded from the Office of Graduate Studies. Enquiries regarding this approval should be sent to thesis@newcastle.edu.au.

The University of Newcastle, along with 20 other Australian universities, is involved with a worldwide networked digital library of theses and dissertations. In addition to the hard bound copy of your thesis, you are now also **required** to submit the final version of your thesis online via the *Australian Digital Theses Project (ADT)*. By making your thesis part of the program, you give free internet access to those who may be interested in your research. For more information see Newcastle's ADT web-page: http://www.newcastle.edu.au/service/library/adt/ and follow the instructions for depositing your thesis.

One copy of your thesis has been retained by this office for reference during the examination process and is now available for collection from the Office of Graduate Studies, The Chancellery, East Wing. Please be aware that this copy will be stored in this office until you submit your hard bound corrected copy, at which point, if not collected, it will be confidentially destroyed.

May I offer my congratulations on your fine achievement and wish you every success with your future endeavours.

Yours sincerely

Karen Kincaid

Ms Karen Kincaid
Executive Officer – Research Training
Graduate Studies

CC: Co-Supervisor, Dr Salim Momtaz
Principal Supervisor, Prof Wayne Erskine
Asst/Dean Research Training, Faculty of Science & Info Tech, Dr Deborah Hodgson
Faculty Administration Contact, Faculty of Science & Info Tech, Ms Lina Bozinovska
Head of School, School of Environmental and Life Sciences, A/Prof Hugh Dunstan

EXAMINER'S REPORT ON MASTER'S THESIS

REPORT 1

Received from: Dr Shahalam M. N. Amin
Bloomsburg University of Pennsylvania, USA.

Thesis Title: Flash flood and landslide disasters in the Philippines; reducing vulnerability and improving community resilience

Author: Edgardo Jaucian Ollet

A. Examiner's Recommendation: **Award**: the thesis be classified as passed.

B. Detailed Report:

This is a very well written, well edited, and well presented thesis. The author has done an excellent job in accomplishing the objectives of his research through appropriate methods. The ultimate outcome of this study – a modified version of a community focused model (Landslip-Disaster Quadrant Model) based on six building blocks should be useful in future flash flood and landslide disaster risk mitigation programs. In particular, the recommended action steps can be used by various service providers in improving the community resilience to natural disasters. In this respect, the research also has an applied value. In my view, the breadth and depth of this work has exceeded the normal expectations of a master-degree research. The following corrections/suggestions can easily be incorporated in the final draft of the thesis.

Some Corrections:

1. Page 28, section 3.3, 2nd sentence – replace analysis by analytical
2. Page 53, 2nd paragraph, 1st sentence – replace counts by counting
3. Page 63, 2nd para, 6th line – replace is giving by provide
4. Page 90, last para 1st line – should meteorology be weather conditions? Isn't rainfall an element of meteorology? In the next page, how can climate be under Meteorology? Meteorology is a short-term condition whereas climate is a long-term view of weather conditions. Can you use another term such as weather or Atmospheric/weather conditions instead of meteorology? Think.
5. Page 92. You mentioned ITCZ, and La Nina. Can you explain in a paragraph or two what are they and how they affect rainfall etc.?
6. Page124, 1st para, 3rd line – the area is **a site of** an old landslide.
7. Page 146, 2nd para, 7th line - … safety but apparently not at the right time.
8. Pages 146, 2nd para, 9th line – replace explained by explains
9. Page 146, last para, 3rd line – adapt to ….
10. Page 147 – rewrite/rephrase the second sentence
11. Page 153, 3rd line – agriculture-based
12. Page 154, 2nd para, last but one line – 3.8% confirmed
13. Page 162, last para – needs editing
14. Page 163, last para, 1st line – rephrase, observing the sounds…

15. Page 171, line 17 – replace income jobs by either source of income or paid-jobs
16. Page 173, 2nd para, 3rd line – translate *banca*
17. Page 192, 3rd sentence - rephrase
18. Page 213 last line – Department of Environment **and** Natural ....
19. Page 214 – picture too hazy. You have few other pictures like this one. Can you improve them?
20. Page 222, last sentence - rephrase
21. Page 223, 2nd para – needs editing
22. Page 229, 2nd para, line 7 – It accounts ......, rewrite the sentence
23. Page 229, 2nd para, line 16 – practice

EXAMINER'S REPORT ON MASTER'S THESIS

REPORT 2

Received from: Dr Emmanuel Mirabel Luna
University of the Philippines, Philippines.

Examiner's Appraisal of the Study

The thesis on hand, which is done for the master's thesis through research, is a commendable work in terms of its comprehensiveness and scope of work, compared to other thesis I have seen. Getting five cases of disaster events, plus providing a national context to the study makes the study more useful as it documents these disaster events. We need such kind of documentation in the Philippines. The use of graphics is very effective and complements the discussion, helping the reader appreciate better what is being discussed. The study contains a lot of pertinent data regarding the disaster situation in the country and this is very useful for us working in the disaster risk reduction sector.

The author's effort to re-conceptualize models of analysis is a commendable attempt for it shows the imagination and the interest of the author to reflect, and have the courage to bring forth innovative ideas. In academics, this is an effort worthy appreciating for it shows the development of cognitive analytical skills on the part of the student.

I would say that the paper was well written, except that there is a need for structuring of some narratives that are quite long paragraphs. Some items on the quotation of respondents (pages 175-182) do not sit well in terms of format with the authors' analysis. Is it possible to just put the quotations in a box, after which the analysis follows?

Some of the pictures are not clear and I wonder how this can be improved if this would be published. I wonder why there are red marks on page 184. I think this should be explained or just remove the red marks. The date on page xxxi should be corrected because it was not February 2008. I am not very sure if the names of the persons in then cases in the appendix are real name, or perhaps I missed some explanations, but if these are the real names, then does the author has the permission from the persons to divulge their real identity, plus their pictures? If there is no consent, then I suggest that the names be changed and the pictures in the cases be removed to protect their identity.

Overall, I appreciate the study and I would like to congratulate the students and the project proponents and mentors.

Dr Emmanuel Mirabel Luna