

ANALYSIS OF COMMUNITY'S COPING
MECHANISMS IN RELATION TO FLOODS:
A CASE STUDY IN NAGA CITY, PHILIPPINES

MAFE PALMIANO-REGANIT

March, 2005

ANALYSIS OF COMMUNITY'S COPING MECHANISMS IN RELATION TO FLOODS: A CASE STUDY IN NAGA CITY, PHILIPPINES

by

MAFE PALMINO-REGANIT

Thesis submitted to the International Institute for Geo-information Science and Earth Observation in partial fulfillment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation, Earth Resources and Environmental Geosciences, Coastal Zone Studies

Thesis Assessment Board

Dr. Cees Van Westen (Chairman of the Board, ESA Department, ITC, The Netherlands)
Dr. T. van Asch (External Examiner, Utrecht University, The Netherlands)
Drs. Dinand Alkema (First Supervisor, ESA Department, ITC, The Netherlands)
Dr. Erik De Man (Second Supervisor, Urban Planning Department, ITC, The Netherlands)
Dr. Paul van Dijk (Program Director, EREG, ITC, The Netherlands)



**INTERNATIONAL INSTITUTE FOR GEO-INFORMATION SCIENCE AND EARTH OBSERVATION
ENSCHEDA, THE NETHERLANDS**

I certify that although I may have conferred with others in preparing for this assignment, and drawn upon range of sources cited in this work, the content of this report is my original work

Signed

Disclaimer

This document describes work undertaken as part of a programme of study at the International Institute for Geo-information Science and Earth Observation. All views and opinions expressed therein remain the sole responsibility of the author, and do not necessarily represent those of the institute.

For my Parents

&

Yez, Victor, Viktor, Philippe, Therese

I humbly dedicate this work for you.

Abstract

The study aims to know the community's coping mechanism in dealing with floods. This objective is attained through the conduct of field survey, analysis, and identification of coping mechanisms. A descriptive and exploratory approach is designed to figure out and understand how the community reacts and response with the floods and the possible measures the Local Government Unit (LGU) can do to strengthen and help the community reduce flood damages. The study is undertaken at Naga City, Philippines as a case for flood risk assessment studies within the ITC SLARIM Project. However, this study is not solely for the Local Government of Naga City but rather it may also serve to other Local Government Units (LGU) experiencing flooding.

A survey was conducted to gather information on the community's responses in dealing with floods. The community's reactions were analyzed as well as the factors relating to the strategies on dealing with floods. An inventory of these mechanisms can be used by the Local Government Unit. Understanding the community's perceptions on flooding and LGU's flood mitigating measures is also essential in defining the policies for recommendations on flood management.

Field data were gathered from household interview adopting the simple random sampling. The analysis started with literature review and the processing of field survey data to understand the approaches and factors that influence the mechanisms and to describe how the community deals with the floods. The study focus on how the community's response to protect and cope with the 6 identified element exposed to risk - income, physical structures, disruption of road, Injuries and life losses, business stocks, and their personal belongings.

Result shows that more than 50% of the households perceived the flood as a nuisance to them rather than a catastrophe. They opt to stay in the area for the proximity to the source of economic livelihood and education of children. The people apply more than 6 coping mechanisms in order to live in the area. For these people, coping mechanism are an integral part of their life to live with the effects of flood. These mechanisms were categorized into economic, physical, and social.

The viable coping mechanisms employed by the community to protect and cope with the effects of the floods are the economic and social types of coping mechanisms. The economic and social coping mechanisms employed by the households focus on the preparedness, response and recovery measures on dealing with the floods. The social mechanisms tend to strengthen the social structure of the community.

Three factors were identified that influence the coping mechanisms employed by the community at different flood stages –before, during, after. Income, access to assistance, and geographical location show significant relationships with the community's coping mechanisms.

Finding shows that there is a need for inclusion the community's coping mechanisms for more realistic policies and programs on disaster management. The aim of flood disaster mitigation and response of the Local Government Unit (LGU) should increase community's capacities to better deal with adverse effects of flood. This could be achieved through knowing the community's coping mechanisms. Above all, it is necessary that those that are impacted by flood or those people who suffered from the negative of effects of floods become the main actors or take part in the planning and policy-setting of flood disaster management programs.

Acknowledgements

This thesis is the product of collective efforts. My journey towards its completion could not have materialized without the valuable time and resources contributed by many individuals and institutions. From the bottom of my heart, I gratefully acknowledge and give thanks to each one of them;

To the ITC, for providing a unique environment conducive to learning;

To the Netherlands Fellowship Program, for providing sufficient financial support for me to pursue higher education abroad;

To the Department of Environment and Natural Resources, for allowing me to study abroad. Special thanks to USEC Ramon P. Paje, Director Florece, Dr. Palaypayon and Mrs Rebecca Matusalem, and my officemates, for their support to pursue this study.

My teachers in various modules I attended in ITC, particular to mention Drs. Kingma, Drs, Voskul, and Dr. Damen

To my supervisors, Drs Dinand Alkema and Dr. Erik De Man, and to Dr. Cees van Westen, not only for their valuable academic counsel to direct my work, but also their patience to help me stay in focus and for letting this study carried within the SLARIM project.

To the officials of Naga City in the Philippines for allowing me to carry out the research in their area, supplying official documents and providing their insights on my subject matter;

To my classmates in EREG, for the benefit of their company, intellect, and humor, not only in the course of my thesis work, but also for the duration of our course; special thanks to khamal, Muhy and Ali , to my fieldwork companions thanks a lot.

To all my Filipino friends whom I met here, not only for being my surrogate family, but also for allowing me to use their time, resources and skills for the completion of my work. I name in particular Gay, Gresan, Juliet, Grace, John, and Lyn, Sharon, Brandon, Mars, Jun, Alwin, Jonald, Flor and the kids. However, I specially thank Tony and Alice, for being here for the long haul and for the patience and indulgence a true brother and sister would not hesitate to give. I am truly blessed to have enjoyed their company and support through these months. For Alice and Rhoel who patiently edited and help me formatted this paper, thanks a lot.

For Prakash whom I shared a lot of valuable ideas during the stay here in Enschede

For Carl, thanks for helping me in settling my office unfinished works.

For my family, whose love, support and fortitude served as my driving force to stay and to continue my studies.

To almighty God for his guidance.

Table of contents

1. INTRODUCTION	16
1.1. Background	16
1.2. Research Problem	17
1.3. Research Questions	17
1.4. Research Objectives	17
1.5. Research Conceptual Framework	18
1.6. Significance of the Study	20
1.7. Scope and Limitation	20
1.8. Thesis Structure	20
2. LITERATURE SURVEY: CONCEPT AND TRENDS	22
2.1. Flooding and its Impact.....	22
2.2. Defining the Hazard and Disaster	23
2.3. Concept and Trends in Flood Hazard Management.....	23
2.4. Concept of Coping Mechanisms	24
2.5. Factors That Influence The Coping Mechanisms	26
3. STUDY SITE SELECTION AND METHODOLOGIES	28
3.1. THE STUDY AREA.....	28
3.1.1. Reasons for Site Selection	28
3.1.2. Geographical Location	28
3.1.3. The specific Study Area	29
3.1.4. Triangulo as Study Area	30
3.1.5. MaboLo as Study Area	30
3.2. Methodologies and Research Activities.....	30
3.2.1. Literatures and Maps	30
3.2.2. Data Collection	31
3.2.3. Interview	31
3.2.4. Mini Workshops	32
3.3. Data Analysis	32
3.3.1. The Flowchart of the Methodology	33
4. NAGA CITY GOVERNMENT, DISASTER MANAGEMENT AND SOCIO-ECONOMIC AND PHYSICAL FEATURES OF MABOLO AND TRIANGULO	35
4.1. INTRODUCTION.....	35
4.2. Naga City as Local Government	35
4.3. Statutory Role of the City and Barangay	35
4.4. The Naga City Disaster Management	36
4.4.1. Structural Measures	37
Improvement of River Flow	37
Construction of Dikes and Embankments	37
Private Initiatives.....	37
4.4.2. The No-Structural Measures.....	38
Formation of Task Force	38
Designations of Evacuation Centers.....	38
GIS Application.....	38

4.5.	SOCIO-ECONOMIC AND PHYSICAL FEATURES OF MABOLO AND TRIANGULO	38
4.5.1.	Respondents Socio-Economic Profile	38
	Age and Gender	38
	Respondent Educational Attainment	39
	Households Size	40
	Length of Stay	40
4.5.2.	Distribution of Income.....	41
	Land Tenure	42
4.5.3.	Physical Characteristics.....	43
	Physical Features of House Wallings.....	43
	Physical Features of House Roofing	43
4.6.	Social Structure: Mabolo and Triangulo.....	44
	Household Memberships in Organizations	44
	Households Access to Assistance.....	46
	Reasons for Stay	46
4.7.	Flooding in Mabolo and Triangulo	47
	Water Depth	47
	Water Duration	48
4.8.	Community's Perceptions on Flooding.....	49
	Perceptions on Effects of Floods.....	50
4.9.	Summary and Conclusion	51
5.	COPING MECHANISMS: MABOLO AND TRIANGULO.....	53
5.1.	Introduction	53
5.2.	The Types of Coping Mechanisms	53
5.3.	Coping Mechanisms on Houses/Building Structures	54
5.4.	Coping Mechanisms on Houses Contents.....	57
5.5.	Coping Mechanisms on Income.....	61
5.6.	Coping Mechanisms on Business Stocks.....	64
5.7.	Coping Mechanisms on Road Disruptions.....	67
5.8.	Coping Mechanisms Injuries ,Diseases and Lifeloss.....	70
5.9.	Summary and Conclusion	73
6.	ANALYSIS AND RESULT OF THE DATA:MABOLO AND TRIANGULO.....	75
6.1.	Non Spatial Analysis.....	75
6.1.1.	Factors that Influence the Coping Mechanisms, Before Flooding	76
	Coping Mechanisms in Relation to Hazard, Before Flooding, Mabolo	76
	Coping Mechanisms in Relation to Income Before Flooding, Mabolo.....	77
	Coping Mechanisms in Relation to Access to Assistance Before Flooding, Mabolo.....	77
	Coping Mechanisms in Relation to Hazard Before Flooding, Triangulo.....	78
	Coping Mechanisms in Relation to Income Before Flooding, Triangulo	78
	Coping Mechanisms in Relation to Access to Assistance before Flooding, Triangulo	78
6.1.2.	Factors That Influence Coping Mechanisms During Flooding	79
	Coping Mechanisms in Relation to Hazard During Flooding, Mabolo.....	79
	Coping Mechanisms in Relation to Income During Flooding, Mabolo	79
	Coping Mechanisms in Relation to Access to Assistance During Flooding, Mabolo	80
	Coping Mechanisms in Relation to Hazard During Flooding, Triangulo	80

Coping Mechanisms in Relation to Income During Flooding, Triangulo.....	81
Coping Mechanisms in Relation to Access to Assistance During Flooding, Triangulo	81
6.1.3. Factors that Influence the Coping Mechanisms After Flooding.....	81
Coping Mechanisms in Relation to Hazard After Flooding, Mabolo	81
Coping Mechanisms in Relation to Income After Flooding, Mabolo	82
Coping Mechanisms in Relations to Access to Assistance After Flooding, Mabolo.....	82
Coping Mechanisms in Relation to Hazard After Flooding, Triangulo	83
Coping Mechanisms in Relation to Income After Flooding, Triangulo.....	83
Coping Mechanisms in Relation to Access to Assistance, Triangulo.....	83
6.2. Analysis of Factors that Influence the Coping Mechanisms Using Pearsons Correlation ...	83
Correlations of Factors that Influence the Coping Mechanisms	83
6.3. Spatial Analysis of the Factors Relating to Coping Mechnaisms and Selection of	
Predominat Coping Mechanisms.....	86
6.3.1. Coping Mechanisms Before Flooding: Mabolo and Triangulo.....	87
Coping Mechanisms in Relation to Hazard Before Flooding	88
Coping Mechanisms in Relation to Income Before Flooding, Access to Assistance and	
Geographical Location	89
Coping Mechanisms in Relation to Income, Before Flooding	89
Coping Mechanisms in Relation to Access to Assistance Before Flooding	90
Coping Mechanisms in Relation to Geographical Location	90
6.3.2. Coping Mechanisms During Flooding: Mabolo and Triangulo	91
Coping Mechanisms in Relation to Income, Access to Assistance and Geographical Location,	
During Flooding	92
Coping Mechanisms in Relation to Income, During Flooding.....	92
Coping Mechanisms in Relation to Access to Assistance, During Flooding.....	93
Coping Mechanisms in Relation to Geographical Location During Flooding.....	93
6.4. Coping Mechanisms After Flooding: Mabolo and Triangulo.....	94
Coping Mechanisms in Relation to Hazard, After Flooding.....	95
Distribution of Coping Mechanisms in Relation to Income, Access to Assistance and	
Geographical Location	96
Coping Mechanisms in Relation to Income, After Flooding	96
Coping Mechanisms in Relation to Access to Assistance, After Flooding.....	97
Coping Mechanisms in Relation to Geographical Location, After Flooding.....	97
6.5. Summary and Conclusion	98
6.5.1. Factors that Influence Coping Mechanisms	98
6.5.2. Predominant Coping Mechanisms	99
6.5.3. The Viable Coping Mechanisms	100
7. CONCLUSION AND RECOMEMNDATION.....	101
7.1. Conclusion	101
Perceptions on Flooding.....	101
7.2. Recommendations.....	103
7.2.1. Policy Recommendation.....	103
• Inclusion of Community's Involvement in Disaster Management Plan	103
• Raising Awareness of the Community on Impact of Flooding.....	103
• Strict Enforcement of Police Authority During Flooding.....	104

- Strengthening of Community's Access to Assistance 104
- Improvement of Facilities on Evacuation Centers 104
- Promotion of Livelihood Opportunities 105

REFERENCES 106

APPENDIX 108

APPENDIX A. List of Coping Mechanisms Identified in the Study Area 108

APPENDIX B. Questionnaires for the 2 Studies – Vulnerability and Coping Mechanisms 111

List of figures

Figure 1 Research Conceptual Framework	18
Figure 2 Naga City Landuse Allocation 2000.....	29
Figure 3 Study Area.....	29
Figure 4 Distribution of Respondents	31
Figure 5 Data Collection Phase.....	33
Figure 6 Data Analysis Phase.....	34
Figure 7 Distribution of Respondents by Gender.....	39
Figure 8 Distribution of Respondents by Education	40
Figure 9 Distribution of Respondents by Household Size	40
Figure 10 Distribution of Respondents by Length of Stay.....	41
Figure 11 Distribution of Average Income	42
Figure 12 Distribution of Respondents by Land Tenure	43
Figure 13 Physical Features of House Wallings	43
Figure 14 Physical Features of House Roofing.....	44
Figure 15 Physical Features of House Floors.....	44
Figure 16 Coping Mechanisms in Relation to Hazard	88
Figure 17 Income, Coping, and Assistance Maps Overlaid with Road, Railroad, and River Maps	89
Figure 18 Flood Depth and Coping Map Overlaid with Road, River, and Railroad Segment Maps.....	91
Figure 19 Income, Coping, and Access to Assistance Maps Overlaid with Road, River, and Railroad Segment Maps	92

List of tables

Table 1 Distribution of Respondents Age	39
Table 2 Frequency Distribution by Organizational Membership, Triangulo.....	45
Table 3 Frequency Distribution by Organizational Membership, Mabolo	45
Table 4 Frequency Distribution by Source of Assistance, Triangulo	46
Table 5 Frequency Distribution by Source of Assistance, Mabolo	46
Table 6 Distribution by Reasons of Stay, Triangulo.....	47
Table 7 Distribution by Reasons of Stay, Mabolo	47
Table 8 Distribution of Water Depth, Triangulo.....	48
Table 9 Distribution of Water Depth, Mabolo	48
Table 10 Distribution by Water Duration, Triangulo.....	48
Table 11 Distribution by Water Duration, Mabolo.....	49
Table 12 Distribution by Types of Flooding, Triangulo	50
Table 13 Distribution by Types of Flooding, Mabolo	50
Table 14 Distribution by Perceptions, Triangulo.....	50
Table 15 Distribution by Households Perceptions, Mabolo	51
Table 16 Frequency of Mechanisms to Protect the Houses (Before Flooding, Mabolo).....	55
Table 17 Frequency of Mechanisms to Protect the Houses (Before Flooding, Triangulo)	55
Table 18 Frequency of Coping Mechanisms on Houses (During Flooding, Mabolo).....	56
Table 19 Frequency of Coping Mechanisms on Houses (During Flooding, Triangulo).....	56
Table 20 Frequency Coping Mechanisms on Houses (After Flooding, Mabolo)	57
Table 21 Frequency Coping Mechanisms on Houses (After Flooding, Triangulo).....	57
Table 22 Frequency of Coping Mechanisms on House Content (Before Flooding, Mabolo)	58
Table 23 Frequency of Coping Mechanisms on House Content (Before Flooding, Triangulo).....	58
Table 24 Frequency of Coping Mechanisms on House Contents (During Flooding, Mabolo)	59
Table 25 Frequency of Coping Mechanisms on House Contents (During Flooding, Triangulo).....	59
Table 26 Frequency of Coping Mechanisms on House Content (After Flooding, Mabolo).....	60
Table 27 Frequency of Coping Mechanisms on House Content (After Flooding, Triangulo)	61
Table 28 Frequency of Coping Mechanisms on Income (Before Flooding, Mabolo)	61
Table 29 Frequency of Coping Mechanisms on Income (During Flooding, Triangulo).....	62
Table 30 Frequency of Coping Mechanisms on Income (During Flooding, Mabolo).....	62
Table 31 Frequency of Coping Mechanisms on Income (During Flooding, Triangulo).....	62
Table 32 Frequency of Coping Mechanisms on Income (After Flooding, Mabolo).....	63
Table 33 Frequency of Coping Mechanisms on Income (After Flooding, Triangulo)	63
Table 34 Frequency of Coping Mechanisms on Business Stocks (Before Flooding, Mabolo)	64
Table 35 Frequency of Coping Mechanisms on Business Stocks (Before Flooding, Triangulo)	65
Table 36 Frequency of Coping Mechanisms on Business Stocks (During Flooding, Mabolo).....	65
Table 37 Frequency of Coping Mechanisms on Business Stocks (During Flooding, Triangulo).....	66
Table 38 Frequency of Coping Mechanisms on Business Stocks (After Flooding, Mabolo).....	66
Table 39 Frequency of Coping Mechanisms on Business Stocks (After Flooding, Triangulo)	67
Table 40 Frequency of Coping Mechanisms on Road Disruption (Before Flooding, Mabolo).....	68
Table 41 Frequency of Coping Mechanisms on Road Disruption (Before Flooding, Triangulo)	68
Table 42 Frequency of Coping Mechanisms on Road Disruption (During Flooding, Mabolo)	69

Table 43 Frequency of Coping Mechanisms Per Class on Road Disruption (During Flooding, Triangulo).....	69
Table 44 Frequency of Coping Mechanisms on Road Disruption (After Flooding, Mabolo).....	70
Table 45 Frequency of Coping Mechanisms on Road Disruption (After Flooding, Triangulo).....	70
Table 46 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeloss (Before Flooding, Mabolo).....	71
Table 47 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeloss Before Flooding, Mabolo	71
Table 48 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeloss (During Flooding, Mabolo).....	72
Table 49 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeloss (During Flooding, Triangulo)	72
Table 50 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeloss (After Flooding, Mabolo).....	73
Table 51 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeloss (After Flooding, Triangulo)	73
Table 52 Classification of Factors Relating to Coping Mechanisms.....	75
Table 53 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms Before Flooding, Mabolo	77
Table 54 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms Before Flooding, Triangulo.....	78
Table 55 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms During Flooding, Mabolo.....	80
Table 56 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms During Flooding, Triangulo	80
Table 57 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms After Flooding, Mabolo	82
Table 58 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms After Flooding, Triangulo.....	82
Table 59 Pearson's 2-Tailed Correlation of Coping Mechanisms on Income, Flood Depth, and Access to Assistance, Mabolo and Triangulo.....	86
Table 60 Predominant Coping Mechanisms, Before Flooding	87
Table 61 Predominant Coping Mechanisms During Flooding.....	91
Table 62 Predominant Coping Mechanisms, After Flooding.....	94
Table 63 List of Viable Coping Mechanisms.....	100

ABBREVIATION

ADPC	Asian Disaster Preparedness Center
ERN	Emergency Rescue Naga
ITC	International Institute for Geo-Information Science and Erath Observation
LGU	Local Government Unit
NCDMCC	Naga City Disaster Mitigation Coordinating Council
NDCC	National Disaster Coordinating Council
OGA	Other Government Agencies
PNR	Philippine National Railroad
SLARIM	Strengthening Local Authorities on Risk Management
UNDP	United Nations Development Fund

1. INTRODUCTION

1.1. Background

This study is carried out within the Flood Risk Assessment Project of the SLARIM (Strengthening Local Authorities on Risk Management) project of ITC (International Institute for Geo-information Science and Earth Observation). Naga City is one of the project sites for Flood Risk Assessment of SLARIM. The project aims to assist the Local Government Units in a more reliable and effective way on risk management.

Flooding is one of the common hazards that causes loss of life and properties of the people and even causes severe economic setback, specially, in developing countries (UNDP, 1999).

In the Philippines, monsoon rains and typhoons are the common causes of flooding. Philippines usually experienced typhoons during the months of July to December. The recent (November to December 2, 2004, four typhoons, *Unding*, *Violeta*, *Winnie* and *Yoyong* (local typhoon names) claims 998 lives, 752 injured people, 837 people missing, and approximately a total of 85.7051 million USD economic damages to crops, infrastructures and properties (NDCC, 2004).

The Philippine government tends to exert more efforts to combat flooding. Several mitigating measures have been introduced. This ranges from structural to non-structural interventions and from preparedness to rehabilitations. Structural interventions includes, building dikes, canals, roads and bridges, rescue centers etc., and tends to be one of the solutions to mitigate flooding. Non-structural interventions include social infrastructure and development – like capacity building, community organizational development and institutionalization and implementation of early warning system, (NDCC, 2002).

Despite these interventions, the people are still impacted by the flood hazards, as mentioned above. The people are the first who felt the effect of the flood hazard and thereby, may tend to developed mechanisms to counter its effect. Although the community have mechanisms, it is on the hands of the planner and policy makers and the government, as a whole, to strengthen or adopts the community's mechanisms and this can be one of the effective solutions on flood hazard problems. This study aims to show how the people reacted and cope with flooding and the types of mechanisms the community has at different stages of flooding.

Coping mechanisms that the community has developed can apply at all phase of the hazard management cycle: mitigation, preparedness, response and recovery. The coping mechanisms are developed in the community based on past experiences and it may suit its needs. The indigenous knowledge is vital and useful information for planners and policy makers. This will provide information in the planning and policy setting for a more viable disaster mitigation and response measures. For the past years, we have witnessed how the

community-based knowledge can be tapped in disaster management. The new trends on flood management are more focused on the non structural measures.

This study has looked upon the community's coping mechanisms in dealing with the floods in Naga City. The data generated from this study can be useful information for the Local Government Unit undertaking Disaster Management Program

1.2. Research Problem

For the last decades we had witnessed that floods have the potential negative impact to human population. On the contrary, there are some scholars saying that floods can bring economic and environmental benefits (Blaikiei, et.al., 1994; Smith, K. et. al. 1998) as well like irrigating and fertilizing agricultural fields and replacing the water from reservoir however, this study views that floods has the negative impact to the people.

In Naga City, structural and non-structural mitigating measures were introduced to address the flood problems like flood modelling, flood prone areas mapping, formation of task forces and institutionalization of Disaster Management Offices. However, during the literature searches and interviews, there is no detailed study in relation to the coping mechanisms employed by the community to deal with floods was found. According to Carter, N., (1992), the people had the respective mitigation and response measures that would protect their lives and cope with the effects of floods. The knowledge the community possesses in flood mitigation and response is vital information for the disaster management to consider because their ideas may suit their needs. However, the problem lies on how the community's knowledge on flood mitigation and responses be considered in disaster management.

This study draws on a body of a critical analysis recover from the community response to flooding and its strategies to the effects of the flooding. The concept of coping emphasizes the positive potential and actions of people to combat the adverse effects of floods. This is helpful information for the planners and policymakers to involve the knowledge of the community in effective flood hazard management.

1.3. Research Questions

1. How does the community perceive the floods?
2. How does the community deals with the floods?
3. What are the factors that influence the community's coping mechanisms?
4. What types of community's coping mechanisms can be incorporated into flood risk reduction strategies of the Local Government Unit?

1.4. Research Objectives

The abovementioned research problems are supported by the following objectives:

1. To learn how the community perceives the floods.
2. To know the community's coping mechanisms related to floods.
3. To understand the driving forces behind the choice for certain coping mechanisms.
4. To come up with the viable coping mechanisms for policy recommendation.

1.5. Research Conceptual Framework

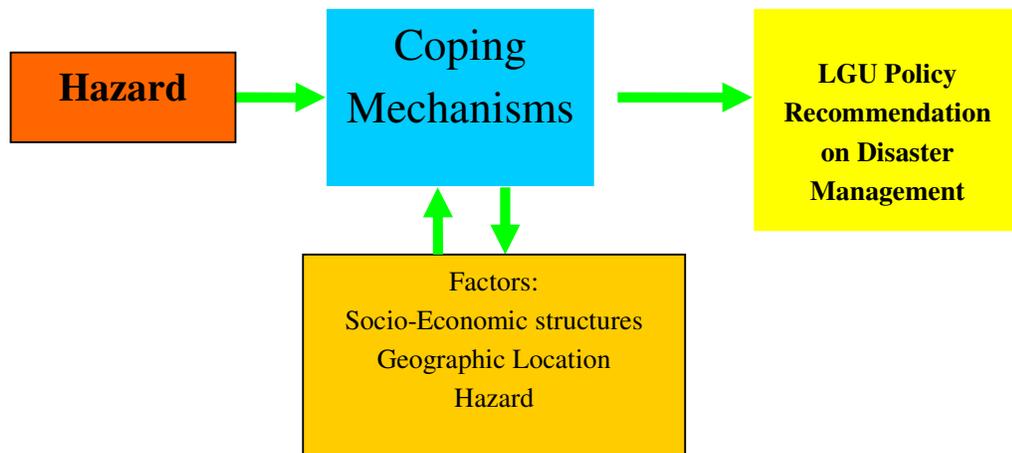


Figure 1 Research Conceptual Framework

This research conceptual framework was based on the concepts of vulnerability, coping capacity and disaster management discussed from the books of Blaikie, P. et. al, (1994) *At Risk*; Smith, K., et. al, (1998) and Tobin G., et. al, (1997) *Natural Hazards*

The research conceptual framework summarizes the concept of this study. As illustrated in Figure 1, the study consists of four (4) components – the hazard, coping mechanisms, the factors that relate the coping mechanisms and LGU policy recommendation on disaster management. The hazard is the threat the community has to cope with. The coping mechanisms are the community's strategies to deal with the effects of floods. The factors are driving forces that influenced the community's coping mechanisms. The LGU policy recommendation entails the considerations of identified community's coping mechanism.

This forward arrow described the assumptions of the study. The assumptions show that the hazard is the threat the community had to cope with and the coping mechanisms can be used by the LGU on disaster management. The feedback arrow is the interactive process of the proposition of the study in relation to the identified factors that influence the coping mechanisms.

Concept of Risk Management

Hazards and Disasters

Disasters are often connected with the natural or human made events. However flood itself is just a hazard. Flood become a disaster when it hits the vulnerable community, it causes disaster. Blaikie, P., (1994) states that hazard refer to "extreme natural events which may affect different places singly or in combination at different times over a varying return period". According to Smith, K. et. al, (1998), the detailed way to define disaster is "an event, concentrated in time and space, in which the community experience experiences severe danger and disruptions of its essential functions, accompanied by widespread human or material losses, which often exceeds the ability of the community to cope without external assistance.

Vulnerability and Capacity

In knowing the risks of a community, it is necessary to consider the people's vulnerability and their capability in undertaking measures to counter its effects. There are some prevailing physical and socio-economic factors that influence the extent to which the community maybe impacted by the flood hazard. The level of the vulnerability and ability to cope can determine the magnitude of the disaster.

Vulnerability has been defined as a "combination of characteristics of a person or a group, expressed in relation to hazard exposure which derives from the social and economic condition of the individual or community concerned" (Blaikie,P. et. al, 1994). A community is said to be "vulnerable" or "at risk" when they are exposed to crises and are likely to be affected by the impact of the flood hazard. The capacity is positive conditions and practices that increase the ability of the community to respond to the needs effectively or which reduces risk of the disaster.

Risk

Risk is a probability of an event happening in the future, which has negative consequences. Risk is a function of hazard and vulnerability (Tobin, G. A., et. al, 1997). Risk reduction include all measures, which reduces flood disaster related losses of life or properties by reducing vulnerability of the elements at risk or by strengthening the community's capacity.

Coping Mechanisms

Coping mechanism is a "manner in which people acted within the existing resources and ranges of expectations of a situation to achieve various ends" (Balikie, P., et. al, 1994). This means that community's coping strategies involves managing of resources to counter the effects of the flood hazard. Coping strategies refers to the set of measures taken by the community for obtaining resources in time of disaster. The strategies are usually based on the socio-economic and physical structures of the community.

1.6. Significance of the Study

This study is envisioned to come up with information on community's coping mechanisms that could be useful for the Local Government Unit (LGU). This may result in a policy recommendation for Local Government Units (LGU) for planning and policy setting regarding flood mitigation and flood disaster response. This study can give an ample picture of the situation in the area in cases of flooding. This study will provide a road map on interventions that can be used to reduce flood risk and improve the response to flooding. The design of this study may provide guidelines for incorporating the spatial socio-economic data in future in flood risk assessment studies.

1.7. Scope and Limitation

This study is about identifying the community's coping mechanisms that can serve as information for the LGU as an input in the flood mitigation and response policies and programs. It focused on the understanding how the community's cope with the floods. Descriptive and a basic spatial analysis were used in this study. The spatial analysis was by digitizing the topographic map using the ILWIS software to visualize the components being described to. Frequency counting of the data taken from field and the Pearson's correlation were used as part of statistical analysis. The purpose of this is to describe the situation and the actions the community has taken to save their properties and lives.

The fieldwork and questionnaire was tailored to address the need of the two MSc studies, the vulnerability assessment and this study, and one PhD research on flood risk assessment for the SLARIM project of ITC.

Big religious festival were being held in Naga City during the time of fieldwork and most of the respondents were busy preparing and participating on the festival that resulted to several call backs. Call backs resulted to the reduction of the number that can be interviewed considering that we have to go back to respondents place more than once. Despite these constraints, the author believes this is still the right way to study the community's coping mechanisms related to floods.

1.8. Thesis Structure

The present chapter contains the parameters of the study. Background is given to introduce the topics and issues on flood hazard and coping mechanisms. The research problems show the issue in this the topic of this study. The conceptual framework summarizes the concept of the study. The significance of the study discusses the importance of community's mechanisms in flood mitigation and response.

Chapter 2

This chapter synthesizes the available literatures. It tackles the importance of community's mechanism in planning and policy making for disaster management. The indicators, including social capital used in this study, are supported by previous works.

Chapter 3

This chapter gives the basic profile of the study area, specific reasons for selection of the study site, brief description of Naga City and the methodologies adopted in the field.

Chapter 4

This chapter shows the socio-economic and physical features of the two barangays, Triangulo and Mabolo. The data used in the discussion were taken from the output of field survey for this study. The Local Government Unit flood Disaster mitigation and response programs and policies were described in this chapter. Both the structural and non structural projects of the LGU were included in the discussion. Brief description of LGU, barangay and community mandates are also included.

Chapter 5

The chapter presents the results of the fieldwork and shows the coping mechanisms of the community at different stages of the flooding – before flooding, during flooding, and after flooding, furthermore the questionnaires resulted in a hazard map. Three types of mechanisms in terms of economic, social and physical as well as the magnitude of the hazard were shown in this chapter.

Chapter 6

This chapter shows the analysis of factors that influence coping mechanisms and the predominant coping mechanisms practiced by the community to deal with the floods. Analysis includes the non-spatial and spatial approach.

Chapter 7

This chapter is about the conclusion on the results of the study. It discusses the important mechanisms for adoption of the LGU. This also emphasizes the needs for further research to supplement the present study.

2. LITERATURE SURVEY: CONCEPT AND TRENDS

This chapter gives an overview of the natural causal factors of flooding, its impact to the people and the way the people cope with its effects. The discussion includes the usefulness of the peoples' indigenous knowledge in the planning and policy making on disaster management. The factors that can influence the coping mechanisms are also included as an important part of this chapter. This supports the analysis methodologies undertaken in this study.

2.1. Flooding and its Impact

Flood is one of the natural hazards. Flooding can be defined as the overflowing of water from sources such as rivers, reservoir, estuaries, and ponds caused by prolonged seasonal rains, typhoon rains, intrusion of seawater on the land or during tidal surges (Smith, K., et. al, 1998). There are two major types of flooding. The first is the river basin flooding which are caused by the storms and monsoon rains. The other type is the sea surges flooding which inundates the adjacent lands when the coastal area is lower than the sea water (Smith, K., et al, 1998). In tropical areas, floods are often with the first type, because of heavy rainfall during monsoon and typhoon seasons. Apart from the rainfall, topography, vegetation, soil types, diversification of river channels, and rapid urban growth influence the magnitude, duration and frequencies – speed of water of the flooding. Rapid urban development which is a characteristic of erosion tends to reduce the surface permeability and increases runoff rates (Haque, E.C., 1997; Smith, K. et. al, 1998) hence increases development of flood hazard.

In general, flooding is phenomenon that has negative consequences. A hazardous flood claims lives of the people and animals, disrupts their livelihoods, destroys roads, bridges, vehicles and houses and even induces diseases, like dysentery, severe gastro-intestinal and cholera outbreaks, that needs sophisticated medications. This causes disruption to medical services due to an increase in demand on the medical facilities that resulted in the reduction of accessibility to the normally required medical attention. The case of malnutrition, one of the major flood impacts, due to disruption in their means of livelihoods that reduces their incomes. And the disruption of road network that causes price increase of commodities and affects the food distribution systems (Tobin, G., et. al 1997; Blaikie, P. et al. 1994; Smith, K. et .al. 1998).

However, some authors say that there are some gains from the damaging floods (Smith, K, 1997; Prasad, R. S, 2003). This ranges from availability of jobs like labor for cleaning debris and flood waste, repairs of the houses and appliances, and more business income due to disruption of road network. Flooding brings economic and environmental benefits. For instances it may increase the soil fertility because of siltation carried by flood. It provides water for irrigation and domestic consumptions particularly in the case of India (Prasad, R.S, 2003). However, the losses from flood far outstrip gains from it.

2.2. Defining the Hazard and Disaster

There are different definitions of hazard. Cutter, S., (1993) argued that “hazard is a broader concept that incorporates the probability of an event happening, but also includes the impact of the magnitude of the event on the society and environment”. Blaikie, P., (1994) states that hazard refers to “extreme natural events which may affect different places singly or in combination at different times over a varying return period”. Tobin, G.A, et.al, (1997) states that hazard is an “interaction between the human system and the events”. They further state that hazard overlaps with disaster where hazard is the potential event and disaster is the result of the hazard. Blaikie, et.al, (1994) state that “there is a disaster when significant number of people had been affected by the hazard, be it to their livelihood, lives, and properties, that made them incapable of regaining or coping with losses”. According to Smith, K., et. al., (1998), the detailed way to define disaster is “an event, concentrated in time and space, in which the community experiences severe danger and disruptions of its essential functions, accompanied by widespread human, material or environmental losses, which often exceeds the ability of the community to cope without external assistance. These definitions of disaster have in common that the difference between the flood event (hazard) and disaster depends on the coping capacity of the community affected. Apparently floods in well-prepared communities with a strong social structure are less disastrous than the unprepared communities.

2.3. Concept and Trends in Flood Hazard Management

The negative effect of the flooding forces government and the people to mitigate and respond to the effects of flooding. The government and the people had their respective hazard mitigation and response programs at different flood stages –before, during, and after flooding (Carter, N., 1992). This includes preparedness, response and recovery. Preparedness involves the inclusion of educating the public and the managers in conceptualizing and providing emergency training courses. Response consists of the use of human, financial and physical resources, search and rescues, temporary shelters to the affected public and relief food items. While the recovery involves the repair and reconstructions, rehabilitation planning and implementation of disaster management programs (Parker, D. et. al, 1992; Carter, N. 1992). Parker, (1992) stated that “hazard management embraces everything, from hazard evaluation and identification, emergency planning, and disaster management”. According to Pearce, L, (2003), the government must encourage the community to participate in decision making process. Pearce further suggests that local government needs dedication to encourage the community’s participation “through education and consensus building processes that heightens citizen ownership of any given disaster management plan”.

Hazard mitigation can be both structural and non-structural. The structural interventions, generally refers to the engineering works like dikes, embankments, seawalls, modifying of river channel, flood gates, reservoirs to control the river flows and avoid to spread the water (Waugh,W.L.,2000 , Smith, K. et al., 1998). Although this intervention achieved success to combat flooding, however, there is still possibility that these structures may fail. Failure may occur because of a flood may happen beyond the design of the protection structures or because the structures are weakened due to poor maintenance. More structures require

higher budget and the cost of structure may not be feasible to many developing countries lying on the flood prone areas.

Typically, non-structural interventions are designed not to prevent the flood but to reduce or avoid the impact of the flood. Among these measures, warning system, evacuation projects, landuses to control flood prone areas for settlement, zoning, building codes to avoid physical destructions and application GIS-based methodologies on hazard map zonation are the non-structural interventions that cater a wider range of area and larger number of people (Thomalla, F. et al, 2004, Blaikie, P. et.al, 1994; Tobin, G. et. al, 1997; Waugh,L., 2000). Inclusion of community's knowledge in hazard management is a non-structural intervention. Community's participation indecision making and policy setting is a new trend to avoid or lessen the impact of flooding (Pearce, L., 2003). During the IDNDR Hemisphere Meeting (June 1999), the participants agreed that in preventive perspective of disaster management stakeholders at the local level should be involved. In fact consideration of public in decision making and policy setting is inevitable. According to Pearce, L. (2003), community's participations should be integrated is sustainable approach to hazard management. Carter, N. (1992) emphasizes that communities are the "disaster front" and therefore it is necessary to involve the community in decision making in disaster organizations.

There are already examples of participatory approach in the formulation of disaster management plans in Asia. The Local Government Units in Cambodia, Sri Lanka, and Naga City, Philippines are prepared with participation of the community wherein community were asked to map the flooding and possible mitigating and response measures (Cambodia, 2000; Sri Lanka, 2001; Naga City, 2001). However, these plans needs to further exploration to fully integrate the community's knowledge.

It is therefore important that the coping mechanisms of the community be integrated in the planning and policy making of the local government. Carter, N. (1992), emphasized that disaster management should involve the community and needs a clear disaster policy and organization from national to local level of the government. Legislation provides a formal basis for the planning and implementation of disaster management program.

2.4. Concept of Coping Mechanisms

What is coping in terms of flooding? According to Blaikie, P., et.al, (1994) "Coping mechanism is a manner in which people acted within the existing resources and ranges of expectations of a situation to achieve various ends". Thus, the community's coping mechanisms is a way of solving the problems within the availability of its resources. Studies on coping mechanisms, pays attention to counteract the effects of flooding. Various studies focused on understanding how the community responds and how the community or people perceive the flooding (Tomalla F. et. al, 2004; Haque, E.C., 1997; Brahmi, et al, 2002). Blaikie, P. et al. (1994) states that "local-level indigenous knowledge includes people strategies for dealing with flood risks" and "The people response have been developed by people in many places, often a hundred years, specially where people have had to colonize and cultivate new lands in the floodplains". Coping mechanisms is primarily developed to protect and regain from losses or damages from the effect of the flood hazard (Blaikie, P. et

al 1994). In Bangladesh, several coping mechanisms have been practiced by the communities includes cultivation of bananas and bamboo for their food, shelter and rafts for their mobility to be able to cope during flooding and to cope with the effects of floods (Haque, E.C., 1997). In Laos, the local coping mechanisms where developed to cope with the effects of flood. Coping mechanisms include variety of crop diversification for flood resistant varieties, this enable the farmer to reduce crop losses when flooding occurs in the area. After the flooding, the people have to look for alternatives to meet their economic need by substituting livelihoods. People have to prepare rat traps, fishing traps and arrow to hunt the wild animals and sell them. This also serves as substitute for other foods. Collecting and selling non timber forest products like bamboo and ornamental plants were practiced for their economic needs (Brahmi, A. et. al, 2002). However, this kind of coping mechanism has the high possibilities to cause the extinction of the wildlife.

Similar studies on coping mechanism are conducted. The coping mechanisms on poverty issues were undertaken to know how the community cope with the pose risk. In Zambia, several coping mechanism have been used to counter the effect on poverty issue. This include reducing physical mobility, reducing households expenditures, diversify livelihood by home-based enterprises like food processing and livestock production, and increase of participation of woman in community-based activities to avail social services (Moser, C. et.al, 1997)

During the cyclone Orissa in 1999 in India, the people developed coping mechanisms like people had to bring their basic needs like food, clothing, and important documents, animals are freed to and placed at safer areas. These are the common mechanisms they employed to be able to save their properties and lives (Waugh, L.JR., 2000)

In conclusion, the community has inherent varieties of coping mechanisms that varies from place to places. These relate to different stages of flooding and different flood damages and losses. The community's coping mechanisms are based on past experiences and availability of resources. Blaikie,P., et. al., 1994, states that several type of coping mechanisms were developed with patterns based on the past hazard events. These include: prevention, impact minimization, building up food resources and saleable assets, diversification for production, diversification of income sources, development social support network, and post-events strategies.

The preventions are those mechanisms that avoid the water from intrusion by physical means. The impact minimizing strategies are actions to reduce the negative effects of flooding like livelihood diversifications or community distribution of emergency supplies. The creation and maintenance of labor power reserves is linked more on utilizing family members to earn income. The mechanisms on diversifications of production include the farming systems. Farmers employ different farming style like intercropping, use high yield and flood resistant varieties, introduction of technologies on slope farming and the use of kitchen garden. Diversification of income sources like engaging in home-based small scale enterprises using available resources (household member use the part of the house as beauty salon or food processing). Development of social support networks includes the social structures rights and responsibilities to cope with the effects of the hazard, specially, within

the family. Example of this is soliciting support from relatives, friends, neighborhood, and accessing social services from the government (relief items, medical services, loans). Social responsibilities include giving aide or extending helps to neighborhood. This shows that the obligation lies within the community as a whole to assist and provide those who are so needy.

2.5. Factors That Influence The Coping Mechanisms

According to Blaikie, P. et.al (1994), the community's coping mechanisms is influenced by the resources the people have, and the magnitude of flooding that the community had to cope with. The resources can be tangible and intangible. Tangible resources includes those asset that have values when sold and people can mobilized these resources to cope or rebuild the losses while intangible are those assets with no physical existence, this focus on social structures and people's well-being (Blaikie, P. et.al, 1994; Haque, E.C., 1997).

Haque, E.C., (1997), in his study on coping response on erosion in Bangladesh affirms that socio-economic structural components of the community significantly influence the type of coping measures of the community. Indicators used to assess socio-economic structures include income and household size and its occupational types like the laborer engage in portering and services worker engage in rendering services to restaurant. In general one can say that income and social structures are the main assets in coping with disaster.

In the study of poverty, vulnerability and flood coping strategies, income and social relationships are assets in coping strategies. Households with greater income have diversified livelihood and has different meals style and social status. Likewise, people who are economically stable in terms financial assets sustained lesser impact of the hazard, can employ suitable mitigating measures and has faster recovery compared to those that are poor in terms of financial resources (Mosser, C., 1997; Blaikie, P. et. al, 1994).

Economic improvement and strengthening social networks may lead to a reduction on the vulnerability of the community or the people. According to Smit, B., (2002), in his study of vulnerability and adaptive capacity of community shows that there are changes coping range when the economic, social and institutional conditions of the community or the households changes. The coping range is the extent of the community or households coping capacity or the capacity to cope with the effects of floods. The effectiveness of social network or the institution, economic resources, and infrastructure are the factors that can influence for coping with the hazards.

Social networks together with a set of norms and organizations are the social capital through which people access to have power and resources. Social capital is a collective effort of common goods. It has a reinforcing capacity that a supportive community and diverse promotes the development in collective way these includes, neighborhood relations and participation in communities activities or organizations (Hyde, J., 1999). Developing relationships among communities resulted in building trust and mutual responsibilities for the good of the community (Lesser, E. L., 2001). They further emphasizes that "communities of practice is a generator of social capital". Participatory in voluntary associations, embodying norms and trust, reciprocity, tolerance, and inclusion and activating networks in public

communication are believed to build and maintain the social capital upon which the vitality of the governance system and sustainable development are dependent. In an example of such social network, Moser, C. et al (1997) showed the importance role that woman play like cooking, taking care of child and sharing food and water. Dealing with the effects of floods depends on the resources, the threat they faced with, and their geographical locations. It is therefore important to know the driving forces that influence the community's strategies to counter the effects of floods.

3. STUDY SITE SELECTION AND METHODOLOGIES

3.1. THE STUDY AREA

3.1.1. Reasons for Site Selection

The study is conducted within the project of Strengthening Local Authorities in Risk Management (SLARIM) of the International Institute for Geo-Information Science and Earth Observation (ITC). Naga City is one of the project sites of SLARIM. The study area is chosen to fit the two ITC Master of Science students studying on vulnerability and this study and a PhD research under SLARIM project.

The choice of the actual study area within the City of Naga was guided by the following selection criteria:

1. Frequently flooded
2. Marginalized community
3. Strong collaboration with barangay officials

The reason for selecting the frequently flooded area is to know the flood magnitude the community had experienced in the area. The marginalized community are the people that are most impacted by the floods. Collaboration with the barangay officials is needed to ensure the cooperation of the respondents in answering the questions and for safety reasons of the researcher.

Reconnaissance surveys on the area were conducted by the ITC and SLARIM staff and the researchers. This enabled us to visualize the physical status of the area. Preliminary interviews with the barangay officials, the head of barangays, were undertaken to know the willingness to collaborate on this project. Based on the survey, barangay Mabolo and Triangulo were chosen among the 6 barangays visited. Both of the areas experiences flooding specially during monsoon rains and typhoons. Physical characteristics of the houses in both areas mostly are made from light materials to semi-concrete materials. The area is densely populated and mostly occupied by informal settlers.

3.1.2. Geographical Location

Naga City is placed on the Philippine Map between 13 to 14 degrees North latitude and between 123 to 124 degrees east longitude. This is situated in the Bicol Peninsula, within the Bicol River Basin, Southern Luzon, Philippines. This flat alluvial land is within the central portion of the province of Camarines Sur. The area is dominated by Bicol River that starts from Mayon Volcano in Albay province. In Naga City, a tributary (Naga River) joins the Bicol River. The Naga River has its origin in the slope of Mount Isarog in the east of the City.

Because of its gently sloping terrain and the proximity of the study area to the river it is affected by tides coming from San Miguel bay and flows as far as the upstream of Naga City.

Naga City has a total land area of 8,448 hectares covering 27 barangays. Of the total land area, 67.55% is devoted to agriculture 14.30% to residential, 7.23% to forest parks and reserves, 5.97% grassland and 1.92 % for commercial, institutional comprised 1.78% and other uses comprised 1.25% of the total or 8,448 hectares (Naga City, 2002). The landuses of Naga City is depicted in Figure 2

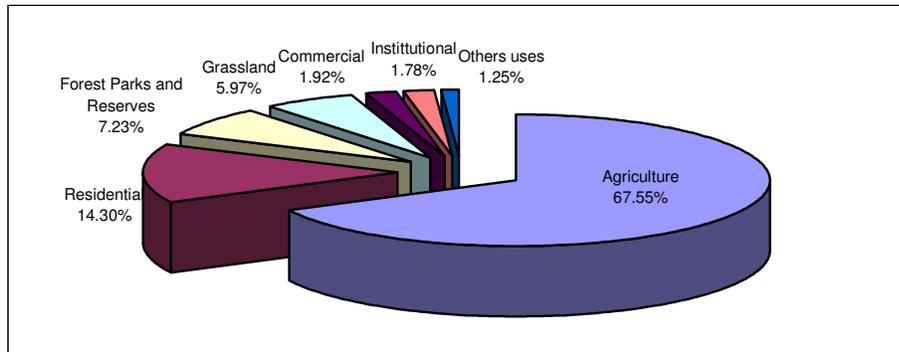
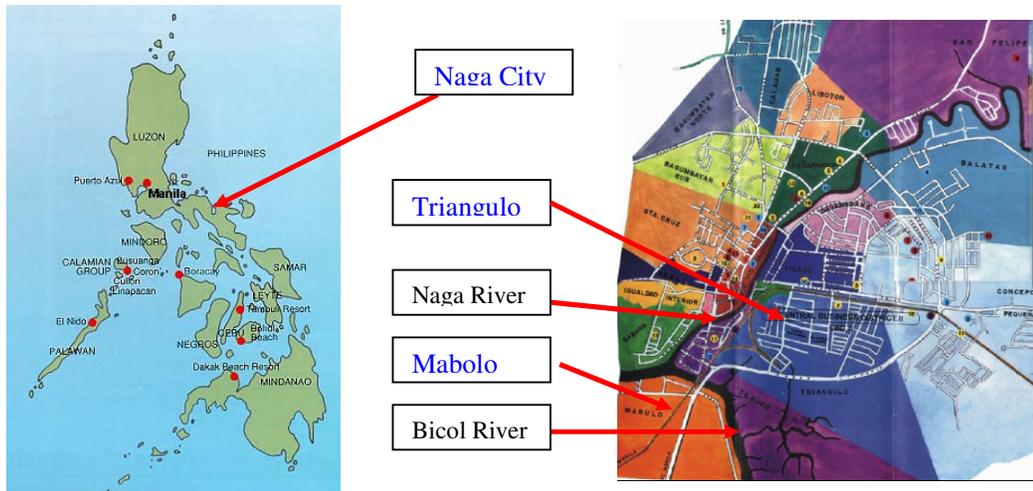


Figure 2 Naga City Landuse Allocation 2000

Naga City population density in 2000 is estimated at 1,503 people per square kilometers (Naga City Profile 2000:14). Based on Naga City, 2002, the population of the city stands 137,810 and the total households of 26,317.

3.1.3. The specific Study Area

The Study Area



Map of the Philippine

Map of Naga City

Figure 3 Study Area

3.1.4. Triangulo as Study Area

Barangay Triangulo, an area with a very pronounced poor urban community is located less than a kilometer from the commercial centers of Naga. Topographically, Triangulo is the lowest part of Naga City and experiences frequent flooding specially during monsoon season. Triangulo is straddled by the railroad tracks of the Philippine National Railroad (PNR) and the diversion highway going to Manila, the capital city of the Philippines.

Years ago, the area used to be muddy until the workers from PNR made it habitable by placing earth fillings. After World War II both employees and workers of PNR settled in the area, building homes and forming a community. The number of settlers still continues to grow. Despite of the unsanitary condition of this area, the people from nearby municipalities and provinces who are searching for better livelihoods and for education of children education migrated in the area.

Based on 2002 estimates the population of Triangulo is 6882. It has 1218 households with an average of 6 members per household. The total land area is 1.3206 sq. km. or 1.70 % of the total land area of Naga City covering 7 zones, the smallest administrative divisions in barangay. Triangulo is entirely plain in terrain and is accessible to all kinds of land transportation like cars and trains (Naga City, 2000).

3.1.5. Mabolo as Study Area

The total land area of Barangay Mabolo is 1.05 square kilometer or 1.4 % as to Naga City total land area. This is divided in six zones. The topography is 85 % plain or 15 % rolling to undulating.

According to the folks, Mabolo is named after the abundant tree called "Mabolo" during the Spanish colony in the Philippines sometime of the year 1850-1875). At first Mabolo was only one solid "sitio" (small unit of Barangay). The increase of settlement in the area started in 1960's. Most of the households in Mabolo are engage in vegetable farming, selling goods, shoe repair, drivers and laborers.

Mabolo has a total population of 6104 covering a total household of 1,017 having an average of 6 persons per household (Naga City, 2002).

Barangay Mabolo is accessible to all kinds of vehicles. It has a public utility *jeepney* (passenger car for public use), bus and *tricycle* (3-wheeled motorcycle with side seat for passenger).

3.2. Methodologies and Research Activities

3.2.1. Literatures and Maps

Literature review, map inventory, and fieldwork were the prime methodologies to collect data. The literature review was initially undertaken to look on the related concepts about the

study. However, the literature review was continued as the progress of the study deals with its research components.

The map inventory included the building footprints, cadastral and topographical maps. These were processed thru geo-referencing and digitizing to create a spatial database. Although, it was attempted to use the KVR 1992 image, unfortunately, the subject area all covered with clouds.

3.2.2. Data Collection

The field data collection consisted of two main methodologies, questionnaires and mini-workshops. The questionnaires were designed to fit the data needed for two studies on flood risk assessments, the vulnerability study and this study on coping mechanisms.

3.2.3. Interview

The study adopted the simple purposive random sampling. The number and list of the households were taken from the respective barangay offices. Selections of the respondents were done through drawing the names in order to give equal chances for all households existing in the barangay to be selected.

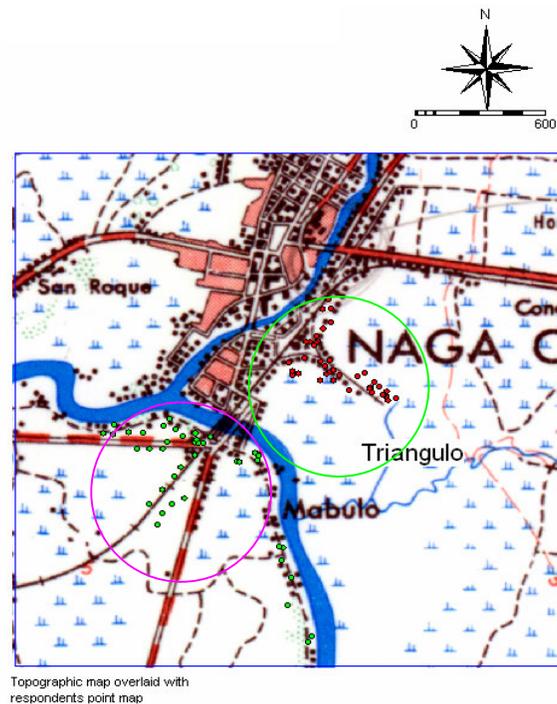


Figure 4 Distribution of Respondents

A total of 80 respondents, 40 from each barangay, were drawn randomly. Likewise, 5 substitutes for each zone in the barangay were drawn to replace the respondents that are

selected but not willing to be interviewed or when the respondents is not available after 2 call backs.

From the drawn sampling population household interviews were conducted applying the survey questionnaires. Interviews were conducted in mix languages and in vernacular – Tagalog and English and Nagauenos and Legazpi dialects. However, most of the interviews were conducted in Nagauenos dialect considering that the researcher knows the local dialect and both languages. However, interviews were translated to English language so as other researchers could understand what transpires during the interview. The researcher conducted open ended interviews to gather information how they protect and cope with the damages or losses on their houses, belongings, income or livelihood, business stocks and lives at different stages of flooding.

3.2.4. Mini Workshops

One mini-workshop for every barangay was organized. These were useful in gathering information on the damage or losses the community suffered, the magnitude of floods and the coping mechanisms. Theory or techniques applied were based on participatory approach. The underlying idea is that participants are more familiar on the community's activities including those related to the coping with flood events. The aim was to map out the ideas they have. Participants were asked to map the types, water depth, duration, and frequency of flooding at different zones. Participants were also asked to list down their strategies to protect their houses, properties and lives and cope with the flood damages or losses. Participants are the Barangay officials and formal and informal leaders from the barangay organizations.

3.3. Data Analysis

Descriptive approach on the study was used for the data analysis. The researcher kept the original detailed field notes and maintained the data sets to cross checks the tabulated data taken from the filed interviews. The data were aggregated in three levels. First from the questionnaires, the reported coping mechanisms were classified at different flood stages-before, during, and after flooding. Second aggregation step was classified on the specific set of main coping mechanisms into more general economically, socially, and physically inclined coping mechanisms. Third aggregation is the summing up of coping mechanisms in each type coping mechanisms. Frequency counts were applied on the mechanisms the community have. This first method was applied to know what coping mechanisms the community is undertaking at their different types of damages or losses at different stages of flooding. The second was to know the common coping mechanisms identified these in three categories, economic, social, and physical. And the third is to obtain the coping mechanisms relating to the identified factors and the predominant coping mechanisms applied by the community at different stages of flooding.

The coping mechanisms were compared with the identified factors-flood depth, access to assistance and income that can influence the coping mechanisms in every zone. Pearson's correlations were used to further know the relation of identified factors to the coping mechanisms. Spatial analysis was used to support the non spatial analysis of the data.

3.3.1. The Flowchart of the Methodology

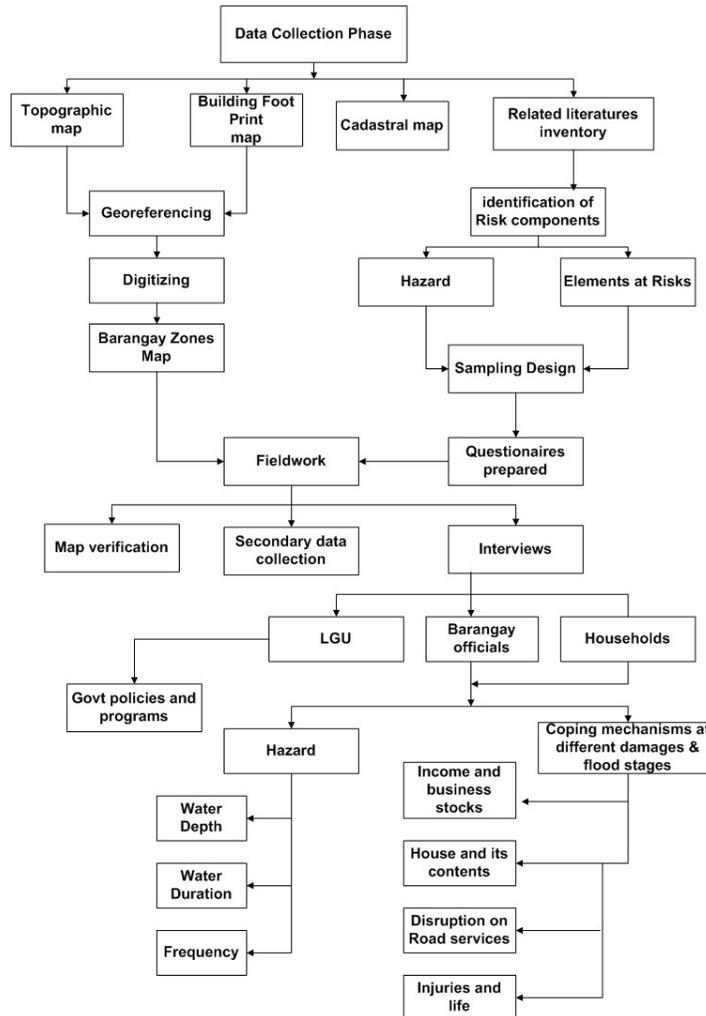


Figure 5 Data Collection Phase

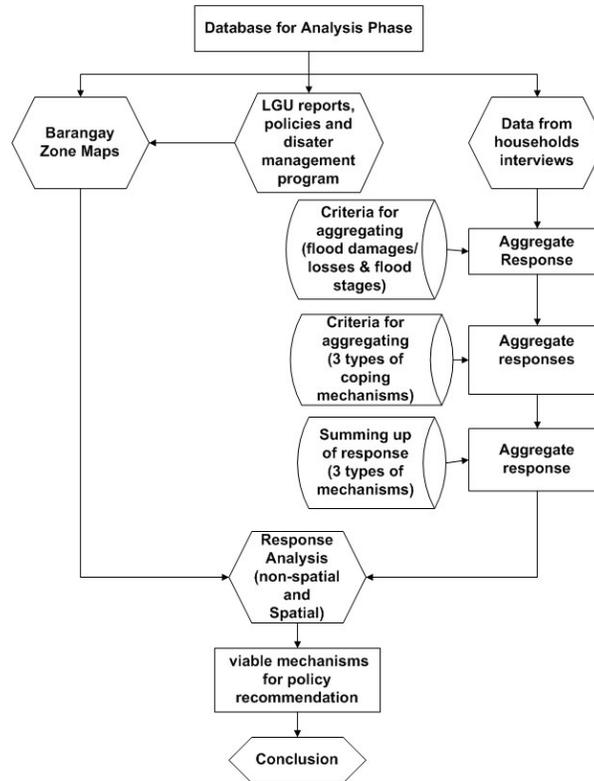


Figure 6 Data Analysis Phase

4. NAGA CITY GOVERNMENT, DISASTER MANAGEMENT AND SOCIO-ECONOMIC AND PHYSICAL FEATURES OF MABOLO AND TRIANGULO

4.1. INTRODUCTION

The Naga City Disaster Mitigation Plan was prepared to make the city safer and more livable. Primarily, it aims to establish awareness and mitigates the flooding and typhoon hazards, promotes policy reforms and standards for mitigation and responses. It focuses particularly on the poor community. This also serves as a model of disaster interventions and practices in the nearby municipalities and cities (Naga City, 2001).

4.2. Naga City as Local Government

Naga City is known for various innovations on best practices for people empowerment and governance. The developmental perspective of Naga city is anchored on the principle of "growth and equity" which is people centered. Robredo, J. (2003) stated that "partnership of all sectors is a mechanism that leads equitable and sustainable growth and development". Hence, the City has moved for the involvement of individual and community in the decision-making. The City continues to support the inclusion of individuals, groups sectors in the decision-making and policy setting. Hence, the community's knowledge on flood mitigation can included Local Government Unit (LGU) risk reduction programs considering this Naga City is a Government that has people centered management.

4.3. Statutory Role of the City and Barangay

The role of the City as embodied in the Philippines Local Government Code of 1991, specifically in section 448;

"The city, consisting of more urbanized and developed barangays, serves as a general-purpose government for the coordination and delivery of basic, regular, and direct services and effective governance of the inhabitants within its territorial jurisdiction".

This focuses on the empowerment of the Local Government Unit (LGU). This code grants the LGU a fiscal and administrative autonomy and planning authority and devolves the basic services like health, agriculture, public works, and social welfares, which includes disaster management, thus aims to improve the accessibility of services to its constituents. The services were put into implementation, empowering the LGU to pass pertinent policies to its effects.

The role of barangay is provided by Section. 384 of this code stating *“As the basic political unit, the barangay serves as the primary planning and implementing unit of government policies, plans, programs, projects, and activities in the community, and as a forum wherein the collective views of the people may be expressed, crystallized and considered, and where disputes may be amicably settled”*. Tapping the people’s participation in decision making or a power sharing in the decision making and policy-setting is one of the intent of this law.

Specifically, the City and the Barangay have the authority to form its disaster management programs. This is strengthened by providing fiscal authority to the City and Barangay to disburse funds for disaster mitigation, response and rehabilitation programs. As stated in Section1, Section 324(d) of Republic Act No. 7160, *as amended, granting appropriation of funding for relief, rehabilitation, reconstruction and other works or services in connection with calamities. That such fund shall be used only in the area, or a portion thereof, of the local government unit or other areas affected by a disaster or calamity, as determined and declared by the Local Sangunian concerned*. The *Sanguniang* is the law making body of the Local Government Unit

4.4. The Naga City Disaster Management

As embodied by law, the City is responsible for the protection of the people, the City of Naga created the Emergency Rescue Naga (ENR) in May 1991 for mobilization of community resources with the efforts of the LGU, other government agencies (OGA) and the private sectors. The ENR provides services on emergency rescue, first aide, ambulance services, quick police response, fire-fighting and disaster preparedness. The ENR evolve as the present disaster management office that was called the “Naga City Disaster Mitigation Coordinating Council (NCDMCC)”. The NCDMCC is in consonance with the Presidential Decree number 1556. The council is attached at the Office of the Mayor and headed by the Mayor with board of directors comprising of heads of the different units of the City Government. The NCDMCC has various programs from preparedness to response and mitigation. For the purpose of this study, these programs were categorized into structural and non-structural measures

Review of the Naga City Disaster Mitigation Plan shows that Naga City has several flood mitigation programs. This ranges from the structural to non-structural approaches. The structural approach includes the construction of flood control structures and improvement. The non-structural interventions include the formation of task forces and application of GIS based technologies in mapping the flood prone areas and maintenance of databases. It is likewise expected that the flood mitigation and response is provided by the LGU, hence the LGU introduces the following interventions to save the lives and properties of the constituents.

4.4.1. Structural Measures

Improvement of River Flow

Several projects had been introduced by the LGU of Naga City to maintain the Naga River and Bicol River. This ranges from canal and river channels cleaning up and improve waste disposal system. The problem posed by the squatters or informal settlers along the river bank does not only contribute to pollution but impedes the cleaning up of the river. The refusal of the squatters to be relocated or moved out of the area causes to hamper the cleaning/construction works on the river channel, thus hampering the implementation of the mitigating measures on

Construction of Dikes and Embankments

Dikes and embankments were constructed to control riverbank erosion and reduced siltation to the river. The Naga-Calabanga embankment was constructed to fixed the river channel and prevent from siltation.

The Tidal Structure

The tidal in gates were constructed to avoid the excessive water from the Bicol River flowing to the Naga River. This also serves as a bridge along the Naga River. One of the purposes of this is to regulate the river flow for the annual religious festival called the "Peñafrancia" where the Naga River is used for steering during the fluvial procession. However, this tidal gate causes the increase of water level at the upstream which contributes to the severity of the inundation in the low-lying areas and the City center.

Drainage Improvement Program

The drainage improvement program is a continuing activity undertaken by the City Engineering Office. It aims to facilitate the flow of water and reduces the duration of water in the area. A master plan was prepared to serve as guide in the construction of the facilities at present and in the future.

Adoption of Naga City River Watershed Strategic Plan

The component of this program is the river park development, relocation of squatters, easement recovery and development, restoration and maintenance of vegetation cover. The easement recovery had started however, problems arises due to occupation of the squatters.

Private Initiatives

The people's initiative to mitigate the flooding is to elevate their lands and buildings above the recorded flood levels. This is usually done by the businessmen or those residents that have the financial capacity to undertake such construction works.

4.4.2. The No-Structural Measures

Formation of Task Force

The City Government has organized task forces, tapping the City Health Office as the lead unit. The Barangay councils, specially, those within the identified flood prone barangays, officials is tapped for the massive information and education campaign on the effect of the flooding.

Designations of Evacuation Centers

Designation of possible evacuation centers is a part of the NDCC response measures. Serving as evacuation centers are the public schools and buildings approximately 3 to 6 kilometers away from the barangays. Evacuation centers designated for Barangay Triangulo in cases of flooding is located at the Concepcion Pequeña Elementary School and Naga City Science High School. The first is approximately 5 kilometers from Triangulo and the later is around 2-3 kilometers away from the barangay. The evacuation center designated for Mabolo is the Concepcion Grande Elementary School and Del Rosario Elementary School. The former is located 5 kilometers (approximately) from Mabolo and the later is more than 5 kilometers.

GIS Application

The City had map out the flood prone barangays. Flood modeling at different return periods (5, 10 and 20 years) was conducted to serve as information for planners and policy setters. More than 60 percent (17 out of 27) of the barangays in Naga City are flood prone areas. The City is also maintaining database, from socio-economic to technical data. They serve as the ready reference of the City in planning.

4.5. SOCIO-ECONOMIC AND PHYSICAL FEATURES OF MABOLO AND TRIANGULO

The socio-economic and physical features of the two barangays were taken from the data on households interviews. A total of 80 respondents (40) from each barangay Triangulo and Mabolo were taken as the sampling population of this study.

4.5.1. Respondents Socio-Economic Profile

Age and Gender

Results of the survey, the respondents in barangay Mabolo has the following age ranges: about 10 percent of the respondent age ranges from 18-28, 17.5 percent are in ages 29-30, 25 percent are in ages 31-40, another 25 percent are ages 41-50, 17.5 percent are in ages 51-60 and 5 percent on age over 60. Likewise, Barangay Triangulo has 12.5 percent of the respondents belong to ages 18-28, 20 percent are in ages 29-30, and another 20 percent belong to ages of 31-40, 25 percent belong to ages 41-50, 15 percent belong to ages of 51-60 and 7.5 percent belongs to age over 60 years.

Table 1 Distribution of Respondents Age

Age Bracket	Triangulo	%	Mabolo	%
18-28	5	12.50	4	10.00
29-30	8	20.00	7	17.50
31-40	8	20.00	10	25.00
41-50	10	25.00	10	25.00
51-60	6	15.00	7	17.50
over 60	3	7.500	2	5.00
Total	40	100.00	40	100.00

Based on the data from interview shows that female dominates the sampled population comprising of 90 percent in Triangulo while 55 percent in Mabolo. About 45 percent of the respondents interviewed in Mabolo are male while in Triangulo has only 10 percent.

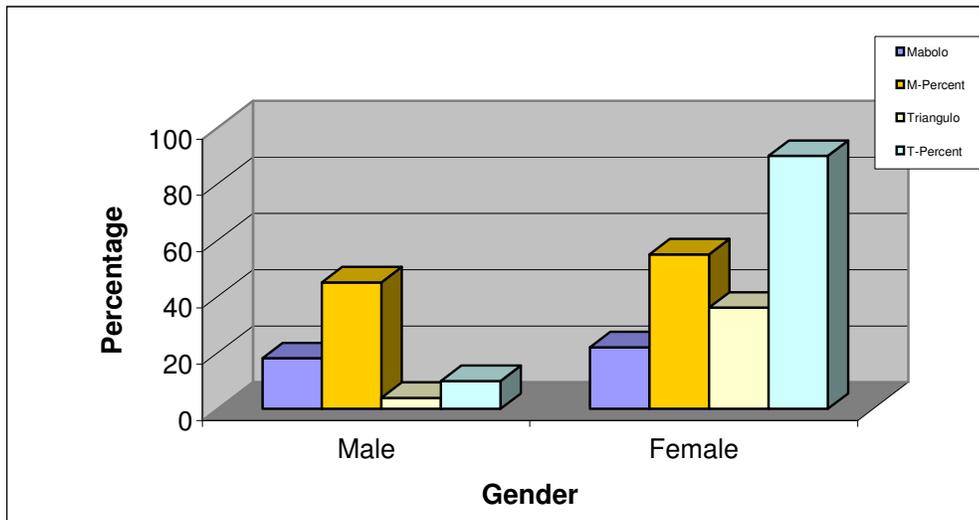


Figure 7 Distribution of Respondents by Gender

Respondent Educational Attainment

The level of education obtained in the area is low as shown in figure 8. This ranges from elementary to college. Majority of the respondents (52.50 percent) in barangay Triangulo are in elementary level while in barangay Mabolo, 50 percent of the respondents are High-school level. Comparing the two barangays in terms of educational level, barangay Mabolo has more educated respondents which range from high school to college level than barangay Triangulo which has more respondents in elementary level.

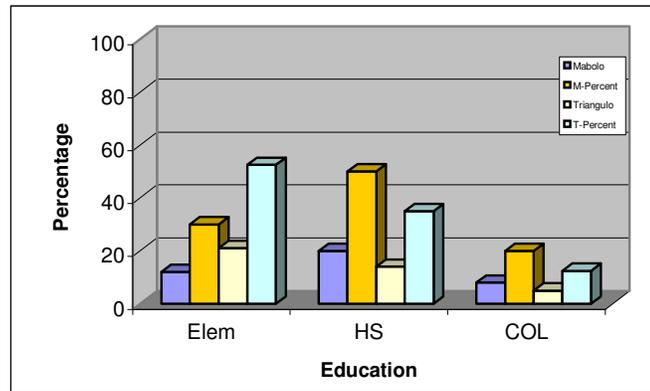


Figure 8 Distribution of Respondents by Education

Households Size

Result shows that the household size in Mabolo is smaller than in Triangulo. The dominant number of household membership in Mabolo ranges from 1-4 which represents 52.5 percent of the total 40 households while in Triangulo has 32.50 percent. The household size that belong to the range of 5-8 obtained 30 percent in Triangulo while 37.5percent in Mabolo. The household size of 9-12 obtained 25 percent in Triangulo and in Mabolo this has 10 percent. The households size than ranges from 13-16 members show 2.5 percent in Triangulo while in Mabolo there is no household that has 13-16 members. Mabolo had the average household size of 5.78 or 6 individuals per household compared to Triangulo, which has an average household size ranges from 1-8 and an average household size of 7.18 or 7 individual per household.

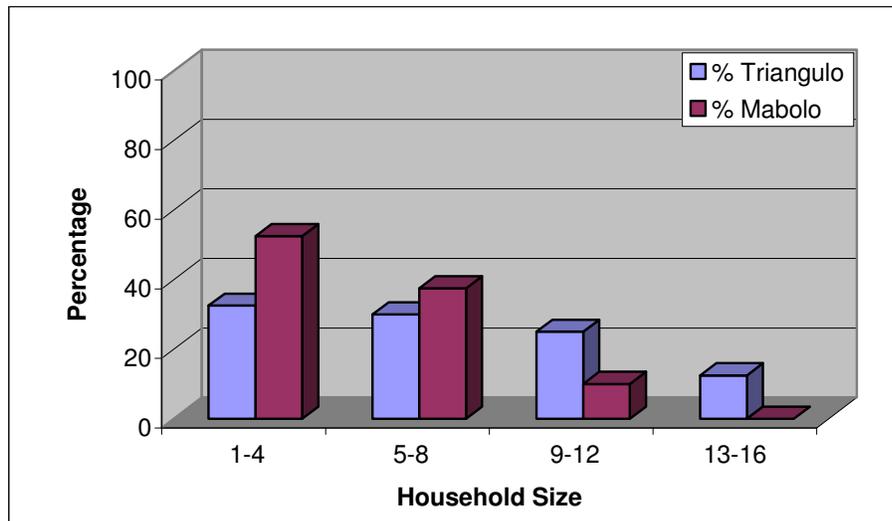


Figure 9 Distribution of Respondents by Household Size

Length of Stay

As shown in figure 10, respondents in both barangays have almost similar long period of stay of residency in the area. The longest duration of stay common both for the two barangays (Mabolo & Triangulo) is in the range of 21-30 years, where Triangulo has 50 percent and Mabolo has 52.5 percent. The length of stay from 0-10 year Mabolo has 20% while Triangulo

has 15 percent. In Triangulo 25% belong to 11-20 years length of stay while Mabolo has 10%. The length of stay range 31-40 years obtained 7.5 percent in Triangulo and 12.50 percent in Mabolo. The range of over 40 year length of stay obtained 2.5 percent in Triangulo and 5 percent in Mabolo.

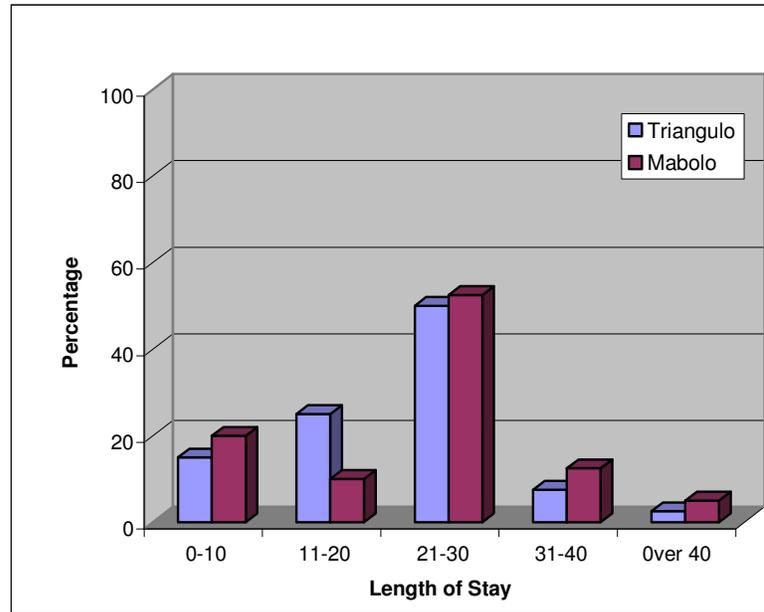


Figure 10 Distribution of Respondents by Length of Stay

4.5.2. Distribution of Income

In terms of income the highest and the lowest income earning community is in Mabolo. The primary source of income in Mabolo comes from business (20%), pension (20%), driver (15%), skilled labor (15%), employment (10%), services (7.5%), farmer (7.5%), factory worker (2.5%), and porter (2.5%). However, most of the households (72.5%) had secondary sources of income deriving from the nine occupational classifications (Annex 1). The zones that had least income are zone 5 and 6.

Income map overlaid with river and road Segment map. (conversion rate 1\$=54P) Poverty threshold is 10,340 (NCSB 2003)

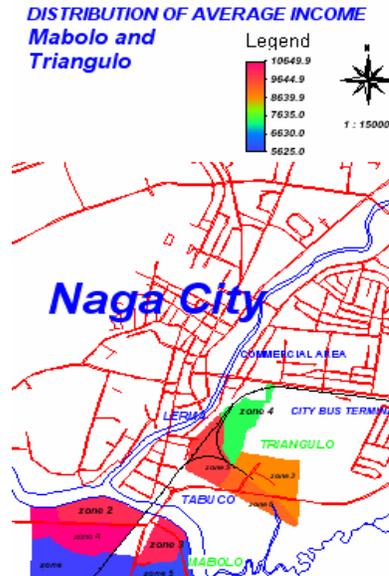


Figure 11 Distribution of Average Income

Triangulo is a median earning community compared to Mabolo. In Triangulo, the least income earning community is in zone 4. However, this is slightly higher compared to Mabolo. The primary source of income in this barangay comes from skilled labor (25%), driver (17.5%), services (15%), employment (12.5%), pensioner (10%), porter (10%), small business (5%), factory worker (2.5%), and factory worker (2.5%). However, most of the households (75%) had secondary income which is slightly higher compared to Mabolo (Annex 1). The location of the barangay is one factor that influences the income considering that Triangulo is just adjacent to the centers where households had higher opportunities to earn a living compared to Mabolo.

Land Tenure

Data from the survey revealed that about 57.5 percent of the households in Triangulo area does not own the land where they are residing. In barangay Mabolo, 30 percent are squatters. Most of the land they are residing is owned by the Philippine National Railroad (PNR) and or by a private individual. As shown in Figure 4-8, Triangulo has 30 percent and Mabolo has 42.5 percent of household own the land. While ancestral land tenure is only 10 percent in Mabolo. About 12.5 percent and 17.5 percent of the households are renting in Triangulo and Mabolo respectively.

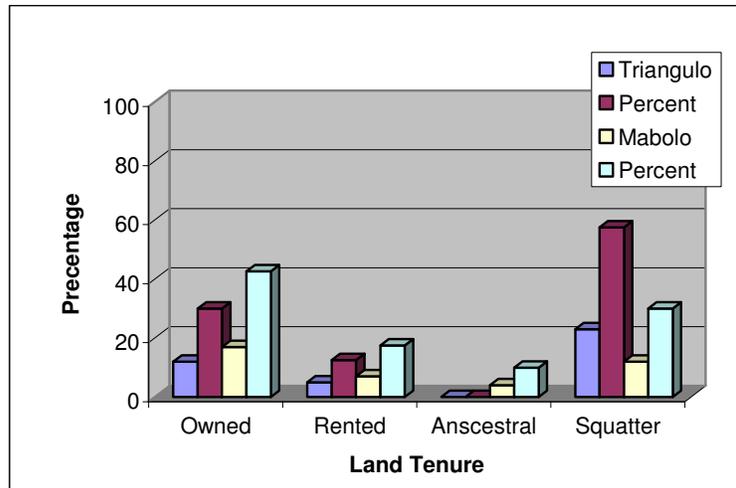


Figure 12 Distribution of Respondents by Land Tenure

4.5.3. Physical Characteristics

Physical Features of House Wallings

Figure 13 shows that most of the house walls, 40% in Triangulo and 35% in Mabolo, are constructed with wooden and concrete materials. Brick and concrete materials attained 17.5 in Mabolo and Triangulo lower in number of houses with this type of wall materials (7%). House with mix materials walling are bigger in number in Triangulo (20%). The mix material referred to includes the combination of wood, bamboo, concrete and bricks.

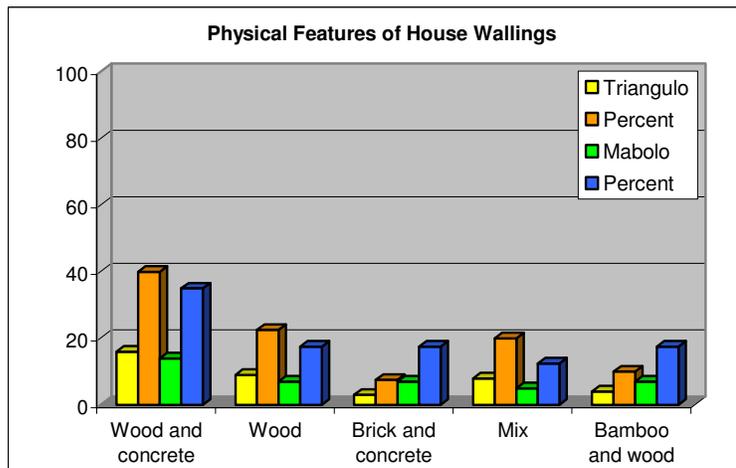


Figure 13 Physical Features of House Wallings

Physical Features of House Roofing

Results of the survey revealed that common roofing material used in the houses is corrugated iron. As shown in Figure 14, 75 percent and 67.5 percent in Mabolo and Triangulo, respectively. This is true in all zones in both barangays. Houses with Palm leaves roof show a very minimal number; in Triangulo 7.5 percent and in Mabolo are 12.5 percent of the houses. The mix materials house roofing, described as the mixture of palm leaves and

corrugated iron, show bigger number in Triangulo (25%) compared to Mabolo having 12.5 percent.

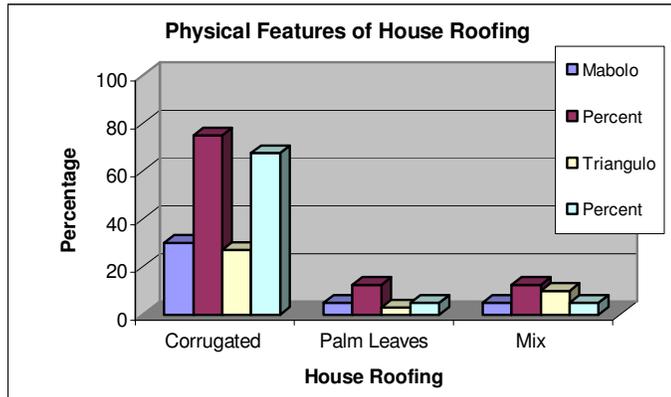


Figure 14 Physical Features of House Roofing

Physical Features on House Floors

Figure 15 reveals that 70 percent and 57.5 percent of households interviewed have their house constructed in single-storey in Mabolo and Triangulo, respectively. This is almost uniformly distributed in all zones both barangays. About 42.5 percent of houses in Triangulo are two storey and 30 percent in Mabolo.

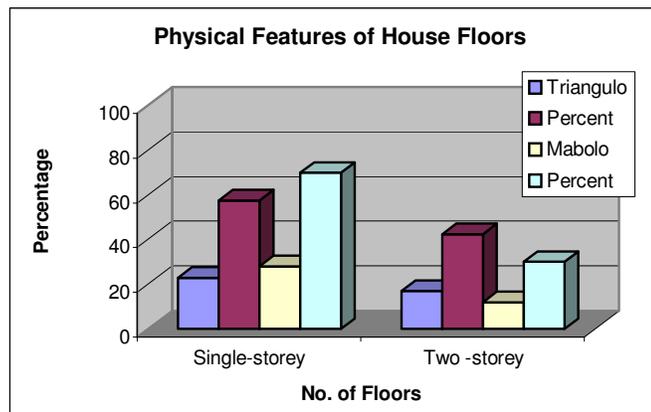


Figure 15 Physical Features of House Floors

4.6. Social Structure: Mabolo and Triangulo

To obtain information on the social network of the community the respondents were asked on their memberships in any organizations and the sources of assistance they have in cases they needed help.

Household Memberships in Organizations

Triangulo

Based on the interview there are 3 active non political organizations in Triangulo. These are Parish Renewal Experience (PREX), Urban Poor, and Lakas Kabaihan. The PREX is a

religious organization initiated by the catholic parish church. This organization extends help to its members who suffered from flooding. The Urban Poor is an association in the community that primarily aims to protect its member from being ejected from the possession of government and private lands. The Lakas Kabaihan is a women club organizations designed for the mothers in the community. The organization teaches the members on proper health and sanitation in the households and community.

Among the zones in Triangulo, zone 3, 5 and 6 attained the highest numbers of households that are that are member in the organizations. These are the zones that had higher average income. However, zone 4 being the poorest in Triangulo had the least numbers of household memberships in organizations.

Table 2 Frequency Distribution by Organizational Membership, Triangulo

Zone	No. of Res (N)	RG	URP	WC		%
		F	F	F	Total	
Zone 3	12	7	9	8	24	32.00
Zone 4	8	2	4	3	9	12.00
Zone 5	9	6	7	5	18	24.00
Zone 6	11	8	9	7	24	32.00
Total	40	23	29	23	75	100.00

%= sum of F/summation of F*100 RG-religious group; URP- Urban Poor; WC- Women's Club (Lakas Kabaihan)

Table 3 Frequency Distribution by Organizational Membership, Mabolo

Zone	No. of Res (N)	RG	URP	MC	BK	Total	%
		F	F	F	F		
Zone 2	7	4	4	4	6	25	19.23
Zone 3	5	3	3	5	3	19	14.62
Zone 4	17	8	7	13	12	57	43.85
Zone 5	7	4	3	2	2	18	13.85
Zone 6	4	2	3	1	1	11	8.46
Total	40	21	20	25	24	130	100.00

%= sum of F/summation of F*100 RG- religious group; URP-Urban Poor; MC-Mothers club; BK-Bantay Kataid

Mabolo

Organizational affiliation in Mabolo is stronger than in Triangulo. More numbers of households are involved in organizations. There are 4 active organizations identified in Mabolo. Some of these are also present in Triangulo. These are the PREX, and Urban Poor. The Mothers Club (MC) is designed for the mothers in the community. It teaches the members on health care, education of children and home-base livelihood. The Bantay Kataid is an organization designed for the community to promote camaraderie among neighborhood. This also helps the neighborhood to settle family disputes. It is observed that the zone that had higher average income had the higher number of households that are member in organizations while the households in zone with lower average income had slightly lesser number of households that are member in organizations.

Households Access to Assistance

In cases of disastrous flooding, communities rely on the government, relatives, neighbors, and friends. In the study area, the community relies on the LGU for assistance when there is a severe flooding in the area. The second source of assistance is kinship. Looking at the cultural background of the Philippines, family ties are still close hence, in cases where family member suffers from any distress the family always extend assistance. Neighborhoods and friends who are not affected by flooding helps other neighborhood by accommodating, providing livelihood, sharing some foods and used clothes and other assistance that they can afford to extend.

Table 4 Frequency Distribution by Source of Assistance, Triangulo

Zone	No. of Res. (N)	AFN	AFR	AFF	AFG	Total	%
		F	F	F	F		
Zone 3	12	4	6	2	10	22	30.99
Zone 4	8	3	4	1	6	14	19.72
Zone 5	9	4	3	2	6	15	21.13
Zone 6	11	4	6	2	8	20	28.17
Total	40	15	19	7	30	71	100.00

%=F/summation of F where F is frequency of response; AFN-assistance from neighbor; AFR-assistance from relatives; AFF-assistance from friends; AFG-assistance from Local Government

Table 5 Frequency Distribution by Source of Assistance, Mabolo

Zone	No. of Res. (N)	AFN F	AFF F	AFR F	AFG F	Total F	% F
Zone 2	7	3	5	3	6	17	18.89
Zone 3	5	2	5	2	3	14	15.56
Zone 4	17	6	14	7	12	39	43.33
Zone 5	7	3	3	2	4	12	13.33
Zone 6	4	2	2	1	3	8	8.89
Total	40	16	29	15	28	90	100.00

Similarly described in Table 4

Reasons for Stay

The three main reasons for staying in the area are proximity to their livelihood, proximity to market/centers, and proximity to school. Most of the household depends on the business existing at the commercial centers of Naga City. Proximity to educational center shows proportional responses with the proximity to livelihood and centers. Also raised as reasons are claimed on ancestral property to the land, no where to go and access to church.

Table 6 Distribution by Reasons of Stay, Triangulo

Reasons	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
	F	%	F	%	F	%	F	%
Proximity to Market/centers	10	21.74	5	17.24	8	20.51	9	21.43
Proximity to School	8	17.39	5	17.24	7	17.95	7	16.67
Proximity to Work/Livelihood	11	23.91	8	27.59	9	23.08	11	26.19
No choice	5	10.87	6	20.69	4	10.26	4	9.52
Proximity to Religious Houses	5	10.87	2	6.90	5	12.82	6	14.29
Ancestral Place	7	15.22	3	10.34	6	15.38	5	11.90
Total Frequency	46	100.00	29	100.00	39	100.00	42	100.00

$\% = F / \text{summation of F per zone} * 100$ where F is the frequency of responses

Table 7 Distribution by Reasons of Stay, Mabolo

Reasons	M-zone 2		M-zone3		M-zone4		M-zone 5		M-zone 6	
	F	%	F	%	F	%	F	%	F	%
Proximity to Market/centers	5	18.52	4	20.00	14	23.73	6	23.08	3	20.00
Proximity to School	6	22.22	4	20.00	9	15.25	4	15.38	2	13.33
Proximity to Work/Livelihood	6	22.22	5	25.00	15	25.42	7	26.92	4	26.67
No choice	3	11.11	2	10.00	6	10.17	4	15.38	2	13.33
Proximity to Religious Houses	3	11.11	3	15.00	7	11.86	3	11.54	2	13.33
Ancestral Place	4	14.81	2	10.00	8	13.56	2	7.69	2	13.33
Total	27	100.00	20	100.00	59	100.00	26	100.00	15	100.00

$\% = F / \text{summation of F per zone} * 100$ where F is the frequency of responses

4.7. Flooding in Mabolo and Triangulo

The flood magnitude described in this study is the water level and duration. The water levels were measured by using scale in terms of feet (1 foot = 0.3048 meter). Duration is measured in number of days the water stays in the area. These are based on the households experienced on flooding in the area.

Water Depth

Mabolo and Triangulo are one of the most flooded areas in Naga City. These are the barangays that are experiencing higher water depth when flooding occurs (Naga City, 2000). Triangulo is nearer to the Naga River and has a lower terrain where the water from adjacent barangays drains. During flooding the highest water depth in Triangulo is more than 8 feet. This is experienced in zone 4 where most of the marginalized people in this community live. Other zone experienced more than 7-8 feet depth of water during flooding. However, in zone 5 the water depth reaches 5 to 6 which is slightly lower compared to other zones. Triangulo is known to be the lowest part of Naga City.

Table 8 Distribution of Water Depth, Triangulo

Water Level (feet)	T-zone 3		T-zone 4		T-zone 5		Zone 6	
	F (N=12)	%	F (N=8)	%	F(N=9)	%	F(N=11)	%
1-2	0	0.00	0	0.00	1	11.11	0	0.00
3-4	1	8.33	1	12.50	2	22.22	0	0.00
5-6	3	25.00	2	25.00	6	66.67	1	11.11
7-8	6	50.00	1	12.50	0	0.00	7	77.78
More than 8	2	16.67	4	50.00	0	0.00	1	11.11
Total	12	100.00	8	100.00	9	100.00	9	100.00

%F/N*100 where is the frequency of response and N is the number of respondents

Table 9 Distribution of Water Depth, Mabolo

Water Level	M-zone2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
	F (N=7)	%	F(N=5)	%	F(N=17)	%	F (N=7)	%	F(N=4)	%
1-2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
3-4	0	0.00	1	20.00	1	5.88	0	0.00	1	25.00
5-6	2	28.57	3	60.00	3	17.65	2	28.57	1	25.00
7-8	4	57.14	1	20.00	11	64.71	4	57.14	2	50.00
More than 8	1	14.29	0	0.00	2	11.76	1	14.29	0	0.00
Total	7	100.00	5	100.00	17	100.00	7	100.00	4	100.00

%F/N*100 where is the frequency of response and N is the number of respondents

In Mabolo the highest water depth the community experienced reaches to 7 to 8. The most flooded areas in Mabolo are in zone 2, 4, and 6 wherein the water depth reaches to 7 to 8 feet. Water depth in zone 3 reaches to 5 to 6 feet. Zone 2 and 5 are located long the Bicol River. These had lower terrain and serve as the drain of the upstream area. Although zone 3 is located along the Bicol River however, this has higher terrain compared to other zones in the barangay. Part of zone 4 lies along the Bicol River and other part are going landward however, the area has flat terrain and is lower compared to zone 2 and 3. Generally zone 6 is in the inner part of Mabolo bounding the Municipality of Milaor. Part of zone 6 is located adjacent to zone 4. Zone 6 experienced severe flooding when the water from Milaor, neighboring municipality flows to the area. This zone is the land locked zone in Mabolo and thereby water stays for longer period.

Water Duration

Triangulo

In Triangulo, the maximum water duration was based on the highest frequency of respondents interviewed which shows that the water lasted around 7 to 10 days in the area. This is experienced in zone 3, 4, and 6. However, in zone 5 the water subsides within 5 to 6 days. This is because the terrain in zone 5 is slightly higher than in other zones in Triangulo.

Table 10 Distribution by Water Duration, Triangulo

Water Duration	T-zone 3	%	T-zone 4	%	T-zone 5	%	Zone 6	%
1-2 days	0	0.00	0	0.00	0	0.00	0	0.00
3-4 days	2	16.67	1	12.50	1	12.50	0	0.00
5-6 days	3	25.00	1	12.50	5	62.50	1	9.09
7-10 days	6	50.00	5	62.50	2	25.00	7	63.64
more than 10 days	1	8.33	1	12.50	0	0.00	3	27.27
Total	12	100.00	8	100.00	8	100.00	11	100.00

%=F/N where F is frequency and N is number of respondents

Table 11 Distribution by Water Duration, Mabolo

Water Duration	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
	F	%	F	%	F	%	F	%	F	%
1-2 days	0	0.00	1	20.00	0	0.00	0	0.00	0	0.00
3-4 days	0	0.00	1	20.00	1	5.88	1	14.29	1	25.00
5-6 days	1	14.29	3	60.00	4	23.53	1	14.29	1	25.00
7-10 days	5	71.43	0	0.00	2	11.76	4	57.14	2	50.00
more than 10 days	1	14.29	0	0.00	10	58.82	1	14.29	0	0.00
Total	7	100.00	5	100.00	17	100.00	7	100.00	4	100.00

%=F/N where F is frequency and N is number of respondents

Mabolo

Table 10 reveals that zone 4 has the longest duration of flooding (more than 10 days) compared to other zones. While zone 2, 5 and 6 the water lasted from 7 to 10 days. Zone 3 the water lasted around 5 to 6 days. This is due to the location of zone 3 (slightly higher in terrain).

4.8. Community's Perceptions on Flooding

Perceptions on Types of Floods

Four types of flooding were identified by the households in the study area. These are flash flooding, excessive water on the sheet due to monsoon rains, tidal flooding, and river flooding. They experienced flash flooding when the tidal gate in Naga River were forgotten to be opened and during the breakage of reservoir in the municipality of Bato and flood come down from Bicol River. Tidal flooding is experienced by the households in Mabolo residing along the Bicol River. They experience an ankle- knee-length flooding during the high tide. This usually lasted around 2-3 hours a day. Monsoon rains is a type of flooding that frequently occurs during the months of July to December. This is the typhoon months in the Philippines. Typhoon flooding is usually coupled with heavy rains and strong winds that are ranging from 120 to 250 kilometers per hour.

Triangulo

Result of the households surveyed shows that the communities had high awareness on the flooding that occurs in their area. The zones that experienced higher magnitude of flooding had higher responses on the types of flooding (Flash floods and monsoon rains). However, all households in the zones are aware of typhoon flooding. Tidal flooding is not experienced in Triangulo, considering that Triangulo lies farther to the Bicol River compared to Mabolo.

Table 12 Distribution by Types of Flooding, Triangulo

Types of Flooding	N = 12		N=8		N=9		N=11	
	T-zone3		T-zone4		T-zone 5		T-zone 6	
	F	%	F	%	F	%	F	%
Flash Floods	9	75.00	6	75.00	5	55.56	8	72.73
Monsoon Rains	10	83.33	7	87.50	7	77.78	10	90.91
typhoon Floods	12	100.00	8	100.00	9	100.00	11	100.00
Tidal Floods	0	0.00	0	0.00	0	0.00	0	0.00

% = $F/N \times 100$ where F is frequency and N is number of respondents in the zone (one respondents can give multiple answers hence total is >100%)

Table 13 Distribution by Types of Flooding, Mabolo

Types of Flooding	F (N=7)		F (N=5)		F (N=17)		F (N=7)		F(N=4)	
	M-zone		M-zone		M-zone		M-zone		M-zone	
	2	%	3	%	4	%	5	%	6	%
Flash Floods	6	85.71	3	60.00	14	82.35	6	85.71	3	75.00
Monsoon Rains	7	100.00	4	80.00	15	88.24	6	85.714	4	100.00
typhoon Floods	7	100.00	5	100.00	17	100.00	7	100.00	4	100.00
Tidal Floods	4	57.14	0	0.00	7	41.18	1	14.28	0	0.00

% = $F/N \times 100$ where F is frequency and N is number of respondents in the zone (one respondents can give multiple answers hence total is >100%)

Mabolo

Awareness on flooding shows high responses on Monsoon and typhoon types of flooding. This is highly attained by zones that experienced higher magnitude of flooding. Flash floods show higher response of the zones that are lying along the Bicol River and zone (4) that has lower terrain in Mabolo. Zone 3 and 6 did not experienced tidal flooding considering that zone 3 is higher in terrain and zone is located in the inner area of the barangays

Perceptions on Effects of Floods

Most of the respondent responses consider that flooding is a nuisance to them except to those zones that are lower in terms of financial resources and had experienced of higher magnitude of flooding. Some of the respondents say that occurrence of flood is natural in the area. The zone (zone 2, 3, 5, and 6 in Triangulo and zone 2, 3, and 4 in Mabolo) that has higher average income had higher number of responses that flooding is a nuisance to them rather than a catastrophe. This is because the households with higher income can employ more measures to protect and recover from the effect of floods to their lives and properties (Blaikie, et.al, 1994).

Table 14 Distribution by Perceptions, Triangulo

Zone	Nuisance		Catastrophe		Others(natural)	
	F	%	F	%	F	%
	Zone 3 (N=12)	6	50.00	3	25.00	3
Zone 4 (N=8)	4	50.00	3	37.50	1	12.50
Zone 5 (N=9)	6	66.67	1	11.11	2	22.22
Zone 6 (N=11)	5	45.45	4	36.36	2	18.18

%= $F/N \times 100$ where N is number of respondents and F is frequency

Table 15 Distribution by Households Perceptions, Mabolo

Zone	Nuisance		Catastrophe		Others	
	F	%	F	%	F	%
Zone 2 (N=7)	4	57.14	2	28.57	1	14.29
Zone 3 (N=5)	3	60.00	1	20.00	1	20.00
Zone 4 (N=17)	9	52.94	6	35.29	2	11.76
Zone 5 (N=7)	2	28.57	3	42.86	2	42.86
Zone 6 (N=4)	1	25.00	2	50.00	1	50.00

$\% = F/N \times 100$ where N is number of respondents and F is frequency

4.9. Summary and Conclusion

Naga City is a Local Government Unit (LGU) that moved for the involvement of community's participation in Disaster Management. Disaster management is institutionalized in Naga City as evident by the existence of offices and task forces to implement disaster management programs. The concept of disaster management is pro-poor with the aim to make the City safer and livable. The disaster management had the emphasis on the structural measures to mitigate the flood. Although there are non-structural measures but it is more on emergency and relief measures. GIS application were used identify the flood prone areas wherein Mabolo and Triangulo is one of the most flooded area of the City. Public schools and building are designated evacuation centers.

In the conduct of the interview the respondents are mostly female. Most of the respondent's educational attainment ranges from elementary to high-school level. More than 50% of the respondents had live in the area for more than 21 years. Most of the households living in the area are informal settlers. These households are occupying the land owned by the Philippine national Railroad (PNR), although there are several respondents owned their land but this is least in number among the household interviewed. The main reasons of staying in area are proximity to livelihoods and education of children. The physical features of the house are made of light materials (combination of concrete and wood) and mostly had single storey house. The average household size in the study area is from 6-7 individual per household. Most of the source of income of these households derived form skilled laborer, driver, porter, small business, rendering services, factory workers, pensioner, and farmer. The mean average income in Mabolo is 8487.42 pesos per month while in Triangulo the mean average income is 9198.70 pesos per month (1US\$=54 pesos). It is observed that the household income in the study area is below the poverty thresholds of 10,348 per month (NCSB, 2002). There 5 organizations existing in the study area. The religious organization called the Parish Renewal Experience (PREX), the Urban Poor, Women's Club, Mothers Club and "Bantay Kataid". Most of the households need assistance from the relatives, LGU, neighborhood and friends.

The community is aware of the different types of flooding and the negative effects of flooding to their lives and properties. The types of flooding in the area are the floods that are caused by monsoon rains, typhoon, flash floods and tidal flooding. However, tidal flooding were experienced in Mabolo. The highest flood depth of more than 8 feet is experienced by households in Triangulo while in Mabolo, the flood depth reaches from 7-8 feet. More than 50% of the households perceived that flood is a nuisance to them rather than a catastrophe.

Some says that it's natural for them and few answer that it s a catastrophe. They opted to live in the area for economic reasons and education of their children.

5. COPING MECHANISMS: MABOLO AND TRIANGULO

5.1. Introduction

This chapter present and interpret the data taken from the field on the coping mechanisms employed by the households in Barangay Triangulo and Mabolo to deal with the flooding. The coping mechanisms focus on the strategies undertaken by the community to protect and to regain from losses on the identified elements exposed to risks –house, house content, income, business stocks and disruptions on road services, at different stages of flooding;

- Before Flooding
- During Flooding
- After Flooding

Frequency counting and comparison of responses at different flood stages were done to present and interpret the data. The frequency of coping mechanisms refers to the actual number of responses given by the respondents. The coping mechanisms identified were classified on three types the economic, social, and physical. Economic mechanisms include those strategies of the community that are more linked on materials goods and resources and capable of producing profits or benefits. The social coping mechanisms are those undertaken by the community that relates to the society in which they behave. It includes an activities offering opportunity of interactions in a social intersects. While physical coping mechanisms are the activities the community able to protect or cope with flood losses or damages involving a lot of body strength or energy that are existing in action rather than notion or ideas.

To identify the dominant type of coping mechanisms in each zone, this is done by summing up the frequency of responses per type of mechanisms over the summation of total frequency.

5.2. The Types of Coping Mechanisms

The households interviewed in the study area had multiple responses to cope with the different stages of flooding. These specific responses were aggregated into the general one to know the type of coping mechanisms employed by the households. The coping mechanisms were categorized into 3 types –economic, physical, and social. The economic types of coping mechanisms are those responses that are more linked on economic relationship. Examples of economic mechanisms identified in the area are construction of houses with second floor or thresholds or mezzanine, saving money, purchasing business stock or food stock in bulk, and diversification of livelihood like – catching fish to sell in the market and preparing native food items like Pili candies for selling to augment family income. The physical coping mechanisms are those coping mechanism that requires more bodily

strength like cleaning the canal, preparing waterproof materials –like plastic containers or bags, placing things at mezzanine or second floor or storage, and placing improvised catwalks (temporary road used by human only). The social type of coping is the responses that focus on social network strengthening. These include assistances from relatives, neighbors, friends and government. Example of this are sourcing relief materials, staying to neighbor/relative/friends places, placing the valuable things at neighbors, relatives or friends place, helping neighborhood by selling goods on credit at regular price without interest, availing the basic services provided by Local Government like medical services and loans and borrowing money from friends.

5.3. Coping Mechanisms on Houses/Building Structures

For the purpose of this study the house refers to the dwelling place built for a single group of people in the community called household. Household refers to one group of people living in one house. The house is prime resources in the household in which the household have to build and protect with.

Protection of House Before Flooding

Mabolo

The households surveyed in 2, 3, and 4 of barangay Mabolo employed economic type of mechanisms and zone 5 and 6 is the combination of economic and physical type of mechanisms. Economic types of mechanisms attained higher frequency of responses in all zones compared to other types of mechanisms. The economic types of mechanisms in this study area are construction of house with second floor, construction of houses with threshold, and saving money. The zone with higher average income and experiencing higher magnitude of hazard employs more economic type of mechanisms compared to the zone that has lesser financial resources. In the case of Mabolo zone 5 and 6 has lesser average income per month of 5827 and 5625, respectively and zone 5, and 6 are experiencing higher magnitude of hazard.

The physical types of coping mechanisms are the second mechanisms that are employed by the households in zone 2, 3, and 4 the study area. This includes the reinforcing of pillars by nailing and tying of rope the pillars, reinforcing of Roofing by placing heavy material like scrap woods and used tires. The households in the zones (5 and 6) with lesser income employ more physical types of mechanisms compared to those that are financially in advantage. This is attributed by their less capacity to construct their houses with stronger materials and designed.

Social type mechanism is the least employed mechanisms in the area in terms of coping with the flood. Listening to weather forecast is the social type of mechanism in this barangay. Social type of mechanism is less employed by the households in zone that experience lesser magnitude of hazard.

Table 16 Frequency of Mechanisms to Protect the Houses (Before Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	13	61.90	10	62.50	27	50.00	12	48.00	4	44.44
Physical	P	5	23.81	3	18.75	16	29.63	8	32.00	3	33.33
Social	S	3	14.29	1	6.25	11	20.37	5	20.00	1	11.11
Total		21	100	16	100.00	54	100.00	25	100.00	9	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 17 Frequency of Mechanisms to Protect the Houses (Before Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	17	43.59	6	35.29	7	33.33	15	39.47
Physical	P	13	33.33	3	17.65	5	23.81	13	34.21
Social	S	9	23.08	8	47.06	9	42.86	10	26.32
Total		39	100.00	17	100.00	21	100.00	38	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

Most of the households in Triangulo are employing combinations of 2 types of coping mechanisms to avoid damages on their house structures. As shown in Table 17, zone 3 and 6 employs combinations of economic and physical mechanisms while zone 4 and 5 is the combination of economic and social types of mechanisms. The same kinds of mechanisms that are present in Mabolo are applied by the households in this area.

Comparing the types of mechanisms, Table 17 shows that economic type of mechanisms attains higher frequency of responses in the zones that had experienced higher magnitude of flooding. Physical type of mechanisms has higher responses on the zone with higher average income. While the coping mechanisms that fall on social type of mechanisms are highly employed in zone (5) with higher income and lesser magnitude of flooding and in zone (4) having low income and experience higher flood magnitude.

Protection of House During Flooding

Mabolo

In Mabolo social type of mechanisms are the dominant responses to avoid or cope with flood damages or losses in terms of house structures. The social type of mechanism present in the area are securing the house entrances with wooden chair and scrap lumbers, vacating the house, and allowing the house to be flooded for safety reasons.

Physical types of mechanisms attains are the second type of mechanisms applied by the households in the area. This is done by placing catwalks and cleaning the canal from debris and waste to allow the water to flow. However, economic type of mechanisms is not present in the area during flooding.

Observation shows that social types of mechanisms were highly employed by the households in the zones with higher income. The physical types of mechanisms are least employed by the households in all zone. However, the zone with lesser income and had experienced higher flooding magnitude and the zone that experienced lower magnitude of hazard but with higher income employed more physical type of mechanisms.

Table 18 Frequency of Coping Mechanisms on Houses (During Flooding, Mabolo)

Coping Type	Class Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Physical	P	4	19.05	4	25.00	5	13.16	5	20.83	3	33.33
Social	S	17	80.95	12	75.00	33	86.84	18	75.00	6	66.67
Total		21	100.00	16	100.00	38	100.00	24	100.00	7	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 19 Frequency of Coping Mechanisms on Houses (During Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	0	0.00	0	0.00	0	0.00	0	0.00
Physical	P	5	15.15	5	20.00	4	37.04	1	26.67
Social	S	28	84.85	20	80.00	23	62.96	29	73.33
Total		33	100.00	25	100.00	27	100.00	30	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

Table 19 reveals that social type of mechanisms dominates the responses of the households in avoiding damages of their respective house structures in all zones. The social type of mechanisms present in the area in the same kind of mechanisms present in Mabolo. The physical type of mechanisms are least employed in the area during the flooding. However, the economic type of mechanism is not employed by the households to protect their houses during flooding.

The magnitude of hazard and income of the households associates with the coping mechanisms of the communities. This is noted that the zones with higher income and had experienced higher magnitude of hazard had higher responses on social type of mechanisms compared to the zone with higher income and experienced lower magnitude of flooding. The zone that has less magnitude of hazard has higher responses on the physical types of mechanisms.

Coping with the Flood Damage or Losses on House After Flooding

Mabolo

After flooding, coping mechanisms of the households varies from different zones. Table 20 reveals that in zone 2, 3, and 4 the coping mechanisms employed are the combination of economic and physical types of mechanisms. While in zone 5 more responses on the physical type of mechanisms were attained and in zone 6 combinations of economic and social types of mechanisms were employed by the households.

The social type of mechanisms present in the area are borrowing money from friends and relatives for the minor repair of house, Sourcing relief materials usually from the government, and loaning money from the government agencies for those that are employed. The physical mechanisms include cleaning of houses immediately and cleaning of canals to avoid stagnant water and remove dirt like mud and debris. The economic type of mechanisms repairing minor damages of the houses out of their savings and income, drying the wall with electric fan particularly the room partitions to avoid decomposition of wall materials, and repairing the house done by family members so not to incur cost for the repair.

Table 20 Frequency Coping Mechanisms on Houses (After Flooding, Mabolo)

Coping Type	Class Code	M-zone 2		M-zone 3		M-zone4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	9	47.37	7	41.18	16	36.36	4	28.57	5	35.71
Physical	P	7	36.84	6	35.29	20	45.45	7	50.00	4	28.57
Social	S	3	15.79	4	23.53	8	18.18	3	21.43	5	35.71
Total		19	100.00	17	100.00	44	100.00	14	100.00	14	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 21 Frequency Coping Mechanisms on Houses (After Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	P	P	F	P
Economic	E	10	29.41	10	40.00	9	34.62	13	33.33
Physical	P	16	47.06	8	32.00	11	42.31	15	38.46
Social	S	8	23.53	7	28.00	6	23.08	10	25.64
Total		34	100.00	25	100.00	26	100.00	39	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

In Triangulo, coping mechanisms employed are the combinations of economic and physical types of coping mechanisms. The social types of mechanisms are the least mechanism that is employed in the area.

The economic type of mechanisms employed in the area are repairing minor damages on the house and drying the walls using electric fan. The physical types of mechanisms include cleaning the house immediately by removing mud, debris and other waste materials and cleaning of canal. The social types of mechanisms are borrowing money from relatives and friends to repair house damages and sourcing relief materials usually from government and relatives.

5.4. Coping Mechanisms on Houses Contents

The content described in this study includes all the material things that are inside or within the perimeter of the house of the households. House content described in this study includes the furniture and fixtures, appliances, clothes, utensils and other personal belongings of the households.

Protecting the House Content Before Flooding

Mabolo

In avoiding damages or losses in the house contents, the combinations of economic and physical types of coping mechanisms are applied by the households in Mabolo except in zone 6 where there are more responses were attain on physical type of mechanisms. Physical type of mechanism is the second type of mechanisms employed in zones 2, 3, 4, and 5. However in zone 6 combination of economic and social type of mechanisms is the second types of mechanisms employed by the households. Social types of mechanisms are the least number of responses in all zones among the types of mechanisms except in zone 6.

The economic types of mechanisms present in the area are installation of improvised mezzanine, preparing place for storage at the second floor of the house, and preparing stands for refrigerator for those ho have this type of appliances. The physical types of mechanisms are preparing waterproof materials like plastic bags, containers (can or plastic), ropes, stack filling of furniture, and fixing things before evacuation. The social type of mechanisms present in the area is listening to the weather forecasts.

Table 22 Frequency of Coping Mechanisms on House Content (Before Flooding, Mabolo)

Coping Type	Class Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	10	34.48	6	30.00	20	33.90	8	29.63	4	23.53
Physical	P	14	48.28	9	45.00	28	47.46	13	48.15	9	52.94
Social	S	5	17.24	5	25.00	11	18.64	5	18.52	4	23.53
Total		29	100.00	20	100.00	59	100.00	27	100.00	17	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 23 Frequency of Coping Mechanisms on House Content (Before Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	10	27.78	10	52.63	10	34.48	10	27.78
Physical	P	16	44.44	6	31.58	15	51.72	17	47.22
Social	S	10	27.78	3	15.79	4	6.90	9	25.00
Total		36	100.00	19	100.00	29	100.00	36	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

In Triangulo, the coping mechanism varies from different zones. In zone 3 the combinations of the 3 types of mechanisms were applied while in zone 4 economic type of mechanisms had the highest responses. Zone 5 is more inclined on physical type of mechanisms and zone 6 is the combinations of economic and physical type of coping mechanisms. The social mechanisms attained the least responses in all zones among the types of mechanisms.

The economic types of mechanisms present in the area are installation of mezzanine, preparing place for storage at the second floor of the house, and preparing hook to hang some of the things. The physical type of mechanisms is preparing waterproof materials, stack

filling of furniture, and fixing thing before evacuation. The social type of mechanism is listening to the weather forecasts.

Comparing the different types of mechanisms, economic type of mechanisms has high response in the zone that has lower income and experiencing higher magnitude of hazard. Physical type of mechanisms has high response in the zones that had a higher income. The social type of mechanisms had higher responses on the zones that experienced higher magnitude of hazard.

Protection of House Contents During Flooding

Mabolo

Results of the surveys shows that there are only two types of coping mechanisms, physical and economic, applied by the households to avoid damages or losses on their house contents during flooding. The physical types of mechanisms are the dominant mechanisms applied by the households in the area. The social types of mechanisms attain lesser frequency of responses.

The physical type of mechanisms present in the area are placing the thing at the second floor, placing things at the mezzanine (like mattresses, utensils and other things), use waterproof containers to keep the things, stack filling of furniture by tying rope for safety reasons, placing the refrigerators at the improvised tables, and bringing with them important documents, jewelries, and portable radios. The social types of mechanisms include placing appliances (portable) at the relatives and neighbors' places, and guarding the house to ensure safeness of their belongings from looters.

The physical mechanisms can be associated with the income of the households. As shown in the Table 24, the zone with higher income has higher number of responses compared to the zones with lower income. The social type of mechanisms attained higher responses on the zones that experienced higher magnitude of flooding.

Table 24 Frequency of Coping Mechanisms on House Contents (During Flooding, Mabolo)

Coping Types	Class Code	M-zone 2		M-zone 3		M-zone4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Physical	P	25	73.53	14	66.67	37	64.91	19	55.88	12	63.16
Social	S	9	26.47	7	33.33	20	35.09	15	44.12	7	36.84
Total		34	100.00	21	100.00	57	100.00	34	100.00	19	100.00

$P=F/\text{total } F \times 100$ where P is percentage and F is the frequency of responses

Table 25 Frequency of Coping Mechanisms on House Contents (During Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	0	0.00	0	0.00	0	0.00	0	0.00
Physical	P	30	73.17	23	76.67	21	75.00	19	61.29
Social	S	11	26.83	7	23.33	7	25.00	12	38.71
Total		41	100.00	30	100.00	28	100.00	31	100.00

$P=F/\text{total } F \times 100$ where P is percentage and F is the frequency of responses

Triangulo

The same with Mabolo, physical type of mechanisms attained higher responses on coping mechanism to avoid losses of house content during flooding. The other type of mechanism applied by households is the social type of mechanisms. Social type of mechanisms attained lower number of responses compared to the physical type of mechanisms.

The physical mechanism present in the area are placing things at the second floor, placing things at the mezzanine, stack filling of chairs and furniture, placing the refrigerator at the improvised table, and placing the things at the improvised hooks. Usually the mattress and utensils are placed at the mezzanine. The social types of mechanisms are guarding the house to protect the things left in the house from loathers and placing important things at relatives and neighbor places. Physical type of mechanisms had higher response in the zone (4) that has lower income while social type of mechanisms had higher responses on the zones that had higher income.

Coping with Flood Damage or Losses on House Content After Flooding

The aftermath of the floods contends the households to employ mechanisms to cope with the losses or damages on their house contents. In Mabolo, the response of the households surveyed showed that the combinations of physical and economic mechanisms are dominant in the area. Zones 2, 3, and 4 had higher responses on both economic and physical mechanisms. While in zone 5 and 6 highly applies the physical types of mechanisms. The social types of mechanisms attain the least number of responses in coping with the flooding to regain damages or losses on house content.

The economic type of mechanisms present in this area are repairing minor damages to the appliances and furniture, rendering overtime services, and drying the wet things with electric fan to avoid further deteriorations. The physical type of mechanisms are fixing and cleaning the things. Borrowing money from friends and relatives is the social type of mechanism employed by the households in the area.

Comparing the 3 types of coping mechanisms, the economic type had higher frequency of responses in the zone with higher income. The physical type of mechanisms had higher responses on the zones with lower income. While social type of mechanisms had higher responses on the zone that experienced lower magnitude of hazard.

Table 26 Frequency of Coping Mechanisms on House Content (After Flooding, Mabolo)

Coping Type	Class Code	M-zone 2		M-zone 3		M-zone4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	11	44.00	8	47.06	18	42.86	8	40.00	4	30.77
Physical	P	12	48.00	7	41.18	20	47.62	11	55.00	7	53.85
Social	S	2	8.00	2	11.76	4	9.09	1	5.00	2	15.38
Total		25	100.00	17	100.00	42	100.00	20	100.00	13	100.00

$P = \frac{F}{\text{total } F} * 100$ where P is percentage and F is the frequency of responses

Table 27 Frequency of Coping Mechanisms on House Content (After Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	15	55.56	9	40.91	11	64.71	13	48.15
Physical	P	9	33.33	10	45.45	4	23.53	8	29.63
Social	S	3	11.11	3	13.64	2	11.76	6	22.22
Total		27	100.00	22	100.00	17	100.00	27	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

As shown in Table 27, the economic type of mechanisms are the dominant responses on zone 3 and 5 while zone 4 and 6 employs the combinations of economic and physical types of mechanisms. The physical type of mechanisms attained second higher responses on zone 3 and 5. The social type of mechanisms attained the least responses in all zones.

The mechanisms employs in this area are the kind of mechanisms employed in Mabolo.

Comparing the 3 types of mechanisms in every zone, economic type of mechanisms shows higher responses on the zones that had higher income. The physical and social type of mechanisms shows high responses on the zone that has lower income.

5.5. Coping Mechanisms on Income

Income in this study is anything received from rendering services in terms of wage or salary income; self-employment income; business; interest, dividend, or net rental income; Social Security income; public and relative assistance income; all other income, which includes unemployment compensation, veterans' payment, and pensions.

Coping on Income Before Flooding, Mabolo

As shown in Table 28, the response on avoiding loss of income before flooding focused solely on economic type of coping mechanisms. The economic type of coping mechanisms present in the area includes saving money, continue working, buying food stock in bulk, looking for alternative jobs, and they practiced buying food stock at the market because the cost is cheaper compared to the nearby sari-sari stores.

Table 28 Frequency of Coping Mechanisms on Income (Before Flooding, Mabolo)

Coping Type	Class Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	24	100.00	10	100.00	66	100.00	16	100.00	11	100.00
Physical	P	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0	0.00
Social	S	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0	0.00
Total		24	100.00	10	100.00	66	100.00	16	100.00	11	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 29 Frequency of Coping Mechanisms on Income (During Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	26	100.00	13	100.00	14	100.00	16	100.00
Physical	P	0	0.00	0	0.00	0	0.00	0	0.00
Social	S	0	0.00	0	0.00	0	0.00	0	0.00
Total		26	100.00	13	100.00	14	100.00	16	100.00

$P=F/\text{total } F \times 100$ where P is percentage and F is the frequency of responses

Triangulo

The same with Mabolo, the coping mechanisms employed by the households interviewed were only economic type of mechanisms. The economic mechanism present in the area are saving money, continue working, buying food stocks, and looking for alternative jobs.

Coping on Income During Flooding, Mabolo

Mabolo

Economic type coping mechanisms are the dominant mechanisms employed by the household to cope with their income during the flooding in Mabolo. This includes buying of cheap foods item, buying food stocks in bulk, continue working, and saving money,

Social type coping mechanisms are the second types of mechanisms employed by households in the area. The social type mechanisms present in the area are sourcing relief food items, soliciting help from relatives and friends either in kind or in terms of money, and selling the goods on credit to neighbors as form of their help to them or sourcing relief items from the Local Government.

The physical type mechanism attained the least responses of the households interviewed in the area. Change in business location is the only response of the physical type of coping mechanism given by the households interviewed.

Table 30 Frequency of Coping Mechanisms on Income (During Flooding, Mabolo)

Coping Type	Class Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	14	66.67	9	60.00	41	66.13	12	54.55	9	56.25
Physical	P	2	9.52	2	13.33	4	6.45	2	9.09	1	6.25
Social	S	5	23.81	4	26.67	17	27.42	8	36.36	6	37.50
Total		21	100.00	15	100.00	62	100.00	22	100.00	16	100.00

$P=F/\text{total } F \times 100$ where P is percentage and F is the frequency of responses

Table 31 Frequency of Coping Mechanisms on Income (During Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	23	67.65	21	75.00	11	57.89	25	71.43
Physical	P	4	11.76	2	7.14	2	10.53	3	8.57
Social	S	7	20.59	5	17.86	6	31.58	7	20.00
Total		34	100.00	28	100.00	19	100.00	35	100.00

$P=F/\text{total } F \times 100$ where P is percentage and F is the frequency of responses

Triangulo

Coping mechanisms in Triangulo had the same pattern of coping mechanisms with Mabolo. As shown in Table 31 economic types of coping mechanisms are the dominant mechanism applied by the household to cope with their income in Triangulo. The second types of mechanisms are the social type of mechanisms that has high response in terms of coping with the income during flooding. The social type of mechanisms is the least type of mechanisms that are present in the area.

Economic types of mechanisms present in the area are buying cheap food items, buying food stocks in bulk, children were asked to work, continue working, rendering overtime services, and saving money. The physical type of mechanism is temporary change in business location. The social type of mechanisms are sourcing relief items and soliciting help from relatives and friends.

Coping on Income After Flooding, Triangulo

Mabolo

The households surveyed in Mabolo applied economic type of mechanisms to avoid incurring income losses flooding. Table 32 shows that economic types of mechanisms are the dominant mechanisms applied by the households interviewed. The physical mechanism is not present in the area. The social type of mechanisms shows almost even distribution among all zones

The mechanisms that economically inclined mechanisms present in the area are eating more on cheap fishes and vegetables continue working, looking for alternative jobs, prioritizing needs, tight budgeting, rendering overtime services, and buying food at the market because it is cheaper in the market. Social type of mechanisms includes dropping of children from school, borrowing money from in Ma relatives, soliciting helps from relatives, friends, and neighbors, and some also provide livelihood to the neighborhoods

Table 32 Frequency of Coping Mechanisms on Income (After Flooding, Mabolo)

Coping Type	Class Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	33	78.57	22	75.86	69	78.41	28	73.68	20	71.43
Physical	P	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Social	S	9	21.43	7	24.14	19	21.59	10	26.32	8	28.57
Total		42	100.00	29	100.00	88	100.00	38	100.00	28	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 33 Frequency of Coping Mechanisms on Income (After Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	38	73.08	23	74.19	28	73.68	36	73.47
Physical	P	0	0.00	0	0.00	0	0.00	0	0.00
Social	S	14	26.92	8	25.81	10	26.32	13	26.53
Total		44	100.00	31	100.00	38	100.00	49	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

The same with Mabolo, economic type of mechanisms dominates among the 3 types of mechanisms and no physical type of mechanisms applied in the area. Social types of mechanisms had the least responses compared to economic type of mechanisms.

The economic type of coping mechanisms in this area are children were asked to worked, continue working, looking for alternative livelihood, prioritizing needs, tight budgeting, buying of cheaper food items, and rendering overtime services. The Social type of mechanisms includes children dropped (stopped) from schooling, borrowing money from relatives and friends, sourcing of relief food items, and soliciting supports from relatives, neighbors and friends.

5.6. Coping Mechanisms on Business Stocks

The business define in this study are the goods or merchandise that are kept on hand by the households engage in business with the purpose of selling such goods or merchandise in the future. This also includes the vehicles like tricycle (3-wheeled motorized vehicle) and jeepney or equipment used by the households to earn income like sewing machine or oven.

Protecting Business Stocks Before Flooding

Mabolo

The economic type of mechanisms to avoid losses or damages on business stocks were highly employed by the households in Mabolo. Table 34 shows that zone 3, 5, and 6 attained higher responses (more than 50%) on economic mechanisms. While in zone 2 the combinations of economic and physical types of mechanisms had an equal number of responses. However, social mechanism is only present in zone 4.

The economic type of mechanisms include buying of few items for selling to avoid damages, installing mezzanine where they can keep the stocks, some are buying more stocks to sell, and elevating the stores building. The physical type of coping mechanisms present in the area are preparing waterproof containers, preparing storage place at the second floor, and preparing improvised table called "papag" (an improvised platform used to place things temporarily). The social type of mechanisms is only present in zone 4. This mechanism is the preparation of parking or temporary garage at relatives and friends places for those who are engage in small-scale transportation business.

Table 34 Frequency of Coping Mechanisms on Business Stocks (Before Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	7	50.00	6	54.55	8	40.00	4	57.14	5	62.50
Physical	P	7	50.00	5	45.45	11	55.00	3	42.86	3	37.50
Social	S	0	0.00	0	0.00	2	10.00	0	0.00	0	0.00
Total		14	100.00	11	100.00	21	100.00	7	100.00	8	100.00

$P = \frac{F}{\text{total}} \times 100$ where P is percentage and F is the frequency of responses

Table 35 Frequency of Coping Mechanisms on Business Stocks (Before Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	8	44.44	5	45.45	4	44.44	4	40.00
Physical	P	9	50.00	6	54.55	5	55.56	6	60.00
Social	S	1	5.56	0	0.00	0	0.00	0	0.00
Total		18	100.00	11	100.00	9	100.00	10	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

Physical type of mechanisms is the coping mechanisms applied by households surveyed in Triangulo. All zones attained more than 50% of the responses in physical type of mechanisms. The social coping mechanism is only employed by the households in zone 3 considering that one household has a business involving transportation (Tricycle operator). Comparing the 3 types of mechanisms, the economic type shows high responses on zone with lower income. The physical type of mechanisms is higher in zone with higher income except in zone 3 wherein social type of mechanisms is added.

Protecting Business Stocks During Flooding

Mabolo

Physical type of coping mechanism is highly employed in Barangay Mabolo in terms of avoiding damages or losses on business stocks during flooding. These mechanisms include preparing waterproof materials, temporary changing in business location, placing stocks at the mezzanine, and placing stocks at the waterproof containers. The economic type of mechanisms is the second type of mechanisms employed in the area. These includes continue selling, buying stocks, and some temporarily stop selling. The social type of mechanism is the least applied coping mechanisms in the area. The social type of mechanism present in the area are placing some of the business at neighbors place and parking of vehicles at relatives or friends place.

Table 36 Frequency of Coping Mechanisms on Business Stocks (During Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	6	33.33	5	35.71	7	38.88	2	25.00	3	30.00
Physical	P	10	55.56	7	50.00	9	50.00	5	62.50	6	60.00
Social	S	2	11.11	2	14.28	2	11.11	2	12.50	1	10.00
Total		18	100.00	14	100.00	18	100.00	8	100.00	10	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 37 Frequency of Coping Mechanisms on Business Stocks (During Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	9	39.13	4	33.33	4	36.36	4	36.36
Physical	P	12	52.17	7	58.33	6	54.55	6	54.55
Social	S	2	8.70	1	8.33	1	9.09	1	9.09
Total		23	100.00	12	100.00	11	100.00	11	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

Physical coping mechanisms are the most common responses of the households surveyed in terms of avoiding damages or losses of business stocks during flooding in Triangulo. The economic type of mechanism is the second common responses of the households surveyed in this area. The physical type of mechanisms include placing the stocks at the second floor, temporary change in business location, placing stocks at the mezzanine and placing the stocks at waterproof containers. The economic type of mechanisms is the second common responses by the households in the area. The response for economic type of mechanisms include continue selling, buying of business stocks, and stop selling. The social type of mechanisms attained the least number of responses in this area. These are the mechanisms on placing stocks at the neighbors place and parking vehicles at friends or relatives place.

Coping with Flood Damages or Losses on Business Stocks After Flooding

Mabolo

In terms of coping with damages or losses on business stocks after flooding, households surveyed in Mabolo highly employs the economic type of coping mechanisms. These includes continue selling, repacking or rebottling of slightly damage stocks, and repairing minor defects on vehicles. The second type of coping mechanisms that has higher response is the social type of coping mechanisms. Social coping mechanisms in the area are selling goods on credit and hiring some community members for a labor works to help the other household in the community to earn. The physical coping mechanisms are the least type of mechanisms employed by the households in the area. Physical coping mechanism present in the area is only placing some of the remaining stocks at the plastic or can containers to ensure that the stocks will not be damages in case there is reoccurrence of the flooding,

Table 38 Frequency of Coping Mechanisms on Business Stocks (After Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	7	58.33	4	50.00	12	52.17	4	66.67	3	60.00
Physical	P	2	16.67	2	25.00	3	13.04	1	16.67	1	20.00
Social	S	3	25.00	2	25.00	8	34.78	1	16.67	1	20.00
Total		12	100.00	8	100.00	23	100.00	6	100.00	5	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 39 Frequency of Coping Mechanisms on Business Stocks (After Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	8	38.10	3	27.27	3	33.33	3	37.50
Physical	P	10	47.62	6	54.55	5	55.56	4	50.00
Social	S	3	14.29	2	18.18	1	11.11	1	12.50
Total		21	100.00	11	100.00	9	100.00	8	100.00

$P = F / \text{total F} * 100$ where P is percentage and F is the frequency of responses

Triangulo

In Triangulo, physical coping mechanisms are the mechanisms applied by household surveyed in Mabolo. Zone 4, 5, and 6 attained more than 50% of responses on physical type of coping mechanism to regain losses from business stocks after flooding. The physical types of mechanisms are placing the remaining stocks at the plastic or can containers to ensure safeness of the stocks in case there is recurrence of flooding in the area and placing on improvised "papag" table to dry some of the wet items. The second common mechanisms are the economic coping mechanisms. Economic type of mechanisms present in the area are continue selling to gain profit to recover and some they stop selling so not to incur further losses.

5.7. Coping Mechanisms on Road Disruptions

For the purpose of this study, the road is defined as a surface right-of-way for purposes of travel by land vehicles and human being.

Coping Mechanisms on Road Disruption Before Flooding

Mabolo

Physical type mechanisms are the dominant response in Mabolo in terms of coping with the disruptions on road before flooding. The physical mechanism present in the area are preparing improvised catwalks, preparing improvised floaters, and preparing clothes for walking in the flooded area.

The mechanisms that are of economic type shows as the second mechanisms applied in zone 2, 3, and 4. However in zone 5 and 6 economic and social type of mechanism had the same number of responses. The social type of mechanism is the third type of mechanisms applied in zone 2, 3, and 4. The economic type of mechanism present in the area is buying of food stocks in bulk while the social type mechanism is preparing things to stay in other places.

Table 40 Frequency of Coping Mechanisms on Road Disruption (Before Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	2	10.00	1	8.33	6	12.77	2	11.76	1	11.11
Physical	P	17	85.00	11	91.67	39	82.98	14	82.35	7	77.78
Social	S	1	5.00	0	0.00	2	4.26	2	11.76	1	11.11
Total		20	100.00	12	100.00	47	100.00	18	100.00	9	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 41 Frequency of Coping Mechanisms on Road Disruption (Before Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	6	20.00	2	9.52	2	8.70	3	10.00
Physical	P	22	73.33	18	85.71	21	91.30	25	83.33
Social	S	2	6.67	1	4.76	0	0.00	2	6.67
Total		30	100.00	21	100.00	23	100.00	30	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

The same with Mabolo, the zones in Triangulo are more inclined on physical type of mechanisms. The kinds of physical type of physical mechanisms in Mabolo are also present in Triangulo. The economic type of mechanism attained is the second type of mechanisms applied by the households in the area. This includes preparing materials for catwalks, preparing improvised floaters that are made of basin, pail and other flat materials. The catwalk is a temporary small road that only human being can walk, usually made from scrap materials, used to avoid from stepping on the flooded area. The social type of mechanisms has the least response among the 3 types of mechanisms. Only one social type mechanisms was identified in the area, this is preparing the things to stay at other places, like in relatives houses, to avoid the difficulties.

Coping Mechanisms on Disruption of Road During Flooding

Mabolo

Household responses on coping with road disruptions depend on the physical type of mechanisms. These includes placing of improvised catwalks, reduction in frequency of going out, wearing flood suitable clothes, riding on improvised raft or "banca", using floaters to carry heavy things, and bringing clothes to change the wet clothes in reporting for work or marketing.

Economic types of mechanisms are the second mechanisms practiced in the area however this has minimal number of responses compared to physical type of mechanisms. Continue working and buying foods in the market in bulk are the economic type of mechanisms that are present in the area.

Social type mechanisms are the least type of mechanisms employed by the households surveyed in coping with road disruptions in the area. Staying in other places is the only social type of mechanism identified in the responses of the household surveyed.

Table 42 Frequency of Coping Mechanisms on Road Disruption (During Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	11	23.91	7	21.21	23	24.21	7	19.44	4	20.00
Physical	P	34	73.91	25	75.76	71	74.74	28	77.78	16	80.00
Social	S	1	2.17	1	3.03	1	1.05	1	2.78	0	0.00
Total		46	100	33	100	95	100	36	100	20	100.0

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 43 Frequency of Coping Mechanisms Per Class on Road Disruption (During Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	11	20.00	7	15.91	9	18.75	11	16.92
Physical	P	42	76.36	36	81.82	39	81.25	52	80.00
Social	S	2	3.64	1	2.27	0	0.00	2	3.08
Total		55	100.00	44	100.00	48	100.00	65	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

In Triangulo, the dominant coping mechanisms employed by the households interviewed, belongs to the physical type of mechanisms. These includes placing improvised catwalks, reduction in the frequency of going out, wearing flood suitable clothes, riding on improvised "banca" raft, using floaters to carry heavy things, and bringing clothes to change in reporting for work or going to the market.

Economic type of mechanisms is the second option of the households interviewed in coping with road disruption during flooding. However, continue working is the only kind of economic type of mechanism is identified in the responses of the households surveyed.

The social type of coping mechanism identified on the responses of the households surveyed is the option to stay in other places in order to cope with the disruption of road during flooding.

Coping Mechanisms on Road Disruption After Flooding

Mabolo

After flooding the coping mechanisms applied to cope with the disruption on road by the households interviewed in Mabolo are the physical type of mechanisms. Physical type of mechanisms present in the area are cleaning of canal and surrounding and the social type of mechanisms includes participation in barangay cleaning activities and participation on the improvement of road networks by helping the LGU repairing the damage road through

rendering free labor. However, economic coping mechanism is not employed by the household in the area on coping with road disruption after flooding.

Comparing the 2 types of mechanisms present in the area, the physical coping mechanisms are highly employed by the households in zone that had lower income. The social coping mechanisms are highly employed by the households in zone with higher income.

Table 44 Frequency of Coping Mechanisms on Road Disruption (After Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Physical	P	9	52.94	8	57.14	22	53.66	10	58.82	3	60.00
Social	S	8	47.06	6	42.86	19	46.34	7	41.18	2	40.00
Total		17	100.00	14	100.00	41	100.00	17	100.00	5	100.00

$P = F / \text{total F} * 100$ where P is percentage and F is the frequency of responses

Table 45 Frequency of Coping Mechanisms on Road Disruption (After Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	0	0.00	0	0.00	0	0.00	0	0.00
Physical	P	13	46.43	9	52.94	9	47.37	11	45.83
Social	S	15	53.57	8	47.06	10	52.63	13	54.17
Total		28	100.00	17	100.00	19	100.00	24	100.00

$P = F / \text{total F} * 100$ where P is percentage and F is the frequency of responses

Triangulo

Most of the coping mechanisms applied on road disruption after flooding in Triangulo are the combinations of the physical and social types of mechanisms. These types of mechanisms had high responses on zone 3, 5, and 6. However, zone 4 applies mechanisms that are on physical type. The physical type mechanisms present in the area are cleaning of canal and surroundings. The social type mechanisms are participating in barangay cleaning activities and helping in the improvement of road networks like rendering free labor service.

5.8. Coping Mechanisms Injuries ,Diseases and Lifeloss

Coping Mechanisms to Prevent Injuries, Diseases and Life loss Before Flooding Mabolo

The coping mechanisms employed by the households interviewed in Mabolo shows that social types of mechanisms had higher responses in all zones. These are listening to the weather forecast (from the government, media, relatives and friends), evacuating earlier being aware of the flooding season and participating in barangay health program. The second common mechanisms applied by households in the area are combinations of physical and economic types of mechanisms. Physical type of mechanisms includes fixing thing for evacuations stocking of water for drinking and domestic consumptions and cleaning of canal. The economic mechanisms includes buying and preparing energized materials like

flashlights, gas lamp, batteries, and candles, stocking of food items and buying first aid medicine.

Table 46 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeness (Before Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	10	21.28	6	20.69	25	20.83	7	13.46	4	14.81
Physical	P	10	21.28	7	24.14	24	20.00	11	21.15	6	22.22
Social	S	27	57.45	16	55.17	71	59.17	34	65.38	17	62.96
Total		47	100.00	29	100.00	120	100.00	52	100.00	27	100.00

$P = F / \text{total} \times 100$ where P is percentage and F is the frequency of responses

Table 47 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Lifeness Before Flooding, Mabolo

Coping Type	Code	T- zone 3		T- zone 4		T- zone 5		T- zone 6	
		F	P	F	P	F	P	F	P
Economic	E	14	28.57	6	20.00	8	22.86	13	24.07
Physical	P	9	18.37	10	33.33	9	25.71	13	24.07
Social	S	33	67.35	22	73.33	22	62.86	35	64.81
Total		57	100.00	38	100.00	39	100.00	61	100.00

$P = F / \text{total} \times 100$ where P is percentage and F is the frequency of responses

Triangulo

In Triangulo, social coping mechanisms to avoid injuries, diseases or life loss follows the same pattern with Mabolo. All type of mechanisms available in Mabolo is also present in Triangulo. The physical coping mechanisms is the second type of coping mechanisms employed by the households in Zone 4, 5, and 6 while zone 3 is the economic coping mechanisms. However, the economic mechanisms is the third type of coping mechanisms employed by Zone 4, 5, and 6 while in Zone 3 the third type of coping mechanisms employed by the households is the physical coping mechanisms

Coping Mechanisms to Avoid Injuries, Diseases, and life Loss of Life During Flooding

Mabolo

More households depend on the combinations of physical and social types of mechanisms to avoid injuries, diseases or life loss in Mabolo. Table 48 shows that in zone 3, 5, and 6 had higher number of responses on physical type of mechanisms. The physical mechanisms applied in the area are cooking upstairs, cooking food earlier, and using flood walking suits. The social type of mechanisms includes preventing kids from going out, evacuating earlier (evacuate first the old member and the children, the father had to stay in the house to guard the things), evacuating at relatives or neighbor place, evacuating along the highway (at the parking area –Trucks are used as their shield) following the barangay instructions, limiting the frequency of going out, and maintaining proper personal hygiene. Economic mechanism highly employed by the households surveyed in zone 2 and 4. The economic type of mechanisms present in the area includes buying food items at neighborhood stores, boiling water so not to incur cost and avoid sickness, and buying and bringing enough food during

evacuations. To avoid sickness or diseases they fetch water from the public faucet or pump and then boiling this water before drinking.

Table 48 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Life loss (During Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	7	17.50	4	16.67	10	11.76	3	9.38	2	10.00
Physical	P	20	50.00	11	45.83	49	57.65	13	40.63	8	40.00
Social	S	13	32.50	9	37.50	26	30.59	16	50.00	10	50.00
Total		40	100.00	24	100.00	85	100.00	32	100.00	20	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 49 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Life loss (During Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	7	12.07	4	11.76	4	13.79	6	13.95
Physical	P	26	44.83	19	55.88	11	37.93	20	46.51
Social	S	25	43.10	11	32.35	14	48.28	17	39.53
Total		58	100.00	34	100.00	29	100.00	43	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

The same types of coping mechanisms in Mabolo were applied by households surveyed in Triangulo. Most of the households in the area applied the combinations of physical and social types of mechanisms. Table 49 shows that combinations of physical and social types of mechanisms are highly applied in zone 3, 5 and 6. The households in zone 4 applied the physical mechanism. The economic coping mechanism is the least type of mechanism employed by the households in the area. The households avoid sickness by boiling the water for drinking. They prefer to boil the water to avoid cost of bottled water and to avoid gastrointestinal sickness because according to the households flood water might contaminate the faucet or the pump.. The physical coping mechanisms present in the area are cooking upstairs, cooking food earlier, and using flood walking suits. The social type of mechanisms includes preventing kids from going out, evacuating earlier wherein the old member of the family and children were evacuated first, evacuating at relatives place, evacuating at the PNR coaches (this is commonly done by household in zone 4 and part of zone 6), following the barangay instructions, limiting the frequency of going out, and maintaining proper personal hygiene. The economic type of mechanisms present in the area includes buying food items at neighborhood stores and buying and bringing enough food during evacuations.

Coping Mechanisms to Avoid Injuries, Diseases, and life Loss of Life After Flooding

Mabolo

After flooding, the social mechanisms dominates the response on coping mechanisms in zone 2, 3, and 4 while in zone 5 and 6 physical type of mechanisms show higher number of responses in these zones. The physical type mechanism is the second common mechanisms

applied by households in zone 2, 3, and 4. The economic mechanisms had the least number of responses in all zones.

The social types of mechanisms present in the area are consulting barangay health workers, participating in barangay cleaning projects, helping community member through offering services, and practicing proper waste disposals. The physical type of mechanisms includes cleaning the surroundings and cleaning the canal. The economic type of mechanism has only one response this is buying of nutritious food items.

Table 50 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Life loss (After Flooding, Mabolo)

Coping Type	Code	M-zone 2		M-zone 3		M-zone 4		M-zone 5		M-zone 6	
		F	P	F	P	F	P	F	P	F	P
Economic	E	2	8.70	2	7.41	5	6.94	0	0.00	0	0.00
Physical	P	9	39.13	8	29.63	22	30.56	11	52.38	5	55.56
Social	S	12	52.17	17	62.96	45	62.50	10	47.62	4	44.44
Total		23	100.00	27	100.00	72	100.00	21	100.00	9	100.00

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Table 51 Frequency of Coping Mechanisms to Prevent Injuries or Diseases and Life loss (After Flooding, Triangulo)

Coping Type	Code	T-zone 3		T-zone 4		T-zone 5		T-zone 6	
		F	P	F	P	F	P	F	P
Economic	E	2	5.88	1	5.56	2	6.67	3	10.34
Physical	P	14	41.18	9	50.00	13	43.33	14	48.28
Social	S	18	52.94	8	44.44	15	50.00	15	51.72
Total		34	100.00	18	100.00	30	100.00	32	110.34

$P = F / \text{total } F * 100$ where P is percentage and F is the frequency of responses

Triangulo

After flooding, the same pattern and the same type of coping mechanisms with Mabolo were applied by the households in Triangulo. Table 51 shows that the dominant type of coping mechanisms employed by households in the area are the social types of mechanisms. The physical mechanism is highly applied by the households surveyed in zone 4. The least mechanism employed is the economic type.

5.9. Summary and Conclusion

Community's Coping Mechanisms Before Flooding

The coping Mechanisms applied by the communities before flooding in different 6 identified elements exposed to risk are the economic, physical and social coping mechanisms . In Mabolo most of the households applied more on the economic coping mechanisms. The physical coping mechanism is the second choice of the household to protect their lives and properties before flooding. The social coping mechanisms is least applied by the households before flooding. The household in Triangulo applied more on physical coping mechanisms to avoid from incurring damages or losses from the negative effects of floods. The second coping mechanism applied by the households is the economic coping mechanisms and the

least applied is the social coping mechanisms. These coping mechanisms are preparedness measures in order to prevent from incurring flood losses.

Community's Coping Mechanisms During Flooding

During flooding the most commonly applied coping mechanisms in the study area is physical coping mechanisms. The second coping mechanisms that is highly applied is the social type of coping mechanisms and the least type of coping mechanisms during flooding is the economic coping mechanisms. These coping mechanisms are the response measures to address the immediate needs of the household. These are also measures that tend to minimize the impact of the flood.

Community's Coping Mechanisms After Flooding

The economic coping mechanism is highly applied by the households in the study to regain from flood losses or damages. The second type of coping mechanisms employed by the households after flooding is the social coping mechanisms. The physical coping mechanisms is least applied by the household in Mabolo, while in Triangulo physical and social coping mechanisms were equally applied by the households. The coping mechanisms applied by the household after flooding are the measures that address the immediate need of the household and to regain from the flood damages or losses.

6. ANALYSIS AND RESULT OF THE DATA:MABOLO AND TRIANGULO

6.1. Non Spatial Analysis

The data on the identified factors from the result in Chapter 4, particularly the data on flood depth (Table 8 and 9) and access to assistance (Table 4 and 5) were used to analyze their relationships to coping mechanisms. The identified coping mechanisms discussed in Chapter 5 were taken and aggregated to obtain the total frequency count of the identified types of coping mechanisms. Frequency and percentages were used to relate the identified factors that influence the coping mechanisms. The respondents had multiple answers in coping with floods. This study explores the possibilities to know how the community deals with the floods and how this information can be used by the Local Government Unit (LGU) and the ITC SLARIM project on risk assessment. This study uses descriptive approach to analyze the data. The factors that influence the coping mechanisms were analyzed based on the conceptual framework discussed in Chapter 1. The factors for this study include

- Flood depth
- Average income
- Access to assistance and
- Geographical location

The hazard is characterized by water depth as discussed in Chapter 4 (Table 8 and 9) . The value with dominant response is taken for the analysis. The income is based on the average income of the households per month. This is calculated from the total income of the household per zone divided by the number of respondents of the particular zone. The percentages of the access to assistance, as discussed in Chapter 4 (Table 4 and 5), is used. However, the geographical location was included in the spatial analysis. These factors were classified as follows:

Table 52 Classification of Factors Relating to Coping Mechanisms

Depth (ft)	Class	Access	Class	Ave_inc	Class
5-6	Slightly flooded	0-15	Less assisted	Below 6000	Below Minimum wage
7-8	Moderately flooded	15.01-25	Moderately assisted	6001-8000	Minimum wage
>8	Severely flooded	25.01-45	Fully assisted	8001-10000	Poverty line
				>10000	Above poverty line

Access is access to assistance; ave inc is average income

Table 52 shows the classification of factors used for the analysis in order to support the description used in the study. The water depth was classified into 3 categories. The “slightly flooded” refers to zones that experienced 5-6 feet in terms of water depth. The “moderately flooded” zone are the zones that experienced floods at 7-8 feet water depth while severely flooded is the zone that experienced more than 8 feet water depth (1 foot =0.3 meter). The

access to assistance is based on the sources of assistance the community have. The sources of assistance, as discussed in chapter 4, are assistance from relatives, friends, and the Barangay and City Government. The frequency of responses is taken from the data discussed in Chapter 4 specifically from Table 4 and 5. Access to assistance was classified into 3 categories. The less access to assistance are the households that attained the percentage of 0-15 percent, the moderately assisted are the households that attains 15.01-25% on frequency of responses and the fully assisted are the households that attained 25.01-45% on the frequency of responses. The income was classified into 4 categories. The households earning below the minimum wage had an average of less than the 6000 pesos per month which is below the minimum wage rate in the City (NEDA, 2002). The households earning from 6001 to 8000 were classified as the households that belong to minimum wage earners and the households that have average monthly income of 8001-10000 are classified as households within the poverty line. The households that have more than 10000 pesos were classified as above poverty line. The poverty threshold in the City is 10380 pesos per month (NCSO, 2004).

In Chapter 5, the coping mechanisms employed by the households on the identified 6 elements exposed to risk (house, income, content, business stocks, disruption of road services, and injuries/diseases) at different flood stages were described and categorized into three types of coping mechanisms- the economic, physical and social. In this chapter, the frequency of responses on these types of coping mechanisms were totaled (per zone) and the corresponding percentages were calculated per types of coping mechanisms. The data obtained were used to analyze the factors that influence the coping mechanisms.

6.1.1. Factors that Influence the Coping Mechanisms, Before Flooding

Coping Mechanisms in Relation to Hazard, Before Flooding, Mabolo

The magnitude of the hazard had a slight relationship to the coping mechanisms employed by the community. The zone that had experienced slight flooding attained a slightly higher (36.46%) response on physical coping mechanisms compared to other zones that had experienced moderate (31.81%-35.00) flood depth. The economic and social coping mechanisms had no relationship to the coping mechanisms employed by the household before the flooding.

The physical coping mechanisms present in the area are reinforcing the pillars using scrap materials, preparing water proof materials, preparing improvised tables or cabinets, storing water for domestic consumptions, and cleaning the canal. The economic coping mechanisms applied by the community are saving money, construction of houses with reinforced materials, installation of mezzanine, construction of houses with thresholds, buying food stocks and purchasing energized materials. And the social coping mechanisms are listening to weather forecast, preparing temporary garage in friends or relatives place, and asking permission from relatives place to stay or place things at their place.

Coping Mechanisms in Relation to Income Before Flooding, Mabolo

Income had a relationship with the coping mechanisms employed by the community before flooding. It is observed that all the households with the higher income (from poverty line to above poverty line) applied more (40% to 42.5%) on economic and physical types of mechanisms compared to the households that had income below the minimum wage (31.82% to 36.25%). Meanwhile the zones within the below minimum wage income applied more (28.75 % to 36.36%) on social type of coping mechanisms compared to the households with higher income employed lesser (22.92 to 26.80%) on this type of mechanism.

It is true that the households with higher income can provide more economic measures. This is seen in the economic coping mechanisms employed by the households. The household with higher average income can construct the house with second floors and reinforced materials while the less in financial resources can only construct the house with thresholds. Households with higher income can prepare place for storage at second floor and the households that had lower income constructed mezzanine. The households with financial advantage can save money than those with lower income. The households with higher average income employed coping mechanisms like buying food stocks in bulk, buying goods for selling in bulk and purchasing energized materials which the less in financial resources may not do. The physical coping mechanism present in the area are preparing waterproof materials, preparing flood suitable clothes like shorts and used shirts, fixing thing for evacuation, and preparing improvised cabinet. These physical coping mechanisms are doable to the households with below minimum wage income.

Coping Mechanisms in Relation to Access to Assistance Before Flooding, Mabolo

Access to assistance had a relationship to the coping mechanisms applied by the community before flooding. Critical observation on the association of access to assistance to the coping mechanisms shows that the households with lesser access to assistance had employed higher (28.75 to 36.36%) social types of coping mechanisms compared to the zones that had moderate and full access to assistance (22.92 to 26.80%). However, access to assistance had no clear relationship with economic and physical types of coping mechanisms. It is noted that the households that had less assistance are the households that earn below the minimum wage. The social coping mechanisms focus on the awareness of the flooding and strengthening of social network. The social coping mechanisms present in the area are listening to the weather forecast from the media (radio or television) and asking permission for temporary stay or safe keeping of valuable things.

Table 53 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms Before Flooding, Mabolo

Zones	Depth FT	Coping Mechanisms Before Flooding				
		Ave. Income	Assistance	Economic(%)	Physical%	Social(%)
Zone 2	7-8	9946.71	18.89	42.58	34.19	23.23
Zone 3	5-6	10140.00	15.56	40.63	36.46	22.92
Zone 4	7-8	10649.88	43.33	40.61	32.60	26.80
Zone 5	7-8	5585.71	13.33	31.82	31.82	36.36
Zone 6	7-8	5625.00	8.89	36.25	35.00	28.75

(1 foot =0.3048 meter)*

Table 54 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms Before Flooding, Triangulo

Zones	Depth FT	Coping Mechanisms Before Flooding				
		Ave. Income	Assistance	Economic(%)	Physical%	Social(%)
Zone 3	7-8	8633.33	30.99	41.54	30.26	28.21
Zone 4	> 8	7387.50	19.72	35.29	36.13	28.57
Zone 5	5-6	9601.11	21.13	33.33	40.74	25.93
Zone 6	7-8	8931.82	28.17	31.94	38.74	29.32

(1 foot =0.3048 meter)

Coping Mechanisms in Relation to Hazard Before Flooding, Triangulo

The magnitude of flooding can be slightly associated to the physical and social type of coping mechanisms employed by the community. The zones that are slightly flooded employed more (40.74%) on physical mechanisms and lesser (25.93%) on social mechanisms compared to the zones that are moderately and severely flooded employed less physical (30.26% to 38.74%) coping mechanisms and more (28.21% to 29.32%) social coping mechanisms. However, it is observed that economic type of coping mechanisms had no relationship with the hazard. The same types of coping mechanisms employed by the household in Mabolo are employed by the household in Triangulo.

Coping Mechanisms in Relation to Income Before Flooding, Triangulo

It is observed that income does not have a clear association with the social type coping mechanisms of the households interviewed in Triangulo. Taking a closer look at the data on income, a closer range of difference can be observed unlike in Mabolo where the income range had a bigger difference to other zones. Based on the data from the household interviews, most (3 out of 4 zones) of the households Triangulo were classified as within the poverty line and one zone is classified to belong to minimum wage. Hence, it not surprising that the coping mechanisms of the households before flooding are closely related to each other. However, based on the poverty thresholds prescribed in the City (10,389 pesos per month), all the households live below the poverty line (NCSO, 2004).

Coping Mechanisms in Relation to Access to Assistance before Flooding, Triangulo

Observation of the data shows that access to assistance had relations with the coping mechanisms employed by the households in Triangulo. The households with full access to assistance employed more (41.54%) economic coping mechanisms compared to the households with moderate access to assistance applied lesser (31.94% - 35.29%) economic mechanisms. While the households with moderate applied more (36.13%-40.74%) on physical type of coping mechanisms compared to the households with full access to assistance (30.28%). It is observed that there is no clear relationship between the social coping mechanisms and the access to assistance. The social coping mechanism in Triangulo is the same with the social coping mechanisms in Mabolo.

6.1.2. Factors That Influence Coping Mechanisms During Flooding

Coping Mechanisms in Relation to Hazard During Flooding, Mabolo

Hazard had can be associated with the coping mechanisms employed by the community during flooding. Most of the zones (3 out of 4) with moderate flood depth employ less (46.15% to 49.3%) in physical type of coping mechanisms while the zones that are slightly flooded employs more (51.22%) on the physical coping mechanisms. However, it is noted that zone 2 employed more on physical coping mechanism. The difference of this zone to other zones with the same experienced on flood depth can be attributed to other factors. It is observed that the economic and social coping mechanisms had no clear association with the hazard.

During flooding the physical and social coping mechanisms employed by the households tends to minimize the impact of the floods and tends to strengthen the social structure in the community. Examples of physical coping mechanisms during flooding are boiling drinking water, placing things at mezzanine or second floor, placing catwalks and hanging things at the metal hook. Examples of social coping mechanisms are listening to government official instructions, staying at relatives, neighbors or government evacuation centers, and placing valuable things at relatives or neighbors place. While the economic coping mechanisms present in the area tends to address the immediate need of the households. Examples of this coping mechanisms are purchasing cheaper food items, purchasing food stocks in bulk, continue working to meet the economic needs of the family and rendering overtime services.

Coping Mechanisms in Relation to Income During Flooding, Mabolo

Income can be associated with the coping mechanisms employed by the households during flooding. Observation shows that all (3 out of 3) of the households that are on poverty line and above poverty line applied slightly higher (49.30 to 52.78%) physical types of mechanisms compared to the zones that have below minimum wage income applied lesser (46.15% to 48.94%) physical coping mechanisms. Physical coping mechanisms had the same pattern with the economic coping mechanisms. The zones that had higher income applied more (49.30%-52.78%) physical coping mechanisms compared to the zones with lower income applied lesser (46.15%-48.94%) of this type of coping mechanism. While the households with below minimum wage applied slightly higher (31.91% to 38.46%) on social types of mechanisms compared to the households with higher income applied lesser (26.11% to 28.46%) social coping mechanisms.

Economic and physical coping mechanisms during flooding can be distinguished from income. The households with higher income can have more economic and physical measures to protect and regain from the effects of flooding. While the households with lower income economic and physical measures they applied is not enough to counter the effects of the floods to their lives and properties hence, they seek for assistance thereby employing higher social coping mechanisms. Examples of economic mechanisms are purchasing food stocks in bulk, saving money, purchasing business stocks, and purchasing food items at neighborhood stores. Examples of physical coping mechanisms are placing valuable things at mezzanine or at the second floor, placing business stocks at the storage place, and

temporary change in business location. The social coping mechanisms present in the area are listening to government official instructions on possible evacuation, temporary shelter from relatives, neighbors, and government evacuation centers.

Coping Mechanisms in Relation to Access to Assistance During Flooding, Mabolo

Observation shows access to assistance is related to the coping mechanisms. Table 55 shows that the households with moderate and full access to assistance employs more on physical (49.30% to 52.78%) and economic (20.33%-22.82%) coping mechanisms compared to the zones that had lesser access to assistance employed lesser physical (46.15% to 48.94%) and economic (46.15%-48.94%) coping mechanisms. However, the zones with lesser access had higher (31.91% and 38.46%) response on social coping mechanisms compared to the zones with moderate and full access to assistance (25.95% to 28.46%). It is observed that access to assistance follow the same pattern with the relationship of income to the coping mechanisms.

Table 55 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms During Flooding, Mabolo

Zones	Depth FT			Coping Mechanisms During Flooding		
		Ave .Income (P)	Assistance	Economic(%)	Physical%	Social(%)
one 2	7-8	9946.71	18.89	21.11	52.78	26.11
Zone 3	5-6	10140.00	15.56	20.33	51.22	28.46
Zone 4	7-8	10649.88	43.33	22.82	49.30	27.89
Zone 5	7-8	5585.71	13.33	15.38	46.15	38.46
Zone 6	7-8	5625.00	8.89	19.15	48.94	31.91

(1 foot =0.3048 meter)*

Table 56 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms During Flooding, Triangulo

Zones	Depth FT			Coping Mechanisms During Flooding		
		Ave. Income (P)	Assistance	Economic(%)	Physical%	Social(%)
Zone 3	7-8	8633.33	30.99	20.49	48.77	30.74
Zone 4	>8	7387.50	19.72	20.81	53.18	26.01
Zone 5	5-6	9601.11	21.13	17.28	51.23	31.48
Zone 6	7-8	8931.82	28.17	21.40	46.98	31.63

(1 foot =0.3048 meter)

Coping Mechanisms in Relation to Hazard During Flooding, Triangulo

Results of the analysis show that hazard can have an association with coping mechanisms applied by the community during flooding. In Triangulo, it is observed that the zone that is severely flooded and the zone that is slightly flooded applied more physical coping mechanisms (53.18% and 51.23%), while the zone that are moderately flooded had lower responses (46.98% to 48.77%) on the physical coping mechanisms. It is also observed that the zone that is slightly flooded applied lesser (17.28%) economic coping mechanisms compared to the zones that were severely and moderately flooded (20.49% to 21.40%). Observations show that severely flooded zone applied less (26.01%) social type of coping mechanisms compared to other zones that are slightly and moderately flooded (30.74% to

31.63%). The type of coping mechanisms present in Triangulo is the same type of coping mechanism present in Mabolo.

Coping Mechanisms in Relation to Income During Flooding, Triangulo

Income has a relationship with the coping mechanisms employed by the community during flooding. It is observed that the zone that had minimum wage income, households applied more (53.18%) physical coping mechanisms compared to the zones that the households have income within the poverty line (46.98% to 51.23%). The zones that have income within poverty line applied more (30.74% to 31.63%) social coping mechanisms during flooding compared to the zone that had income within the minimum wage (26.0%). However, income had no clear association with the economic type of mechanisms employed by the households in the study area during flooding considering the zones with higher income does not follow pattern on their responses to this type of coping mechanisms. The type of coping mechanisms related to income present in Triangulo is the same type of coping mechanism present in Mabolo.

Coping Mechanisms in Relation to Access to Assistance During Flooding, Triangulo

Access to assistance had relationships with the physical type of coping mechanisms employed by the households. The households that had moderate access to assistance employ more (51.23% to 53.18%) on physical type of coping mechanisms compared to those with full access to assistance (46.98% to 51.23%). However, access to assistance had no clear relations with the economic and social types of coping mechanisms employed by the households in Triangulo during flooding because there is closer difference in income and access to assistance compared to Mabolo that had bigger difference values in income and access to assistance. The type of coping mechanisms related to access to assistance present in Triangulo is the same type of coping mechanism present in Mabolo.

6.1.3. Factors that Influence the Coping Mechanisms After Flooding

Coping Mechanisms in Relation to Hazard After Flooding, Mabolo

It is observed that the flood depth had a slight relationship to the social coping mechanisms of the community after flooding. It is observed that the zone that were slightly flooded had slightly higher (33.93%) responses on social types of coping mechanisms compared to other zones that experienced moderate flooding (26.81% - 33.23%). It is also observed that economic type of coping mechanisms is the important coping mechanism after flooding. There are more economic and social coping mechanisms employed by the households after flooding than the physical coping mechanisms. The economic and social coping mechanisms focus on the response measures to regain from the negative effects of the floods. Examples of economic mechanism present in the area are repairing important damage to the house and appliances, prioritizing the needs, change in the meal by buying more on cheaper food items, and looking for livelihood. The social coping mechanisms include borrowing money from relatives, friends and government, sourcing relief materials, participating in barangay activities, consulting health workers on health problems, and selling goods on credit to neighborhood without interest. Physical coping mechanisms present in the area are cleaning

the surroundings, fixing the house by arranging the things, and cleaning of canal to avoid stagnant water.

Coping Mechanisms in Relation to Income After Flooding, Mabolo

After flooding, income can be related to the social and economic types of coping mechanisms employed by the community. Results show that the households with above poverty line income employed more (33.93% and 33.23%) on the social type of coping mechanisms compared to the zones that are within poverty line (26.81%) and below minimum wage (27.69% and 29.73%). While the households that had income within poverty line show slightly higher (44.93%) response on economic type of coping mechanisms. However, income has no clear relationship with the physical types of coping mechanisms.

It is observed that the economic and social coping mechanisms employed by the households after flooding focus on the recovery measures. Examples of these coping mechanisms were listed in the discussions on the relationship of coping mechanisms to the hazard.

Coping Mechanisms in Relations to Access to Assistance After Flooding, Mabolo

Access to assistance had no relationship with the coping mechanisms applied by the community after flooding. It is observed that there is no pattern followed by each class of assistance. It is observed that the coping mechanism employed by the household after flooding focus on the recovery measures and tends to strengthen social structures. Most of the households in the study have to recover from the negative effects of the flood. Social structure is strengthened as can be observed in the social coping mechanisms. Examples of this the households participates in barangay activities, helping community member in repairing the house, and those households that are not impacted by the floods help the community member by providing small-scale livelihood opportunities to augment the household income.

Table 57 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms After Flooding, Mabolo

Zones	Depth FT			Coping Mechanisms After Flooding		
		Ave. Income	Assistance	Economic F(%)	Physical F%	SocialF(%)
Zone 2	7-8	9946.71	18.89	44.93	28.26	26.81
Zone 3	5-6	10140.00	15.56	38.39	27.68	33.93
Zone 4	7-8	10649.88	43.33	38.71	28.06	33.23
Zone 5	7-8	5585.71	13.33	37.93	34.48	27.59
Zone 6	7-8	5625.00	8.89	43.24	27.03	29.73

(1 foot =0.3048 meter)

Table 58 Distribution of Zones by Flood Depth, Average Income, Access to Assistance, and Coping Mechanisms After Flooding, Triangulo

Zones	Depth FT			Coping Mechanisms After Flooding		
		Ave. Income	Assistance	Economic(F%)	Physical(F%)	Social(F%)
Zone 3	7-8	8633.33	30.99	37.24	31.63	31.12
Zone 4	>8	7387.50	19.72	37.10	33.87	29.03
Zone 5	5-6	9601.11	21.13	38.13	30.22	31.65
Zone 6	7-8	8931.82	28.17	36.36	27.81	35.83

(1 foot =0.3048 meter)

Coping Mechanisms in Relation to Hazard After Flooding, Triangulo

In Triangulo, the hazard can be associated with the coping mechanisms. The households that had experienced severe flooding attains the highest (33.87%) response on the physical type of coping mechanisms and the least response (29.03% and 37.10%) on the social coping mechanisms, while the households that experienced from slight to moderate flooding had slightly lesser (27.81%-31.63%) response on physical coping mechanisms and had higher (31.12%-35.83%) on social coping mechanisms. However, the hazard had no relationship with the economic coping mechanisms employed by the households after flooding. The same types of coping mechanisms with Mabolo were present in Triangulo.

Coping Mechanisms in Relation to Income After Flooding, Triangulo

The income can be related to the employed by the community after flooding. It is observed that the zone with lower average (minimum wage) income attained the higher (33.87%) response on physical compared to zones that had income within poverty line (27.81% to 31.63%). While the households that had income within the poverty line applied more (31.12% to 35.83%) on social types of coping mechanisms than in zone that had lower (minimum wage) income (29.03%). It is observed that income had no clear relationships with the economic coping mechanisms. Examples of physical coping mechanisms in the area are cleaning the surroundings, cleaning the canal, and fixing the things. The social coping mechanisms include sourcing of relief items (food or house materials), providing livelihood opportunities to community members and borrowing money from relatives and government. The example of economic coping mechanisms present in the area are repairing the damages to the house and appliances, change in meals by eating more on cheap food items, and looking for alternative livelihoods

Coping Mechanisms in Relation to Access to Assistance, Triangulo

There is no clear relation of access to assistance and coping mechanisms after flooding in Triangulo. Observation shows that the moderately and fully assisted zones had no clear pattern on the percentage of responses of the households interviewed. Most of the households in Triangulo employed the 3 types of the coping mechanisms. Taking a closer look on the previous analysis, the household with higher access to assistance had higher income. In Triangulo, the household had closer difference in income compared to Mabolo. Hence, it is possible that their coping mechanisms after flooding are closely related to each other.

6.2. Analysis of Factors that Influence the Coping Mechanisms Using Pearsons Correlation

Correlations of Factors that Influence the Coping Mechanisms

The data used for this analysis were taken from the tabulated data taken from the questionnaires. The responses of each respondent on the flood depth, income, access to assistance and the responses on the 3 types of coping mechanisms were used to analyze the relationships between the identified variables. The definition of the 3 types of coping

mechanisms discussed in Chapter 5, were adopted to tabulate the data on 3 types of coping mechanisms per respondent. The Pearson 2-tailed statistical correlation was done through the use of the SPSS program to facilitate the computation and accuracy of the calculation of the data. The range of significance is classified as follow:

- 0.100 (+ or -) and below no relationship
- 0.300 (+ or -) and below is weak relationships
- >0.300 (+ or -) moderate
- >0.800 (+ or -) highly significant

The purpose of using the Pearson correlation is to know the relationships between the identified factors and the 3 types of coping mechanisms per stages of flooding. The result of this correlation can support the relations of variables as discussed in the first part of this chapter. The relationships of variables in the first part of this Chapter were analyze using the data per zone while in this analysis, the relationships of identified factors and the coping mechanisms were taken from the data per respondent. The analysis was done in the whole study area unlike in the first part where analysis was done per zone.

Relationships of Identified Factors that Influence the Coping Mechanisms Before Flooding

Before flooding, the relationship between the factors that are considered to have associations with the coping mechanisms in the study area ranges from weak to moderate. Among the identified factors only income and access to assistance showed moderate (0.438 and .486) relationship with the coping mechanisms before flooding, while the flood depth had no relationship (-.079) with the coping mechanisms. The economic coping mechanisms showed a moderate relationship with the income (0.557) and access to assistance (0.486) while the physical type of coping mechanisms showed a weak relationship with the income (0.276) and access to assistance (0.258) and a negative correlations (-0.256) with the flood depth. The social coping mechanisms showed a weak relationship with the income (0.282) and moderate relationship with access to assistance (0.355). However, no significant relationship was observed with the hazard.

The relationship of income to the coping mechanisms showed that the household that had higher income can employ measures to counter the effects of flooding. The negative relationship of the physical coping mechanisms with the hazard showed that this mechanism is inadequate to counter the effects of flooding and most of the household highly employed the economic coping mechanisms. The relationship between access to assistance and coping mechanisms showed that those household that had better access to assistance has the better opportunity to avoid damages or losses because they can place the valuable things or opt to stay at relatives places. The hazard had no relation to the coping mechanisms because regardless of the flood depth most of the household employed strategies that will make them less vulnerable.

Relationships of Identified Factors that Influence the Coping Mechanisms During Flooding

During flooding, the factors that had relationships with the coping mechanisms are the income and access to assistance. Result shows that income (0.257) and access to assistance (0.327) had moderate relationships with the coping mechanisms applied by the community during flooding. It is observed that hazard (0.077) had no relationship with the coping mechanisms.

The economic coping mechanisms showed moderate relationships with the income (0.476) and access to assistance (0.439) and no relationship with the hazard (0.093). The physical coping mechanisms had a weak relationship with income (0.272) and moderate relationship with access to assistance (0.330) and had a negative relationship with the hazard (-0.226). Social coping mechanisms had negative relationship with the income (-0.226) and no relations with the flood depth (0.047) and access to assistance (-119).

The positive relationships of income and access to assistance to the economic and physical coping mechanisms showed that the household with higher income and better access to assistance may incur less damages or losses compared to those household with lower income. Because the households with higher income can employ measures that could make them minimize the impact of the floods. The negative relationship of the income to the social coping mechanisms shows that the higher the income of the household the lesser the social coping mechanisms during flooding because the household with higher income does not need more assistance from the other to counter the effects of flooding. The household with lower income need more assistance to counter the negative effects of the flooding. The negative relationship of hazard to the physical coping mechanisms shows that the higher the flood depth, the physical coping mechanisms become inadequate to protect the household from incurring flood damages or losses.

Relations of Factors on Coping Mechanisms After Flooding

After flooding, the income and access to assistance showed moderate (.308 and .347) relationships with the coping mechanisms of the household surveyed in the area. However, it is observed that there is no significant relationship between the hazard and the coping mechanisms.

The economic coping mechanisms showed a weak relationship with the income (0.211) and access to assistance (.292) and no relationship with the hazard. The physical coping mechanisms had weak relationships with the income (0.233), access to assistance (0.228) and the hazard (0.247). The social coping mechanisms had weak relationship with the income (0.233) and access to assistance (0.218). However, this type of coping mechanisms had no relationship with the hazard.

After flooding, the coping mechanisms of the households showed weaker relationships with the income and access to assistance because most of the households are introducing measures to recover from the negative effects of floods. The negative relationships of the

access to assistance with the social coping mechanisms shows that those households that had lesser access to assistance had lesser opportunity to regain from the effects of flood compared to the households with higher access to assistance because these household can get more assistance for their faster recovery on the negative effects of the flood. To illustrate this, the household with better access to assistance can borrow money from the government, relatives and friends while those that has lesser access to assistance has to rely more on the Local Government.

Table 59 Pearson's 2-Tailed Correlation of Coping Mechanisms on Income, Flood Depth, and Access to Assistance, Mabolo and Triangulo

Types of Coping Mechanisms	Income		Flood Depth		Access to assistance	
	P-Correlation	Sig	P-Correlation	Sig	P-Correlation	Sig
Before Flooding	0.438	0.000	0.079	0.489	0.492	0.000
Economic	0.557	0.000	0.041	0.717	0.486	0.000
Physical	0.276	0.044	-0.256	0.022	0.258	0.021
Social	0.282	0.011	0.118	0.296	0.355	0.001
During Flooding	0.257	0.021	0.077	0.980	0.327	0.003
Economic	0.476	0.000	0.093	0.413	0.439	0.000
Physical	0.272	0.015	-0.226	0.044	0.330	0.003
Social	-0.226	0.044	0.047	0.676	-.119	0.295
After Flooding	0.308	0.005	0.100	0.378	0.347	0.002
Economic	0.211	0.061	-0.119	0.292	0.29	0.009
Physical	0.233	0.046	0.247	0.002	0.228	0.042
Social	0.244	0.026	0.153	0.176	0.218	0.052

Significant 2-tailed correlation at the 0.01 level

6.3. Spatial Analysis of the Factors Relating to Coping Mechanisms and Selection of Predominat Coping Mechanisms

The spatial analysis of the identified factors that can or may influence the coping mechanisms in the study area is done to support the non spatial analysis of the data discussed in the first part of this Chapter. The identified factors, are based on the conceptual framework discussed in chapter 1, are the hazard, the socio-economic structures, and the geographical location of the community. The data of the identified factors and coping mechanisms discussed in the first part of this Chapter were taken and used in the spatial analysis. The classification of these factors and coping mechanisms used in the non spatial analysis were adopted.

In the non spatial analysis, first parts of this Chapter, the analysis was done by comparing the relations of the identified factors with the coping mechanisms per zone using the values in the table. In this part of analysis, the relationships of all the identified factors-flood depth, income, access to assistance, and geographical location were compared using the identified predominant coping mechanisms in each zone. The classification of each factor discussed in the non spatial analysis is adopted in the spatial analysis of the identified factors relating to the coping mechanisms.

To prepare the map reflecting the barangay, zones, river and road, geo-referencing of the topographic map, taken from the secondary data, was first undertaken. Digitizing the topographic map was prepared to define the boundaries of the barangay, zones, and river in

the study area. Attribute tables for the identified factors (flood depth, income, and access to assistance) were prepared. The values were taken from the data used in non-spatial analysis. The analysis of the relationship of the geographical location to the coping mechanisms was done using visual interpretation.

The data on the 3 types of coping mechanisms at different stages of flooding, discussed in the non spatial analysis (first part of this Chapter) were used to select the predominant coping mechanisms. The selection of the predominant coping mechanisms was based on the following conditions:

1. If the value of frequency is >50% then the type of mechanism is classified on the type of coping mechanisms having such value
2. If there is no type of mechanisms that belongs to the first classification, then the combination of the 2 types of coping mechanisms will be the coping mechanisms with the highest values with a total of >70%, the mechanisms is based on the types of coping mechanisms
3. If the 2 conditions are not satisfied, then the classification of the coping mechanisms belongs to the 3 types of coping mechanisms called mix or a combination of the 3 types of coping mechanisms.

6.3.1. Coping Mechanisms Before Flooding: Mabolo and Triangulo

The predominant type of coping mechanisms employed by the community is the combination of economic and physical mechanisms. As shown in Figure 16 and Table 60, all the zones applies the combination of economic and physical coping mechanisms except in zone 5 in Mabolo wherein the dominant coping mechanisms the combination of 3 types of coping mechanisms – economic, physical and social.

Table 60 Predominant Coping Mechanisms, Before Flooding

Mabolo Zones	Coping Mechanisms Before Flooding			Predominant Mechanisms
	Economic(%)	Physical%	Social(%)	
Mabolo				
Zone 2	42.58	34.19	23.23	Economic-Physical
Zone 3	40.63	36.46	22.92	Economic-Physical
Zone 4	40.61	32.6	26.8	Economic-Physical
Zone 5	31.82	31.82	36.36	Economic-Social
zone 6	36.35	35.00	28.75	Economic-Physical
Triangulo				
Zone 3	41.54	30.26	28.21	Economic-Physical
Zone 4	35.29	36.13	28.57	Economic-Physical
Zone 5	33.33	40.74	25.93	Economic-Physical
Zone 6	31.94	38.74	29.32	Economic-Physical

Coping Mechanisms in Relation to Hazard Before Flooding

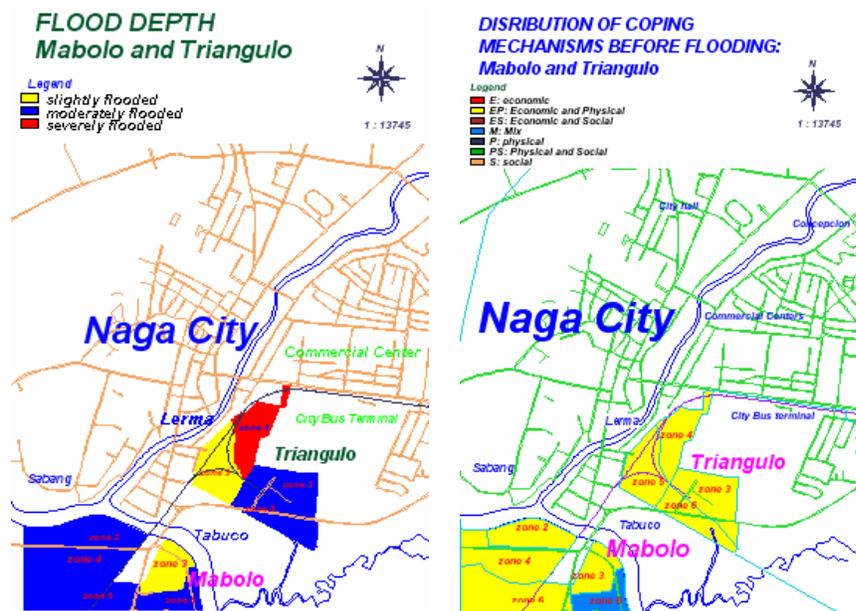


Figure 16 Flood Depth and Coping maps overlaid with road, river, and railroad segment maps

Mabolo

It is observed that in Mabolo, there is a slight relationship between the hazard and the coping mechanisms employed by the community. It is likewise observed that the dominant coping mechanisms of the moderately and slightly flooded zones employed the combination of economic and physical coping mechanisms. Except in zone 6, the households interviewed applied more on the combinations of identified 3 types of coping mechanisms. This might be attributable to the location of the area wherein zone 5 lies along the riverbank.

Triangulo

In Triangulo the hazard establishes no clear relationship with the coping mechanisms employed by the community. All the zones applied the combination of economic and physical types of coping mechanisms. Observation shows that regardless of the magnitude of the hazard, the community had to be prepared for the occurrence of flooding. However in non spatial analysis the figures may have relationships with the hazard. This relation may not be seen in the map considering that it has only a slight difference in the values.

Coping Mechanisms in Relation to Income Before Flooding, Access to Assistance and Geographical Location

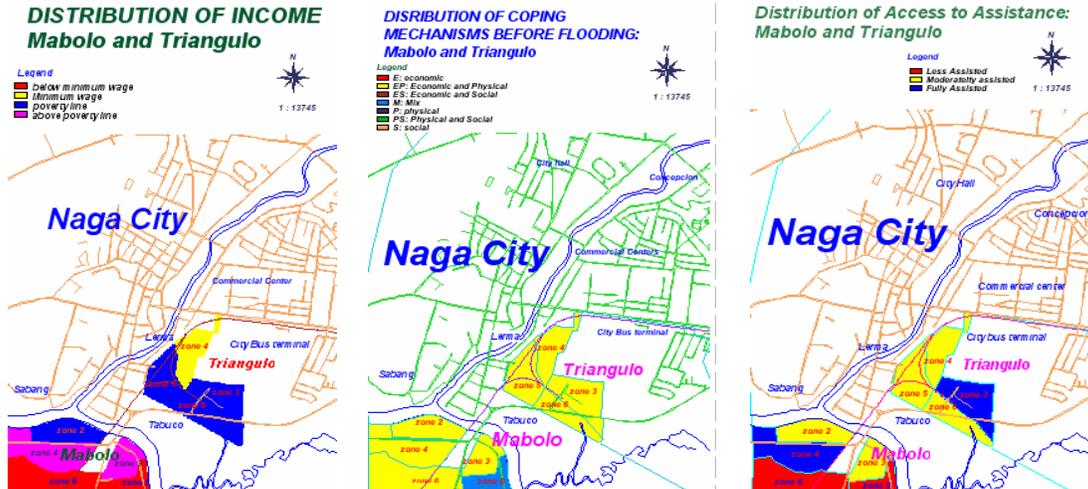


Figure 17 Income, Coping, and Assistance Maps Overlaid with Road, Railroad, and River Maps

Coping Mechanisms in Relation to Income, Before Flooding

Mabolo

In Mabolo analysis shows that income is associated with the coping mechanisms applied during flooding. It is observed that the zones that had income above the poverty threshold applied the combination of economic and physical types of coping mechanisms before flooding. However, the zones that are below the minimum wage applied different coping mechanisms. Zone 5 applied the combination of 3 types of coping mechanisms while zone 6 applied the combination of economic and physical type of coping mechanisms. The difference can be attributable to the geographical location of the zone wherein zone 5 is located along the river bank while zone 6 is located at the upstream part of the barangay. However, the zone within the poverty thresholds is compared with the zones in Triangulo having the same income class. Observation shows that this zone had employed the same type of coping mechanisms with some of the zones in Triangulo having the same income classes.

Triangulo

In Triangulo, there is an association between the income and the coping mechanisms of the households in the community. Although all the households in Triangulo had employed the same types of coping mechanisms, the comparison was based on the zones in Mabolo with the same income class. However, zone 4 cannot be compared considering that in Mabolo there is no zone with the same income class of zone 4. Hence, limited number of zones may contribute some biases on the analysis. It is observed that the zones that had income within the poverty line employed the same types of coping mechanisms with the zone in Mabolo (zone 2). It is also noted that all the zones applied the same type of coping mechanisms in Triangulo, and this can be attributable to the closer range of income among the community member. The households in the zones are living within the poverty thresholds and within the

minimum wage minimum wage rate of the City. There is no household that is earning below the minimum wage rate unlike in Mabolo wherein the 2 zones are earning below the minimum wage rate of the City (NEDA, 2002).

Coping Mechanisms in Relation to Access to Assistance Before Flooding

Mabolo

The map in Figure 17 showed that access to assistance has a relationship with the community's coping mechanisms. Observation showed that households with moderate and full access to assistance employed the combination of economic and physical types of coping mechanisms. It is observed that the zone that had lesser access to assistance had difference in types of coping mechanism. It is noted that zone 2 employed the combination of economic and physical types of coping mechanisms while zone 5 employed the combination of the 3 types of coping mechanisms. The difference can be attributable to other factors.

Triangulo

In Triangulo access to assistance had a relationship to the coping mechanisms applied by the community before flooding. Although, all the households employed the same types of coping mechanisms it can be compared with Mabolo. It shows that the households with moderate and full assistance applied the same combination of coping mechanisms, economic and physical types, as in Mabolo.

Coping Mechanisms in Relation to Geographical Location

Mabolo

Geographical location may influence the coping mechanisms of the community before flooding. It is observed that the zone that is farther from the road and lies along the riverbank employed the combination of the 3 types of coping mechanisms. There might be some factors that can influence the mechanisms as seen in zone 2 and 3 wherein these also zone lies along the riverbank. The difference is attributed to the income of the households wherein zone 2 and 3 had higher income (within the poverty line and above poverty line) while zone 5 had lower income (below the minimum wage) and to the nearness to the road network

Triangulo

In Triangulo, the geographical location had no clear relationship with the coping mechanisms employed by the community. All the zones had the same dominant types of coping mechanisms – combination of economic and physical types. It is observed that Triangulo had better access to the road because it is adjacent to the commercial centers and the railroad tracks serve as their access to transportations.

6.3.2. Coping Mechanisms During Flooding: Mabolo and Triangulo

The dominant coping mechanisms applied by the community in Mabolo are the combination of economic and social types. As shown in the map 3 out of 5 zones applied the combination of economic and social mechanisms 2 zones. In Triangulo the 2 zones applied physical coping mechanisms (zones 3 and 4) and the other 2 applied the combination of physical and social types.

Table 61 Predominant Coping Mechanisms During Flooding

Mabolo Zones	Coping Mechanisms During Flooding			Predominant Mechanisms
	Economic(%)	Physical%	Social(%)	
Mabolo				
Zone 2	21.11	52.78	26.11	Physical
Zone 3	20.33	51.22	28.46	Physical
Zone 4	22.82	49.30	27.89	Physical-Social
Zone 5	15.38	46.15	38.46	Physical-Social
Zone 6	19.15	48.94	31.91	Physical-Social
Triangulo				
Zone 3	20.49	48.77	30.74	Physical-Social
Zone 4	20.81	53.18	26.01	Physical
Zone 5	17.28	51.23	31.48	Physical
Zone 6	21.4	46.98	31.63	Physical-Social

Coping Mechanisms in Relation to Hazard, During Flooding

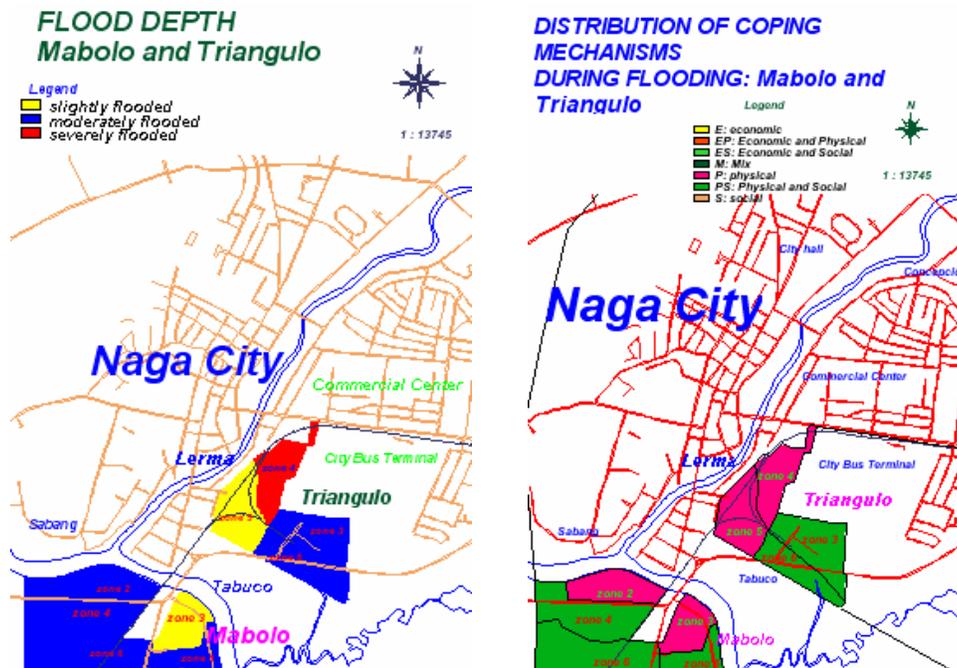


Figure 18 Flood Depth and Coping Map Overlaid with Road, River, and Railroad Segment Maps

Mabolo

The hazard has a slight relationship with the coping mechanisms employed by the community during flooding. Observation shows that most (3 out of 4) of the moderately flooded areas employ the combination of physical and social coping mechanisms, while the slightly flooded area employed physical type of coping mechanisms which is the same with the zone in Triangulo having the same flood class.

Triangulo

In Triangulo, it is observed that hazard has a slight relationship with coping mechanisms. The zones that were classified as moderately flooded applied the combination of physical and social coping mechanisms. While the zones that are slightly and severely flooded applied the physical coping mechanisms. No comparison can be made considering that only one zone is slightly and severely flooded in the area. However, slightly flooded can be compared to the zone in Mabolo having the same type of coping mechanisms.

Coping Mechanisms in Relation to Income, Access to Assistance and Geographical Location, During Flooding

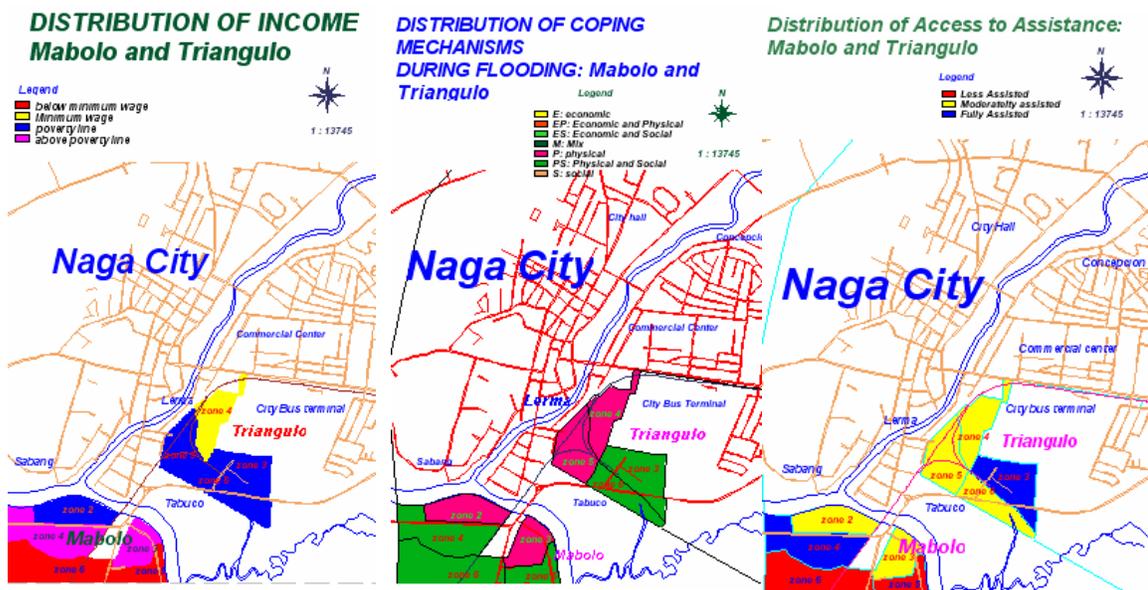


Figure 19 Income, Coping, and Access to Assistance Maps Overlaid with Road, River, and Railroad Segment Maps

Coping Mechanisms in Relation to Income, During Flooding

Mabolo

Income has a slight relationship with the coping mechanisms employed by the community. It is observed that the households in zones that were receiving income below the minimum wage per month employed the combination of economic and social coping mechanisms. The households in zones that were above the poverty threshold applied different types of coping

mechanisms. Households in zone 4 used combination of physical and social coping mechanisms, while households in zone 3 employ the physical coping mechanisms. Comparison with the household with an income within the poverty line cannot be made because there is only one zone in Mabolo having the household with the income within the poverty line.

Triangulo

In Triangulo it is observed that income has a slight relationship with the coping mechanisms employed by the community. There are only 2 out of 3 of the households in the zones with income within the poverty thresholds that applied the combination of economic and social types. The difference in zone 5 can be attributed to the magnitude of hazard that the household had experienced, wherein this zone had experience lower water depth. However the households with minimum wage income cannot be compared considering that there is no other zone having this income class.

Coping Mechanisms in Relation to Access to Assistance, During Flooding Mabolo

In Mabolo, access to assistance has a relationship with the coping mechanisms applied by the community during flooding. It is observed that the zones that had less access to assistance and with full access to assistance employed the combination of physical and social types of coping mechanisms. While the zones that had moderate access to assistance applied the physical type of coping mechanisms.

Triangulo

In Triangulo, there is a slight relationship between coping mechanisms and the access to assistance as one of the influencing factors of the community's coping mechanisms during flooding. It is observed that 2 out of 3 zones that had moderate access to assistance applied physical types of coping mechanisms, while the zones that had full access to assistance applied the combination of physical and social coping mechanisms. This is the same observation in Mabolo for households having the same access to assistance classes.

Coping Mechanisms in Relation to Geographical Location During Flooding

Mabolo

The geographical location has a relationship with the coping mechanisms employed by the community. The zones (2 and 3) that have better access to transportation employed physical coping mechanisms while the zones that have less access to a road network employed the combination of physical and social coping mechanisms (zone 4,5,and 6). It is also observed that most of the zones lying along the river bank employed the same types of coping mechanisms except in zone 5 wherein the difference is attributed to the access to transportation and other factors like income.

Triangulo

In Triangulo, geographical location can be associated with the coping mechanisms of the community. It is observed that the zones that have better access to the road employed the combination of physical and social types of coping mechanisms, while the zones that had lesser access to the road network applied physical coping mechanisms. This is observed in zones 4 and 5 wherein the main road used to transport is by the railroad track compared to zones 3 and 6 wherein these zones are closer to the national and roads. However, nearness to the river can have a relationship on the coping mechanisms. Based on observation, the 2 zones that are closer to the Naga River employed the same type of coping mechanisms (physical) and the zones that are closer to the Bicol River tributary have the same coping mechanism- combinations of physical and social types.

6.4. Coping Mechanisms After Flooding: Mabolo and Triangulo

The predominant (3 out of 5 zones) coping mechanisms after flooding in Mabolo are the combination of economic and social types. This is applied in zone 3, 4, and 5. The combination of economic and physical types of coping mechanisms were employed by zones 2 and 6. However, in Triangulo, the dominant type of coping mechanisms is the combination of 3 types of coping mechanisms- economic, physical, and social. This type was employed by the households interviewed in zone 3 and 5. However, the combination of economic and physical coping mechanisms was employed by the households in zone 4 and the combinations of economic and social type of coping mechanisms was employed by the households in zone 6.

Table 62 Predominant Coping Mechanisms, After Flooding

Mabolo Zones	Coping Mechanisms After Flooding			Predominant Mechanisms
	Economic F(%)	Physical F%	Social F(%)	
Mabolo				
Zone 2	44.93	28.26	26.81	Economic -Physical
Zone 3	38.39	27.68	33.93	Economic-Social
Zone 4	38.71	28.06	33.23	Economic-Social
Zone 5	37.93	34.48	27.59	Economic-Physical
Zone 6	43.24	27.03	29.73	Economic-Social
Triangulo				
Zone 3	37.24	31.63	31.12	Mix
Zone 4	37.1	33.87	29.03	Economic-Physical
Zone 5	38.13	30.22	31.65	Mix
Zone 6	36.36	27.81	35.83	Economic-Physical

Coping Mechanisms in Relation to Hazard, After Flooding

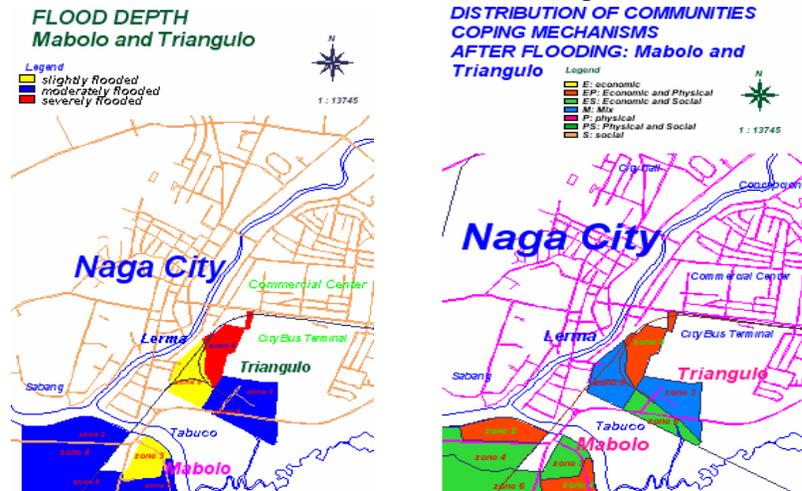


Figure 20 Flood Depth and Coping Map Overlaid with Road, River, and Railroad Segment Maps

Mabolo

In Mabolo, hazard had no clear relationships with the coping mechanisms employed by the community. Only 2 zones that experienced moderate flooding applies the combination of economic and social types of coping mechanisms and some (zone 2 and 5) households who also experienced moderate flooding applied the combination of economic and physical coping mechanisms. However, the slightly flooded zone cannot be compared because no other zone in Mabolo had this type of flood depth.

Triangulo

In Triangulo, hazard has no clear relationship with the coping mechanisms of the community. The zone that experienced moderate flooding employed different coping mechanisms-combination of economic, social and physical coping mechanisms and combination of economic and social type of coping mechanisms. The zones that were slightly flooded and severely flooded cannot be compared because there is no other zone that experienced the same flood depth.

Distribution of Coping Mechanisms in Relation to Income, Access to Assistance and Geographical Location

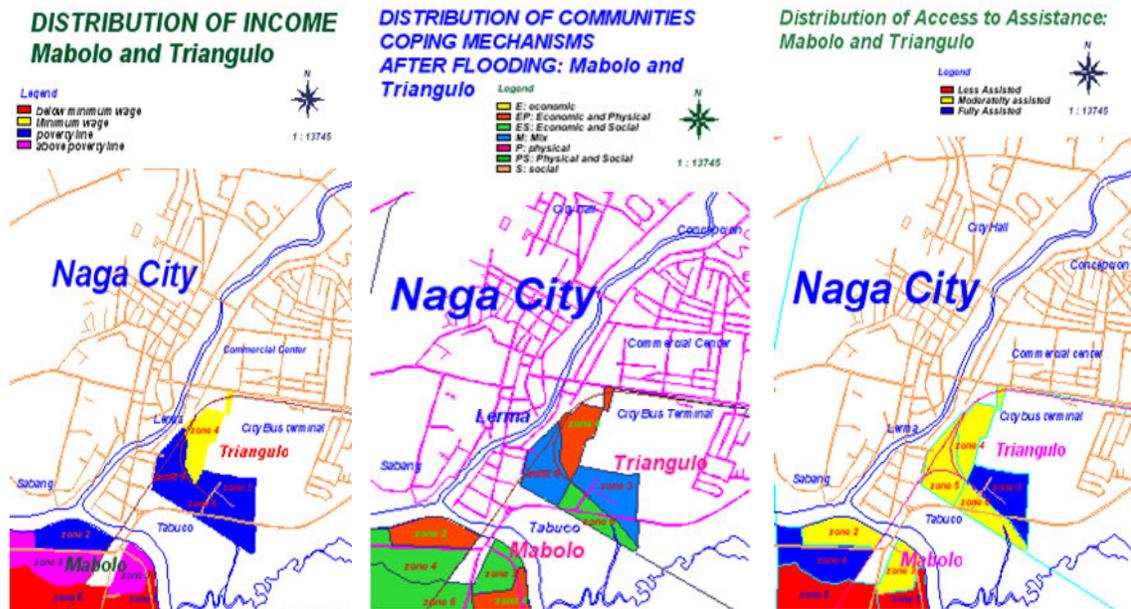


Figure 21 Income, Coping, and Access Maps Overlaid with Road, River, Railroad, and Zone Segment Map

Coping Mechanisms in Relation to Income, After Flooding

Mabolo

In Mabolo, income may have an association with the coping mechanisms employed by the community. Results show that the zone with below the minimum wage income applied different types of coping mechanisms like the combination of economic and social types and the combination of economic and physical type. However, most of the households living above the poverty line applied the same combination of economic and social coping mechanisms. The household having an income within the poverty threshold applied the combination of economic and physical coping mechanisms.

Triangulo

The income of the households in Triangulo has a slight relationship with the coping mechanisms of the community. Two out of 3 of the zones with the households have income within the poverty threshold employed the combination of economic, physical and social coping mechanisms. It is noted that households in zone 5 that earned within the poverty thresholds, applied a combination of economic and social types of coping mechanisms. This can be attributable to the flood depth the households experienced wherein this zone experienced lower water depth compared to other zones. The zone with the households that earned within the minimum wage applied the combinations of the economic and physical types of coping mechanisms. However, this cannot be compared since no other zone had this type of income.

Coping Mechanisms in Relation to Access to Assistance, After Flooding

Mabolo

In Mabolo, access to assistance had no clear relationships with the coping mechanisms applied by the community. It is observed that all the zones employed different combinations of coping mechanisms. It is further observed that the zone with moderate assistance applied different combinations of coping mechanisms the same with the zones that had less access to assistance. However, the zone that had full assistance employed the combination of economic and social coping mechanisms. This cannot be compared since there is only 1 zone in the area which belongs to this category. Observation shows that the difference can be attributable to the location, the hazard and income of the community. The location and the hazard influence the coping mechanisms of zones 2 and 5. It is noted that these zones are located long the riverbank and had a higher magnitude of flooding compared to other zones and the same types of coping mechanisms employed by these zones – combination of economic and physical types of coping mechanisms. The zones that are located at the upstream part of the barangay and the zone that experienced lower magnitude of flooding employed the same combination of coping mechanisms-economic and social types.

Triangulo

Access to assistance had no clear relationship with the coping mechanisms employed by the community after flooding. Result of the data shows that the zones that had moderate access to assistance employed different combinations of coping mechanisms. Zone 4 had moderate access to assistance employed a combination of 3 types of coping mechanisms while zone 3 with the same level of access to assistance employed the combination of economic and physical coping mechanisms. The same pattern was observed in zones with full access to assistance, wherein zone 6 employed the combination of 3 types of coping mechanisms while zone 3 employed the combinations of economic and social types of coping mechanisms. These differences can be attributed to the perceptions of the community on the severity of flooding as previously discussed.

Coping Mechanisms in Relation to Geographical Location, After Flooding

Mabolo

Geographical location can be associated with the coping mechanisms of the community. Observation show that the zones that were located at the upstream part of the barangay and the zone with a slightly higher terrain applied the combination of economic and social coping mechanisms while the zones that were located along the riverbank applied the combination of economic and social types of coping mechanisms

Triangulo

In Triangulo, geographical location has no clear influenced on the coping mechanisms of the community. Observation shows that the zones with a closer access to the road (zone 6 and

3) employed different type of coping mechanisms. And the zones that were closer to the railroad applied different type of coping mechanisms.

6.5. Summary and Conclusion

6.5.1. Factors that Influence Coping Mechanisms

Relationships of Income on Community's Coping Mechanisms

Analysis of the data shows that the income had a significant relationship on the coping mechanisms employed by the households. The households that have the financial resources employed measures that lessen the effects of the floods. It is observed that the coping mechanisms of the household depend on the income. Most of the households with higher average income applied more on economic coping mechanisms before and after the flooding. These mechanisms are distinguishable from the household's income. To illustrate this on the coping mechanisms the household with higher average income construct the house with reinforced materials and with 2 floors while most of the households with lower average income construct the house with threshold and they have only single floor-storey house. The household with better financial standing buy food stocks in bulk in financial resources depend more on the relief items given by government, relative or friends. The physical and social coping mechanisms showed a weak relationship with the income.

Relationships of Access to Assistance on Community's Coping Mechanisms

Access to assistance has a significant relationship with the coping mechanisms employed by the community. The households that had better access to assistance had more opportunities to save their valuable belongings and even they are less vulnerable compared to household with lesser access to assistance. The households that had better access to assistance are the households that had higher average income. Before flooding, the households that have better access to assistance are fixing their things upon knowing the severity of flooding. They usually opted to place their things or stays at their relative's or friend's place not affected by floods usually they are staying outside the barangay. They first things they move are the valuable appliances (portable one) and belongings (jewelries and important documents). The next they moved are the elderly and children and usually the last things they move are clothes and utensils. However, most of the households that had lesser access to assistance they opt to wait and follow the Barangay and City officials on the instructions of possible evacuation. This means that the household with lesser access to assistance may respond later than the household with better access to assistance.

Relationships of Geographical Location on the Coping Mechanisms

Geographical location can be related to the coping mechanisms employed by the households in the study area. Result of the analysis shows that the households that are residing along the river bank employed the combinations of the 3 types of coping mechanisms- economic, physical and social. It also observed that households that are residing at the upstream part of the barangay and had better access to the road networks employs the same types of coping mechanisms – combination of economic and social type.

Relationships of Hazard on Community's Coping Mechanisms

The factors that had significant correlations with the household coping mechanisms are the income and access to assistance. It is observed that income had positive correlations with the economic coping mechanisms of the community. This shows that the household with higher income tend to be less vulnerable than the household with lower income. The reason is the households with higher income employ measures to avoid the negative effect of flooding. It is observed that the negative relationship of the social coping mechanisms to income during flooding shows that the household with lower income depend more on assistance. The access to assistance shows the same pattern with income. The hazard had no significant relationship with the coping mechanisms employed by the households.

6.5.2. Predominant Coping Mechanisms

Observation of the data shows that the households employed more than 6 coping mechanisms in order to live in the area. For this community, coping mechanisms is an integral part of their life. They have to protect and cope with the negative effects of the flood to their lives and properties hence, varieties of coping mechanisms were employed by the households.

Results of the analysis showed that before flooding the predominant coping mechanisms employed by the households is the combination of economic and physical types of coping mechanisms. Example of economic type of coping mechanisms present in the area construction of houses with reinforce materials and second floor or mezzanine, boiling water, purchasing of food stocks, saving money and installations of mezzanine. The physical coping mechanisms include the reinforcing of pillars using scrap materials, preparing waterproof materials, fixing things, cleaning the canal, and preparing flood suitable clothes.

During flooding the predominant coping mechanisms employed by the household is the combination of economic and social coping mechanisms. The economic coping mechanisms present in the area are purchasing cheap food items, purchasing food stocks in bulk, rendering overtime services, and continue working. The social types of coping mechanisms identified in the area are placing appliances and valuable things at neighbors and relatives place, evacuating or staying at relatives, neighbors, or City Government designated evacuation centers and train coaches or along the highways, and guarding the house to ensure safety of their things from looters.

Predominant coping mechanisms after flooding include the combination of economic and social types of coping mechanisms. Examples of the economic type of coping mechanisms include repairing major damage on their houses, boiling water to avoid cost, prioritizing needs, tight budgeting, and children are forced to stop from schooling due to financial distress of some households. Examples of the social type of coping mechanism employed by the household interviewed are sourcing relief items (food and house materials), participating in barangay activities, borrowing money from relatives, friends and government, and providing livelihood to help neighborhood that experienced financial distress

6.5.3. The Viable Coping Mechanisms

From the results of the analysis of the data on the identified predominant coping mechanisms, the viable coping mechanisms were selected. These are the economic and social coping mechanisms. These coping mechanisms introduced by the households focuses on the preparedness, response and recovery measures to minimize the impact of the flood and to regain from the flood damages and losses. However, there are some coping mechanisms employed by the household that needs attention of the Local Government Unit because it might increase the vulnerability of the household to risk and it deprived the children from learning

Guarding the house during flooding

Children asked to stop from schooling because the parents cannot afford the school fees

Evacuating at train coaches (PNR coaches)

Evacuating at the highway using the trucks park as their shield

Purchasing food cheap food items

These strategies by the community are putting the households to another risk. Guarding the house make the household member exposed to the danger of flooding. The children were deprived from learning. Evacuating at the train coaches and at the highway is also dangerous because they are also exposed to health risk. Shifting meals to cheaper food will make the household exposed to mal-nutrition problem

Table 63 List of Viable Coping Mechanisms

Economic	Social
Saving Money	Listening to weather forecast
Construction of houses with second floor	Asking permission from relatives for staying or placing valuable things
Construction of house with reinforced materials	Listening to LGU instruction
Construction of house with threshold	Evacuating at relatives, neighbors or friends place
Construction of house with mezzanine	Evacuating at LGU evacuation Centers
Purchasing energized materials	Placing things at neighbors place
Storing food items	Participating at barangay activities
Rendering overtime services	Consulting barangay health workers
Bring enough food for evacuation	Soliciting support from relatives or LGU
Repairing house damages by family member	Sourcing relief food items and house materials
Repairing minor damage to appliances	Borrowing money from relatives/LGU
Looking for alternative jobs/works	
Boiling water so not to buy and anticipate that the water might be contaminated by flood water	

7. CONCLUSION AND RECOMMENDATION

The objective of this chapter is to answer the research questions and research objectives presented in Chapter 1 and to present the conclusion and recommendations arrived at during the conduct of this research study.

With this purpose, this Chapter is divided into two sections. The first section focuses on answering the research questions and objectives while the second section contains the recommendations.

7.1. Conclusion

Perceptions on Flooding

Flood is perceived as a primary hazard that has critical impact to the lives and properties of the households and as a nuisance and that the household has to protect and cope with its effects. Based on the analysis of the data, perception implies how the people view the impact of the flooding based on their experiences and decide what coping mechanisms they need to employ. For example the coping mechanisms to avoid injuries or diseases (discussed in Chapter 5) the household boils drinking water collected from public faucets/pumps because they perceived that the water can be contaminated by the flood water and that they need to boil the water to avoid suffering from sickness or diseases. Also, the construction of houses with second floor or with thresholds and installation of mezzanine show awareness on the existence of floods and anticipating on its effects to their lives and properties. When they learned that unfavorable weather conditions based on their judgment will bring severe flooding valuable possessions like appliances and documents were moved to relatives or neighbors place. Children and elderly were the first to be evacuated, while the mezzanine or ceiling level platforms called the "papag" were used to place the utensils, clothing and mattresses. The household's reason for having this kind of mechanism is that they know the extent of flooding in their area and its effects to their lives and properties. This shows that the community members were able to protect their lives and properties from the effects of floods.

Factors that Influence the Coping Mechanisms

Of the 4 identified factors (hazard, income, access to assistance, and geographical location) that can influence the coping mechanisms of the community- income, access to assistance and geographical locations had relationships with the coping mechanisms employed by the community to deal with floods. Findings show that income influences the coping mechanisms at different stages of flooding -before, during, and after. Household with lesser income are more vulnerable than households with higher income, because the latter can introduce measures that could make them safe and they can recover earlier. Access to assistance shows relationships with the coping mechanisms following the same pattern with the income.

It is noted that the households with higher access to assistance are the households with higher income. The geographical location may have relationships with the coping mechanisms employed by the households. The road network and the distance of the location at the river influence the mechanisms. However, it is observed that there are some factors that influence the location of the household. To illustrate this, after flooding in Mabolo, the households in zones 2 and 5 employed combination of economic and physical coping mechanisms wherein households in zone 3 employed combination of economic and social coping mechanisms, wherein this zone lies closer to the riverbank. The difference is attributable to the income and the flood dept wherein zone 3 had higher income and experienced slight flooding. It is observed that the hazard can be the function of the income wherein results of the data shows that most of the households that reside in areas where water depth is higher and water duration is longer are the households that have lower average income (minimum wage and below wage earners) in the study area.

The Viable Coping Mechanisms

The community applied more than 6 coping mechanisms in order to live in the area. For this community, coping mechanisms is integral part of their life to protect and cope with the effects of flooding. The viable coping mechanisms employed by the households in the area are the **economic** and **social** coping mechanisms. The economic types of coping mechanisms employed by the community are more on the impact minimizing strategies or mitigating measures that aimed to reduce the effect of the floods to protect their lives and properties. Example of economic type of coping mechanisms present in the area are construction of house with second floor or with thresholds or reinforced materials, purchasing of food stocks, saving money, installations of mezzanine, purchasing energized materials, changing meal types like eating more on cheaper but nutritious foods, and looking for alternative jobs. The social type of coping mechanisms are more on the response and recovery measures to cope with the effects of floods. This tends to develop the social structures. Interactions among the households in the community become closer in order to protect and recover from the losses. Example of the social types of coping mechanisms identified in the area are placing appliances and valuable things at neighbors and relatives place, evacuating or staying at relatives, neighbors, or City Government designated evacuation centers, and guarding the house to ensure safety of their things from loathers, sourcing relief items (food and house materials), participating in barangay activities, borrowing money from relatives, friends and government, and providing livelihood to help neighborhood that experienced financial distress. However, there are some coping mechanisms that needs attention of the LGU because these mechanisms may further exposed the household from other risk. Example of this mechanisms are guarding the house during flooding, children asked to stop from schooling because the parents cannot afford the school fees, evacuating at train coaches (PNR coaches), evacuating at the highway using the trucks park as their shield and purchasing food cheap food items.

7.2. Recommendations

7.2.1. Policy Recommendation

- **Inclusion of Community's Involvement in Disaster Management Plan**

The coping mechanisms of the community should be included in the objectives of the existing disaster management plan of Naga City. Although the Disaster Management Plan is pro-poor, there is an inadequate focus on peoples' participation and more focus on structural measures. The Local Government purpose of disaster management should include the community's capabilities to deal with the flood hazards. This could be done by knowing the community's coping mechanisms. Knowing the community's coping mechanisms is necessary for the policy setting and planning of disaster management activities. This could provide more directives for disaster managers to plan measures and policies to improve the effectiveness of risk reduction activities. These directives can be included in the existing policies of the City. The succeeding recommendations can illustrate the importance of knowing community's coping mechanisms in the planning and policy setting on flood disaster management.

- **Raising Awareness of the Community on Impact of Flooding**

There is a need to raise the awareness of the community on the impact of the flooding. The coping mechanisms of the community on listening to the weather forecast can be strengthened by raising the awareness of the households on the negative consequences of the floods. This could be done by preparing booklets, pamphlets, posters or brochures on consequences of the flooding in order that community will keep abreast on the negative impact of flooding. The conduct of dialogue, training courses, and visual aides can improve the awareness of the households and made them prepared to avoid the negative impact of floods.

- **Inclusion of Housing Design Requirements on Building Codes**

Community's good practices in flood preparedness should involve the coordination of the households and the LGU. It is observed that the community's responses to avoid the negative effects of the floods include structural and non structural measures. The house structure design can help lessen the damage to the properties of the community by avoiding the flood depth. The household in the study area introduces measures to avoid the flood depth by constructions the houses with second floor, threshold and mezzanine requires to be supported with policy. There is a need for inclusion the house-design in Building Codes. This can be imposed to those households constructing houses at the upstream part of the barangay wherein velocity of water is slower and the area where the water stay for longer duration. The code shall require the household to build their houses with second floor or with thresholds or mezzanine so that they can avoid or minimize flood losses. Likewise, in the relief operations of the LGU, provision of materials that are strong enough to resist from force of flood water is necessary.

- **Strict Enforcement of Police Authority During Flooding**

There is a need of strict enforcement of police authority during flooding. Household staying in the area facing imminent danger of floods shall be forced to vacate the area in order to make them protected from flooding. As can be seen in the coping mechanisms discussed in chapter 5, most of the households in the study family member had to guard the house because they feared of losing their properties from looter. Family member had to stay in the area during flooding just to guard the house to ensure safeness of their belongings. This means that these people are more exposed to the danger of flood. Police authorities should not allow these people to stay at their houses during flooding because these people are more exposed to risk. In addition in case of rescue operations both the people to be rescued and the person to rescue is put in danger. Police authority should maintain the peace and order situation in the community, they should ensure the safeness of the peoples' properties.

- **Strengthening of Community's Access to Assistance**

Government should give more preferential attention in terms of assistance on the low status group in the community during the evacuation and emergency relief operations. Priority for relief and response measures should be given to the households with lesser access to assistance because these households depend on the Local Government's assistance. The household that had lesser access to access to assistance are the low-income earning households as can be observed in the discussions of relationship of income to the coping mechanisms (Chapter 6).

- **Improvement of Facilities on Evacuation Centers**

There is a need to provide basic facilities like potable water, light, and comfort rooms to maintain sanitation in the evacuation centers. This should be done to encourage the household to go to temporary shelter or evacuation center designated by the Local Government Unit (LGU). As observed in chapter 5, some of the households preferred to stay along the highway or using the train coaches as temporary shelter during flooding than going to evacuation center. These households will be exposed to another risk like health problem. Because of this, a need for improvement of facilities on the evacuation center is needed to encourage these households to stay in the evacuation center and avoid further risk to their lives.

- **Fiscal Allocation Should Include Preparedness Fund**

There is a need for legislation on inclusion the budget for the preparedness activities for the community. As observed the authority of the Local Government to disburse funding on the emergency and response measures. Preparedness activities could be done by providing disaster information campaign to the community through training courses, dialogues, and printing visual aide materials like brochures, pamphlets or posters.

- **Promotion of Livelihood Opportunities**

There is a need for introduction of home-based livelihood opportunities in the area. Analysis shows that more households look for alternative job after flooding in order to regain from the negative impact of the floods hence there is a need for livelihood opportunities in order these households can recover from flood losses. Home-based livelihood like handicraft or food processing can be introduced in the area.

7.4 The Need for Further Research

Considering that this study is an exploratory research more subsequent research can be developed. The following research can be studied to support the present study and further investigate the coping capacity of the community and the Local Government capacity in dealing with floods:

1. Spatio-temporal analysis of the impact of the floods on the community's strategies in dealing with floods
2. The use of higher statistical tools to model the degree relationships of the identified driving forces influencing community's coping mechanisms.
3. The role of social capital in community's coping mechanisms and disaster management.
4. A need to study the coping capacity adaptation of the community and the Local Government Unit (LGU)
5. Policy research on flood risk management at the community and Local Government levels.
6. To conduct this study using a larger sampling size or sampling area.

REFERENCES

- Blaikie, P., Cannon, T., Davis, I. and Wisner, B., 1994: *At Risk Natural Hazards, People's Vulnerability and Disaster*; Published by Routledge, London
- Brahmi, A. and Poupphone, K. 2002: *Study of Local Coping Mechanisms in Disaster Management*; Published by National Disaster Management Office, World Vision and Norwegian Church Aid
- Cambodia, 2000: *Cambodia Community-Based Disaster Flood Mitigation and Preparedness*; Asian Disaster Preparedness Center, Bangkok, Thailand
- Cambodia, 2001: *Lessons learned from Community-Based Flood Mitigation and Preparedness Project in Cambodia*; Published by Asian Disaster Preparedness Center, Bangkok, Thailand
- Carter, N, 1992: *Disaster Management: A Disasters Manager Handbook*; Published by Asian Development Bank, Manila, Philippines
- Cutter, S. L., 1993: *Living with Risk*; Published by Edward Arnold, London
- Haque, E.C., 1997; *Hazards in a Fickle Environment: Bangladesh*; Published by Kluwer Academic Publishers, Dordrecht, The Netherlands
- Hyde, J., 1999 *Health System Reform and Social Capital; Response to Globalization: Rethinking Health and Equity*; Volume 42 no. 4 December 1999
- IDNDR, 1999: *Northern Hemisphere Meeting in Latin America held in Costa Rica, June 1999*; Published by International Decade for Natural Disaster
- Lesser E.L., 2001: *Communities of Practice and Organizational Performance*; Published by IBM System Journal Volume 40, No. 4, 2001
- Mosser, C. and McLaine, C., 1997: *Household Responses to Poverty and Vulnerability Volume 3, Confronting Crisis in Commonwealth, Metro Manila, Philippines*; Published by The International Bank for Reconstruction and Development, The World Bank 1818 H. Street N.W, Washington D.C. U.S.A.
- Mosser, C. and McLaine, C., 1997: *Household Responses to Poverty and Vulnerability Volume 2* ;Published by The International Bank for Reconstruction and Development, The World Bank 1818 H. Street N.W, Washington D.C. U.S.A.
- NDCC 2004; *National Disaster Coordinating Council Comprehensive Report on Four Typhoons, January 3, 2005*, NDCC, Manila, Philippines
- NDCC, 2002 : *Contingency Planning for Emergencies: A Manual for Local Government Units* Published by United Nation High Commissioner for Refugee Liaison Office Manila with National Coordinating Council-office of Civil Defense; Edited by Salazar M.E.
- Naga City, 2002: *Naga City Landuse Plan*; Published by Naga City, Philippines
- Naga City 2001: *Naga City Disaster Management Plan*: Published by Asian Disaster Preparedness Center, Bangkok Thailand

- Naga City 2000: Naga City Statistical Report; Naga City, Philippines
- Naga City 2002: Naga City Accomplishment Report, Naga City, Philippines
- NEDA 2002: National Economic and Development Authority Report, Legazpi City, Philippines
- NSCB, 2003: Poverty Index Per Capita in the Philippines; Published by National Census and Statistics Board, Manila, Philippines
- Prasad, R.S, 2003: Flood Management in Integrated Management of the River Basin; Regional Cooperation for Flood Disaster Mitigation in Hindu Kush-Himalayan Region; Report of the 2nd High Level Consultative Meeting on establishment of Regional Flood Information System, Kathmandu, Nepal 10-13 March 2003; Edited by Mandira Shretha
- Parker, D. and Handmer, J., 1992: Hazard Management and Emergency Planning, Perspectives on Britain, Published by James and James Science Publishers, London England
- Pearce, L. 2003: Disaster Management and Community Planning and Public Participation: How to Achieve Sustainable Hazard Mitigation: Natural Hazards: Journal of the International Society for Prevention and Mitigation of Natural Hazard, Volume 28 nos. 2-3, March 2003; Edited by Etkin, D., Haque, E.C. and Brooks, G.G.,;Published by Kluwer Online
- Robredo, J., M., 2003: Making Local Government Work; Published by City Publisher Group and The City Development Information Office, Naga City, Philippines
- Seragilden, I. and Grootaert, C., 2000: Defining Social Capital: An Integrating View, Social Capital A Multi Perspective Edited by Dasgupta, P. and Serageldin, I, 2000: Published by The International Bank for Reconstruction and Development, The World Bank, Washington D.C, U.S.A
- Smit, B. and Pilifosova, O, 2002: From Adaptation to Adaptive Capacity and Vulnerability Reduction [http://www .worldscientific](http://www.worldscientific.com). January 7, 2005
- Smith, K, and Ward, R, 1998: Floods Physical Processes and Human Impact; Published by John and Wiley and Son LTD., West Sussex, England
- Sri Lanka, 2000 : Sri Lanka Multi-Hazard Disaster Mitigation Project (SLUMDMP); Published by Asian Disaster Coordinating Council, Bangkok ,Thailand
- Tobin, G.A. and Montz,B.E, 1997: Natural Hazards: Published by Guilford Press, New York, USA
- Thomalla, F. and Schmuk, H., 2004: We all Knew that a Cyclone Coming: Disaster Preparedness and the Cyclone of 1999 in Orissa India; Journal of Disaster Studies, Policy and Management "Disasters" Volume 28 Number 4, December 2004
- Waugh, L. JR, 2000: Living With Hazards Dealing With Disasters: An Introduction to Emergency Management; Published by M.E. Sharpe, Armonk, New York
- UNDP, 2004: Human Development Report, New York, United Nations Development Programme (UNDP)

APPENDIX

APPENDIX A. List of Coping Mechanisms Identified in the Study Area

Before Flooding

Economic Type

- Saving money
- Construction of houses with 2nd floors
- Construction of house with reinforced materials
- Construction of house with thresholds
- Construction/Installation of mezzanine
- Preparing place for storage at the second floor
- Prepare metal hook
- Preparing stand for refrigerators
- Saving money
- Continue working
- Buying of food stock to avoid scarcity and price increase
- Looking for alternative sources of income
- Buying few stocks when they learn the weather status
- Installation of mezzanine
- Buying more stocks to have enough supply for selling
- Elevating the store building (thresholds)
- Purchasing energized materials
- Storing basic food items (rice, sugar, salt, canned goods)

Physical Type

- Reinforcing of house pillars using scrap materials
- Reinforcing of roofing using scrap materials
- Preparing waterproof materials (scrap materials)
- Stack filling of furniture
- Fixing things before evacuating
- Preparing waterproof containers
- Preparing improvised storage at 2nd floor
- Preparing "papag" (improvised temporary table)
- Preparing improvised floaters
- Preparing improvised catwalk (collect scrap materials)
- Preparing clothes for walking in the flooded area
- Fixing the things for evacuation
- Storing of water for domestic and drinking consumptions
- Cleaning of canal

Social Type

- Listening to weather forecast
- Preparing temporary storage at relatives or friends place

During Flooding

Economic

- Purchasing cheap food items
- Purchasing food stocks in bulk
- Children were asked to stop from schooling
- Saving money
- Rendering overtime services
- Purchasing business stocks (agriculture products)
- Continue selling to earn to meet family needs
- Purchasing food items in the market
- Purchasing food item at neighborhood stores
- Bring enough food during evacuation
- Boiling water to avoid cost of water and avoid sickness (contaminated water)

Physical

- Using flood suitable clothes
- Cooking food earlier
- Cleaning of canal and surroundings
- Placing catwalk
- Placing things or business stocks at the second floor
- Placing things or business stocks at the mezzanine
- Placing things or business stocks at waterproof containers
- Stack filling of chairs
- Placing table at the top of the table or "papag" (improvised platform)
- Hanging of things using metal hook
- Temporary change in business location (second floor or other safer place)
- Placing stocks at the storage (second floor)
- Placing improvised catwalk
- Reducing frequency of going out
- Wearing flood suitable clothes like short and waterproof clothes
- Riding on improvised raft
- Using improvised floaters to carry heavy things (basin or cans)

Social

- Listening to Government Officials instruction
- Vacating the house as the community did to avoid life loss
- Evacuating at PNR coaches and along the highway
- Temporary shelter at City Government evacuation centers
- Temporary shelter at neighbors place
- Temporary shelter at relatives place
- Securing house entrances to avoid the debris entrances
- Guarding the house to ensure safety of belongings
- Just allow the house to be flooded
- Placing the appliances at relatives or neighbors or friends places
- Sourcing relief materials
- Soliciting support from relatives, friends, or City Government
- Selling store items on credit without interest to help community member
- Placing business stocks at neighbors place
- Temporary parking of vehicles at relatives or friends place
- Practice proper personal hygiene
- Preventing kids from going out/playing outside
- Avoid visiting friends

After Flooding

Economic

- Repairing important damages to the houses
- Drying of walls with electric fan to avoid deterioration of walls
- Repairing house by family members to avoid cost of labor
- Repairing minor damages of appliances
- Drying wet things with electric fan
- Change in meals by eating cheaper food items
- Looking for alternative livelihood
- Prioritizing and budgeting the money tightly
- Rendering overtime services
- Continue selling
- Rebottling /repacking some salvage stocks
- Purchasing nutritious foods
- Repairing vehicles
- Children were asked to stopped from schooling

Physical

- Cleaning house and surroundings
- Cleaning the canal
- Fixing things with some innovations for arrangement
- Cleaning the things from flood dirt
- Placing stocks at the containers to void damages by rats

Social

- Borrowing money from relatives and friends
- Borrowing money from government for capital
- Sourcing relief items
- Soliciting support from friends and relatives
- Consult health workers for sickness or injuries
- Selling goods on credit without interest to help neighborhood
- Providing livelihood to co-barangay
- Helping community members in doing works
- Participate in barangay activities

APPENDIX B. Questionnaires for the 2 Studies – Vulnerability and Coping Mechanisms

Vulnerability Study and Coping Mechanisms Survey Questionnaire

Household number _____ Date: _____

Interviewer: _____ Location Code: _____

GPS Location:

Latitude: _____ Longitude: _____

Demographic Profile:

Respondent: _____ Age: _____ Religion: _____

Sex: _____ Education: _____ Length of stay: _____ Location before: _____

House: owned _____ rented: _____ from whom _____ other: _____

Land : owned _____ rented: _____ from whom _____ other: _____

Household membership:

Name	Gender	Age	Education	Religion
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Source of Income:

Work	Primary (P)	Secondary (P)	Worker	Tenure	Remarks
Agriculture					
Poultry					
Business					
Employment					
Private					
Govt					
Services					
Others					

Other properties:

properties	Value (estimated)	Status	Remarks
Land			
Vehicle			
Car			
Tricycle			
Motorcycle			
Livestocks			
Business stocks			
Furnitures:			

Sofa			
Beds			
Dinning table			
Cabinet (aparador)			
Books			
Others			

House Type:

Type	Floors	wall	area	electric	water	roof	status
Light mat							
Wooden							
Semi-con							
Concrete							
GI							
other							

II. Hazard:

- What type of flooding do you experience in your place?
- What are the water depths?
- How many days the water stays
- How frequent you experience flooding in your area?
- What particular months you experience flooding?

Flood type	Water depth	Frequency	Duration	remarks
Typhoon flooding				
Monsoon rains				
Flash flooding				
other				

III. Damages/losses incurred/sustained:

What are the damages you had incurred/sustained before, during and after the flooding?

Economic

Damage/Losses	No. days	No. of stock	Est. value	Recovery	remarks
Income					
Stocks					
occupation					
Disruption in Business					
Others					

Physical:

Damage/losses	No. of units	Estimated value	Recovery period	remarks
House				
wall				
roof				
floor				
pillars				
Appliances:	No. of units	Estimated value	Recovery period	remarks
television				
refrigerator				
Stereo/comp.				
Washing mach				
others				
Furniture:				
sofa				
Dinning set				
Beds				
cabinets				
Vehicle				
land				
Others				

c. Social

Loss/damage	No. of h. member	Medical cost	Recovery period	remarks
Injuries sustain:				
minor				
major				
Illness suffered				
Diarhea				
fever				
Cough/colds				
Skin disease				
Others				
Loss of life				

IV Coping Mechanisms:

1. What you do to avoid or to regain from flood damages of losses?

Economic

Damage/Losses	Pre-flooding	Onset	after	Remarks
Income				
Stocks				
occupation				
Disruption in Business				
house				

Physical:

Damage/losses	Pre-flooding	onset	after	remarks
House				
wall				
roof				
floor				
pillars				
Appliances:	Pre-flooding	onset	after	remarks
television				
refrigerator				
Stereo/comp.				
Washing mach				
others				
Furnitures:				
sofa				
Dinning set				
Beds				
cabinets				
Vehicle				
land				
Others				

Social

Loss/damage	Pre-flooding	onset	after	remarks
Displacement				
Injuries sustain:				
minor				
major				
Illness suffered				
Diarrhea				
fever				
Cough/colds				
Skin disease				
Others				
Loss of life				

2. Are you a member of any organization? What organization?

3. Where do you get assistance in cases there is flooding?

Relatives	Friends	City/ barangay	Remarks

4. How the community perceived with the effects of floods?

Type of flood	Depth	Duration	Frequency	Wind	Remarks
Typhoon flooding					
Monsoon rains					
Flash flood					
Others					

5. What are your reasons for living in this place?

- _____ access to marketing and distribution centers
- _____ proximity to workplace
- _____ access to education
- _____ compatible neighborhood
- _____ own property
- _____ ancestral property
- _____ access to place of worship
- _____ cheap
- _____ others

6. How do you perceived the flooding in your area?

- _____ nuisance
- _____ catastrophe
- _____ others