

Coping with Flooding: Local Responses of Communities in Brgy. Malinta, Los Baños to this Climatic Hazard

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INTRODUCTION

The Philippines is situated along the typhoon belt in the Pacific Ocean. It is visited by an average of 20 typhoons every year, five of which are destructive. In addition, it is also located in the “Pacific Ring of Fire”, making the country vulnerable to frequent earthquakes and volcanic eruptions. The geographic location and physical environment also contribute to its high susceptibility to tsunami, sea level rise, storm surges, landslides, flood/flashflood/flooding, and drought (ADRC 2008).

Communities affected by flooding suffer from a combination of problems such as those related to economic, health, and psychological conditions. Thus, people respond by coming up with ways to cope with this situation. Blaikie *et al.* (1994) defined “coping mechanism” as a manner in which people within the limit of existing resources and ranges of expectations of a situation to achieve various ends. They explained that coping strategies involve managing of resources to counter the effects of flood hazard. Twigg (2004) referred to “coping mechanism” or “coping strategy” as the application of indigenous knowledge in the face of hazards like flooding and other threats. He further classified these into four: economic, technological, social, and cultural. Economic strategy refers to adjustment in livelihood, technological to use of technology to cope with flooding, social to the ability to access support from individuals and groups, while cultural refers to belief systems that help cope with flooding.

In the study of Gaillard *et al.* (2008) conducted in a flood-prone community in Pampanga, the economic coping strategies/mechanisms resorted to by the residents include shifting of livelihood from farming to aquaculture, reduction of frequency of meals from three to two times daily and postponement of payment of debt. The study further showed that more frequent

ABSTRACT

This participatory research was conducted in lieu of the Laguna provincial government's hazard map where the community was identified as flood free. However, the recent flooding in the community revealed that this flooding is not a new occurrence. The study sought to determine the history of flooding in the area, extent of its effect on the households and the community as well as the coping strategies employed. Participatory tools and techniques such as village walk, historical timeline, participatory mapping, Venn diagram, livelihood analysis, and SWOT were used to gather data. The participatory mapping revealed that the most recent flooding affected 472 households and reached as high as 5 feet in some areas. The historical analysis showed that typhoons from 2006-2012 resulted in the longest the worst flooding affecting the village. The study documented how the local communities responded to the series of flooding with the hope that it will raise awareness in the provincial government to update its map and correspondingly provide measures to reduce community vulnerability. The recommendations include a preparation of an IEC for disaster preparedness and disaster response plan to help the community proactively address flooding.

Keywords: climatic hazards, coping with flooding, participatory techniques, participatory tools

praying to God became a common practice during floods, an example of cultural coping mechanism. Reganit (2005) also documented coping mechanisms among residents suffering from flooding. The study revealed that the residents employed six types of coping mechanisms which are categorized as physical, economic, and social, and further classified into before, during, and after.

For example, Reganit (2005) discusses that before flooding, the residents engaged in such physical coping mechanisms as reinforcing of pillars using scrap materials, preparing waterproof materials, fixing of things, cleaning of canals, and preparing flood suitable clothes. The economic type of coping mechanisms resorted to include the construction of houses with reinforced materials and second floor or mezzanine, boiling of water, purchasing of food stocks, and saving money. During flooding, the common economic coping mechanisms are purchasing of affordable food items and food stocks in bulk, rendering overtime services, and continued working. On the other hand, the social types of coping mechanisms practiced by the residents are transferring of appliances and valuable things to neighbors and relatives, evacuating or staying with relatives, neighbors, or in city government-designated evacuation centers, train coaches or along the highways, while some opted to stay in the area and guard their house from looters (Reganit 2005).

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The study of Reganit also identified the coping mechanisms after flooding which are mostly a combination of the economic and social types. The economic types of coping mechanisms resorted to by the residents include repairing major damages on their houses, boiling water to lessen expenses, prioritizing needs, and tight budgeting while some households are forced to stop their children from schooling due to financial distress. For the social type of coping mechanisms, the households engaged in sourcing of relief items (food and house materials), participating in barangay activities, borrowing money from relatives, friends and government agencies, and providing livelihood to their neighbors who are experiencing financial distress (Reganit, 2005).

The main policy that seeks to ensure that communities prepare for and are assisted during and after calamities is Republic Act No. 101211 or the “Philippine Disaster Risk Reduction Management (DRRM) Act of 2010”. This Act aims to improve coordination and implementation of the rescue, evacuation, relief and rehabilitation efforts of the government. The Act states that all municipalities should create a Barangay Risk Reduction Coordinating Council which will spearhead efforts in DRRM. However, the study of Peñalba *et al.* (2012) reports that municipalities suffering from flooding have low adaptive capacity and employed temporary adaptation strategies.

The municipalities of Laguna border east, west, and southwest of Laguna de Bay, with Los Baños at the northeastern border of the lake. Laguna de Bay is said to be the largest shallow freshwater body in the heart of Luzon Island with an aggregate area of about 911 km² (352 sq mi) and a shoreline of 220 km (140 mi). One of the coastal barangays of Los Baños is Barangay Malinta which has a history of flooding resulting from the overflow of Laguna de Bay during heavy rains and typhoons. The Provincial Hazard Map, however, does not identify the community of Malinta as a flood prone area. The study of Ballaran (Ballaran 2013 as cited in Aranas 2013) contradicts this claim that coastal areas of Laguna municipalities were the most vulnerable in terms of sensitivity or the degree to which the community is affected by climate change stressors. The study also revealed that coastal areas were the most vulnerable in terms of sensitivity or the degree to which the community is affected by climate change stressors (Aranas 2013). It is along this light that the research interest focused on identifying coping mechanisms of the people living in Barangay Malinta as well as determining the strengths, weaknesses, opportunities and threats faced by the local government in terms of responding to problems related to flooding in the area.

OBJECTIVES

Residents affected by flooding have shown resilience despite adversity. However, it is important to understand the extent of damage brought about by flooding on communities, how people cope and what institutions offer help during these calamities in order to propose means by which to improve programs that seek to mitigate and address impacts of flooding. The specific objectives of the study are the following:

- to describe the history of flooding in Brgy. Malinta;
- to enumerate the negative effects of flooding on affected residents;
- to discuss the coping mechanisms of the affected residents; and

- to assess the capabilities of the local government unit in addressing the needs of affected residents during flooding.

FRAMEWORK

The interplay of variables discussed in this study starts with the flood prone area affected households coming from Purok 1 and Purok 2 of Barangay Malinta in Los Baños, Laguna. The effects of flooding in the area categorized as physical, health, livelihood, and environment were enumerated. With these effects, various coping strategies were employed by the households such as economic, technological, social/organizational, and cultural. Capabilities and responses toward disaster reduction management were assessed that can aid in addressing the challenges faced in flood prone areas by alleviating the effects, improving the coping strategies or totally eradicating the primary problem which is flooding (Figure 1).

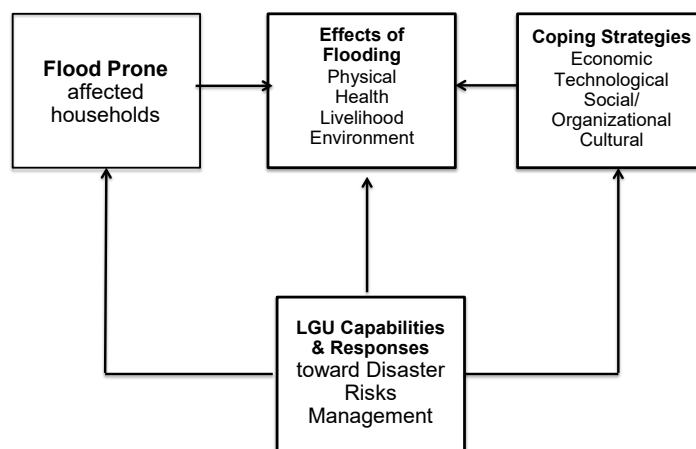


Figure 1. Conceptual framework of the study

METHODOLOGY

The study was conducted in Barangay Malinta, Los Baños, Laguna, Philippines (Figure 2). The barangay has a total land area of 54 ha, divided into five Puroks: I, II, III, IV and V. Only Puroks 1 and II were included since these are the most vulnerable areas. These two puroks are adjacent to one another and directly face Laguna de Bay. Barangay Malinta is located on the coast of Laguna de Bay and lies at the northern part of Los Baños (Barangay Integrated Plan of Brgy. Malinta 2011).

A total of 26 residents and eight local officials participated in the conduct of this study from January to March of 2013. Initial key informant interviews were conducted with selected local government officials and environmental people to help formulate the research questions which were later converted into research objectives. To ensure representativeness of the participants, the following criteria for selection of residents were used:

1. Participants from the youth sector should have been residing in the area for the past 5 years and more than 10 years for senior citizens, women, and fishermen.
2. Residents were severely affected by flooding.
3. Members of the Barangay

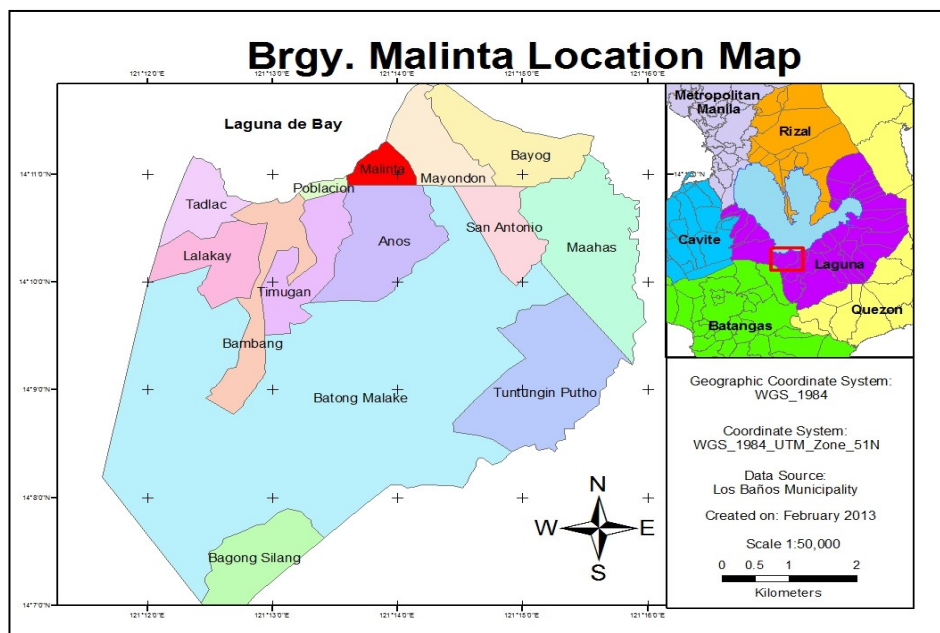


Figure 2. Location map of Barangay Malinta

Each purok should be represented by equal number of males and females (5 each), representing the youth, senior citizen, women and fishermen.

A case study research design was employed. According to Creswell (2008), this type of research design uses a qualitative approach in which the investigator explores a bounded system (a case) or multiple bounded systems (cases) over time through detailed, in-depth data collection involving multiple sources of information (*e.g.* observations, interviews, audiovisual material, and documents and reports) and reports a case description and case-based themes.

The advantages of participatory rural appraisal (PRA) tool in data gathering is its ability to present rich data that comes from experiences of local people. The strength of PRA is that it has a wide variety of methods that enable the community to gather inputs from its stakeholders by identifying and analyzing critical elements of their life, their situation, and plan and carry through feasible changes (Chambers 1997).

However, similar to other qualitative data research methodologies, PRA does not claim “representativeness” of results but presents cases of realities experienced by the participants gathered through using various tools to ensure depth in the discussion. The study employed direct observation, focus group discussion using participatory rural appraisal (PRA) tools, in-depth interviews and man-on-the-street interviews.

The direct observation method used the village walk. It is a walk or series of walk across the landscape (Calub 2003) that provided a bird’s eye view of the situation of the two Puroks that were adversely affected by flooding. The walk served as an opportunity to have informal talks with the people concerning the situations they have experienced during typhoons. The walk enabled us to locate where the particular flooded areas are. At the same time, the village walk provided the researchers the opportunity to invite the residents for the PRA activities.

The focus group discussion was divided into two: for the residents and for the barangay officials using corresponding PRA tools. According to Shaw and Okazaki (2004), one of the many benefits of using PRA in Community-Based Disaster Risk Reduction (CBDRR) that is addressed by the United Nations International Decade for Disaster Reduction (UN-IDNDR) is that community participation will positively address the local socio-economic concerns in disaster reduction by empowering the community with knowledge and skills, develop the leadership capability of the community members and further strengthen their capacity to contribute to development initiatives. The process focuses on capacity building and community empowerment for improving the community capacity in reducing their vulnerability against natural hazards. According to Bessette (2004) the community should not only take part in the various activities but also participate in the decision making process and the planning of development initiatives. This PRA tools and techniques employed are as village mapping, historical timeline, livelihood analysis for barangay residents and Venn diagram and SWOT analysis for barangay officials.

Part1- Barangay Residents

Village Mapping

The village map was used to determine the areas that experienced flooding of 3 feet and above and below 3 feet. Prior to the village mapping, a village walk was conducted to investigate flooded areas. A map was then prepared where people indicated the houses of residents and relevant landmarks in the area. The people also identified flooded areas and the residents affected most by flooding. Triangle cut outs were prepared to determine the depth of flood water. The fuchsia triangle represents the depth of flood water 3 feet and above and the yellow triangle represents flood water below 3 feet.

Historical Time Line

The time line described the typhoons with remarkable impact to the residents. Prior to the conduct of the time line, basic

information about weather disturbances that affected the area such as typhoons and low pressure area were identified by the researchers. The residents recalled the negative and positive effects of each of the typhoons from 1989 to 2012. The names of the typhoon and the year it occurred were written in colored yellow meta-cards and were posted on the wall. The upper portion of the paper indicated the negative impacts while the lower half indicated the positive impact.

Livelihood Analysis

This participatory tool was used to identify the sources of livelihood that affected by flooding. This also reflected the stability of the different jobs of the residents during the different months of the year. The jobs were categorized based on sector such as agriculture, fishery, entrepreneurship, and others. The various organizations, institutions and individuals that helped them were also enumerated. The sources of livelihood were written on colored meta-cards which the respondents posted on Manila paper. Each source of livelihood was rated depending on its stability during the different months of the year. A 10–point rating scale was used with 10 being the most stable and 1 the least stable. The participants were asked where their sources of livelihood are located and the organizations and institutions that helped them in their livelihood.

Part 2 - Barangay Officials

Venn Diagram

The Venn diagram describes the various institutions that provided support to the community during the disaster. Barangay officials identified organizations/institutions that gave various donations and the nature of flow of relationships between the organizations and Barangay Malinta. The significance of the organizations was reflected in the size of the circles where bigger circles mean more importance or more donations given. The closer the distance of the circle to the barangay indicates that the organization works closely with the barangay. The farther the circle meant that these organizations did not closely coordinate with the barangay in terms of giving donations during the time of flooding. The straight lines between organizations and the Barangay meant that the organization directly donated to the barangay while arrows with dotted lines indicated that assistance was provided by individuals.

SWOT Analysis

The acronym stands for Strengths, Weaknesses, Opportunities and Threats. The facilitator asked questions related to human resources, partner organizations, protocols and policies pertaining to flooding in the community. All answers were written on meta-cards and the participants determined where these should be placed, whether under strengths, weaknesses, opportunities, and threats. Based on the result of the SWOT analysis, the participants were asked to provide their recommendations considering the capabilities of their community.

The PRA tools were likewise supplemented with in-depth interviews with residents comprising a youth, senior citizen, mother, and a businesswoman. The data obtained were analyzed using descriptive statistics. In addition, thematic analysis was used to present the effects of flooding and consequent coping mechanism from the in-depth interview. The respondents'

coping strategies were classified based from Twigg (2004) as follows:

- economic/material – refers to how people adjusted their livelihood to the present situation by engaging in alternative livelihood or additional sources of income;
- technological – refers to the strength of the structure of houses/buildings;
- social – refers to the nearest kin that they can run to in times of disaster as well as their neighbours, and wider groups sharing the same identity; and
- cultural –these are risk perceptions and religious views.

RESULTS AND DISCUSSION

History of flooding

Barangay Malinta was once part of its neighboring Barangay Anos. During the historical timeline discussions, participants shared that the barangay has been experiencing flooding for the past 26 years due to typhoons that resulted to overflowing of the lake and creeks bordering the barangay. From 1989 to 2000, the area was hit by several typhoons but the depth of water coming from the rain was tolerable because water levels easily subsided. According to the residents, these typhoons brought about flashfloods which for them did not cause much of a problem. However, flashfloods are often characterized by high destructive capacity in a very short period of time and pose great challenges to the communities (Sharma *et al.* 2015; Kim 2012; APFM 2007). Nevertheless, the residents consider these flashfloods as non-problematic in relation to other flooding events which stayed for months. This flashflood is different compared with the floods which the community experienced from 2006 to 2012 resulting from typhoons and the southwest monsoon which lasted for four months and damaged houses, furniture and fixtures and water wells.

During this period, seven typhoons and one southwest monsoon (*Habagat*) hit the area. The residents of both Puroks 1 and 2 noted that among the typhoons, 'Milenyo' (Xangsane 2006), 'Ondoy' (Ketsana 2006) and 'Pepeng' (Parma 2009) and the southwest monsoon that occurred in 2012 made remarkable impacts on their community. The monsoon, which was also deemed destructive, is characterized by a wind system that changes directions with the seasons and carries with it heavy rainfall (Montz & Grunfest 2002).

Typhoon 'Milenyo' (Xangsane 2006) was characterized by heavy rains that resulted to flooding of up to 4 ft but subsided after four hours, leaving clay mud on affected areas. Typhoons 'Ondoy' (Ketsana 2009) and 'Pepeng' (Parma 2009) also came with heavy rains but caused flooding of up to 4-6 ft. and lasted for months. Tropical storm Pepeng (Parma 2009) was described as the typhoon that brought the worst flooding in the area, lasting for up to three months. This typhoon was the basis of the analysis as agreed upon by all the participants.

To identify the flow of the flooding, a village map was developed to identify the areas which were severely flooded. The participants agreed that 3 feet should be the demarcation height and those which suffered flooding above this height suffered the most. With the help of selected barangay officials,

visualization of the buildings and plotting of infrastructure such as houses, factories and other institutions on the map were conducted, as well as proper identification of families residing in the various parts of the affected areas.

The map revealed that Purok 2 which is located between two creeks is lower in elevation than the entire barangay of Malinta (Figures 3 a and b). These creeks have regularly contributed to the flooding of Purok 2 during the rainy season. By just the features of the sketch map, it could be observed that Barangay Malinta is a flood prone-community and Purok 2, in particular, is a catch basin.

Half of the flooded areas experienced more than 3 feet of flood water while the other half experienced floodwater of less than 3 feet. Results show that 31 houses and one bunk house used by five families experienced flooding above three feet while six houses were flooded below 3 feet. Over all, there were 24 residents with houses submerged for three days and almost four months under three feet in 2009. Those whose houses were submerged below three feet need to elevate their furniture and appliances to protect from flood waters. The houses built in this area are intentionally elevated or are located in an elevated place.

Purok 2 is also the site of a university whose entire area was affected by floods lasting for 2 months. Hence, classes were conducted in tents for almost a semester. Compounding this problem is the fact that the two elementary schools, which also served as the temporary shelter of the residents, were also flooded. Schools were therefore suspended for a week and resumed only when more tent houses were established and vacant houses were allowed to be temporary shelters of the affected residents.

Effects of flooding

The thematic effects of flooding can be categorized as physical, health, livelihood, and environmental (Table 1). The major problem brought by flooding to the community was destruction to property. Portions of houses such as doors and windows were damaged due to the strong flow of water and its submersion to

Table 1. Effects of the remarkable typhoons that hit Purok 1 and 2 in 2009.

Effects	Purok 1	Purok 2
Physical	Destruction of houses, furniture and fixtures, deep wells. Narrow pathways, cramped houses, worsened flooding as water cannot flow freely. Passage ways were filled with mud.	• Destruction of furniture and fixtures • Left clay mud on affected areas • Damaged fish cages
Health	• Colds, fever, sore eyes, flu, and LBM • Problem on toilet sanitation • Leptospirosis	Colds, fever, sore eyes, flu, and LBM
Social	Inconvenience resulting from four months of flooding	Inconvenience resulting from four months flooding
Livelihood		Loss of income from piggery and poultry business
Environ-mental	Presence of snakes	Loss of income from fishing

flood waters. Needless to say, furniture and fixtures as well as appliances were damaged. Some residents shared that most of their earnings from working abroad and that were used to buy furniture and appliances were all lost as these were damaged during the typhoon. Flooded waters came so fast they did not have time to put their things in higher ground. This story is retold by other participants who lost much of their hard earned earnings invested in furniture and other fixture. The stagnant water likewise left visible and unsightly markings on their properties (Figure 4).

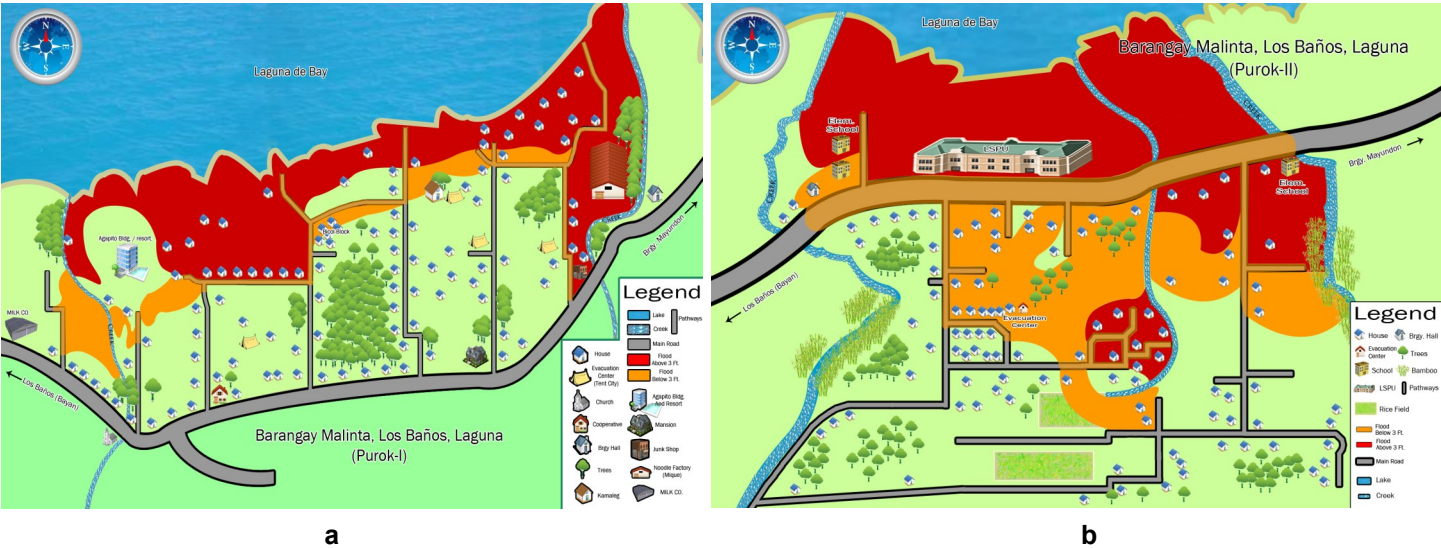


Figure 3. Village map of Purok 1 (a) and Purok 2 (b)



Figure 4. Level of flood water which marked the green gate in Purok 2 along the main road of Barangay Malinta

Because flood waters lasted for three months after the typhoons, residents had to stay in overcrowded evacuation sites. Some stayed in elementary school buildings with second levels but eventually have to move out so classes can resume. For those who have houses with second floors, they opted to sleep at the second level but had to endure the flooded waters at the first level of their house. Those who had second level houses also opened their homes to other residents who had nowhere to stay. However, this became very inconvenient for the residents who had to endure cramped spaces, share toilets with other residents or stay in the small space of their second floors where all belongings that could be saved were also dumped. Residents who were relocated in higher grounds where tent houses and temporary toilets were established had to share common facilities with several others. To accommodate other affected residents, unoccupied houses such as those already abandoned or whose families are living abroad were opened.

Parents shared that their children were likewise negatively affected. The small children did not have grounds where they could play. They told of how they would ride in bancas to bring or send their children to school if they have money for the fare. Otherwise, they carried their young children to school or let the children wade in the flood waters.

The education of the children were likewise affected. With the first floor of the primary and secondary school buildings flooded for months, classes were held at the second floor of the building where the students had to endure cramped conditions. The college students, on the other hand, had to conduct classes in tents as the whole university campus was flooded.

The livelihood of some of the residents were negatively affected as well. *Aling Doring*, who was into poultry and swine backyard business, emotionally recalled her families' experience during the flooding. She not only suffered from the destruction of her house which was adjacent to the creek, but also lost most of her appliances. Moreover, she lost her source of income as she could not continue with her backyard swine raising. Other residents also shared how the flooding adversely affected their

livelihood. A common enterprise of the men in the area is the transportation of residents from one area to another using the *padyak* – a bicycle with side car. As roads are not passable, the men could not continue with their livelihood. The women, on the other hand, who are mostly engaged in selling vegetables or *merienda* (snacks), particularly freshly cooked native delicacies, could also not continue with their business as they could not ply the roads. Another common occupation of the women was washing of clothes of regular clients. While they were able to continue to do so, it became inconvenient after some time since they had to move to places with clean water supply and area to dry the clothes. Eventually, the officials installed long rubber hoses to ensure that more people can access clean water for various purposes.

Because of the months of flooding and crowding in evacuation sites, and insufficiency of toilet facilities, health problems related to common illnesses such as colds, fever, sore eyes, flu, and loose bowel movement (LBM) were experienced. In addition, the residents recalled that in 2009, when the area was hit by 'Ondoy' (Ketsana), a case of leptospirosis arose. Nott (2006) as cited by Mwape (2009) stated that disease outbreak after flooding is common especially in less developed countries. Other tropical countries have outbreaks of malaria and typhoid after flooding. Torti (2014) mentioned in his study that after the onset of a flood, there is a possibility for an increase in communicable diseases and further injury.

The effects of flooding can be categorized into two, namely: primary that is directly caused by the flood which includes injury, loss of life, damages on homes, buildings, roads, railroads, bridges, and communication systems; and secondary, which are caused by disruption of systems and services due to the flood. This include short term pollution of rivers, hunger and disease, and displacement of persons who have lost their homes and disruption of livelihood, community breakdown, family blighted and reduced national gross domestic product (Keller & Blodgett 2008; WMO/GWP 2008). Based on the accounts of the people, damages to homes, loss of income, displacement, disruption of livelihood and health problems were some of the effects of flooding experienced by the participants.

Torti (2012) views that Southeast Asia is more likely to experience the negative impacts of flooding at a much larger scale than higher-income regions of the world. A great cause of this is limited resources, a poor economy, and poor health infrastructure that characterize low-income countries.

Coping Mechanisms

The thematic analysis of coping mechanisms were categorized into economic, cultural, technological and social. Various coping strategies of the residents are reflected during the PRA activities as shown in (Table 2). The coping mechanisms were categorized as follows:

Economic

The nature of livelihood of most of these residents were not tied up to their community. For both puroks, residents were engaged in the informal service sector such as jeepney and tricycle driving, house cleaning, baby sitting, laundering, small time lottery, provision of beauty services such as manicure, pedicure, hair dressing, and landscaping.

Table 2. Coping strategies done in Purok 1 and Purok 2.

Coping Strategies	Purok 1	Purok 2
Economic/material	• Talipapa was opened • Food for Work and Cash for Work from the governments their alternative source of income	• Utilized their banca as a means of transportation
Technological	• Observing the level of water to determine if they need to evacuate • Barangay officials use whistle to inform people to evacuate • Ropes were used to guide the residents during the time of evacuation • Establishments of evacuation centers • Establishments of toilets • Longer hose is attach to the natural spring to have a continued supply of water • Makeshift bamboo bridges were used as bridge during evacuation time • Residents built houses with 12 feet high steel post • Keep attune to the news over the radio • Relief goods including medicine, water food, construction materials were received by the community • Oplan Linis was implemented	• Rip-rap was established along the creek
Social/Organizational	• Bayanihan was observed from the making of makeshift bridges to sharing of houses and vacant lots as temporary shelter to affected families	
Cultural	• Bayanihan system • Prayer	

Certainly, the ones affected were those whose sources of income are located within the area. The fishing industry and fishermen in the area were negatively affected since the fish cages in Laguna de Bay were destroyed. However, short term benefits accrued to the residents as a result of the overflow of fishes. The supply was more than the community's consumption needs that resulted to the building of *talipapa* (small market) where they can sell fresh fishes. Until now the *talipapa* exists and aside from selling fishes, the residents also sell vegetables, fruits and other products from which they were able to earn additional income.

The Food for Work and Cash for Work projects were initiated by local government units to support residents affected by flooding. The residents are employed in projects on a rotational basis to ensure that all residents whose livelihoods were negatively affected by flooding would have cash to address their food needs.

In Purok 2, fishermen who could not go fishing used their *bangka* (boat) as a public utility vehicle. Since the place was flooded, they used their boats to fetch and ferry residents thus providing them with an alternative source of income (Figure 5).

A study by Ourn and Suntornvongsagul (2015) conducted in Prey Veng Province in Cambodia also revealed that farmers diversify their sources of livelihood as a coping mechanism

during flooding. It was an agricultural land area wherein the primary source of livelihood is rice farming and animal husbandry. But since they experienced three month flooding, the farmers need to look for non farming activities or non-skilled labor jobs.



Figure 5. Fisherman uses his boat as a means of public transportation

Technological

Residents tune in to radio stations to keep themselves informed about typhoons. However, radio stations discuss general information about the typhoon but do not provide localized information. Hence, residents rely mostly on sketchy information and advice from local officials.

The tools used by the residents to assess extent of flooding and when to evacuate are crude. At the onset of typhoons the residents were vigilant in observing the level of flood water. They shared that once flood waters reach the height of their beds at approximately 1-2 feet, they start to evacuate. During this period, Barangay officials roam the villages and check on the household flood water levels. While this kind of assessment tool is graphic and easily understandable, it does not factor in speed of water inflow which can significantly increase the extent of flooding and imperil lives of residents.

Barangay officials use whistles to signal that flood waters have risen to 1-2 feet and that households need to evacuate. When the current of flood waters are strong, evacuation is done with ropes tied around posts to guide residents and ensure that they will not be swept away.

Both Purok 1 and 2 built evacuation centers in 2006 as a result of strong Typhoon Milenyo that hit the place. Residents used these evacuation centers for almost 3 months as flooding prevented them from returning to their houses. Toilets were likewise constructed for the use of the residents in the evacuation centers.

In Purok 1, flood water level rose to over 3 feet in 2009. The residents showed their resourcefulness to cope with their present situation. To have access to a continuous supply of fresh water, residents used longer water hoses to connect to a spring. To move from one place to another, makeshift bamboo bridges were built leading to the local vehicle called *ampra*. Bancas of fishermen whose fish cages were damaged by the typhoon were used as transportation in deeply flooded areas.

After flooding, residents rebuilt their houses with 12 ft high steel posts to deal with high level of flood water (Figure 6). In 2011, rip-rap was built along the left side of the creek that passes through Purok 2 to protect the village from flooding (Figure 7). The study of Islam *et al.* (2012), in a village of Bangladesh that suffered flooding, revealed that the people also used different coping mechanisms to protect their houses from flooding waters. These include placing of barriers around the house, raising the platform of the house and preparation of *jagon*, a float made out of water hyacinth and thatch.

Social/organizational

As reflected in the Venn diagram (Figure 8), the barangay received donations from various government institutions, private individuals and institutions; and non-government organizations that helped the residents cope with their situation. The diagram shows the nature of linkages between institutions and individuals with the local government. Those who gave huge amounts of money or donated in kind are symbolized by the blue color and located near the barangay such as the Municipal Social Welfare Department (MSWD), Rural Health Unit (RHU), and the Municipal Office of Los Banos. The second biggest donors came from associations and organizations such as Jubileeville Homeowners' Association, Forbes Park Makati,



Figure 6. House with steel posts near the coastal area



Figure 7. Unfinished rip-rap at Purok 2.



Figure 8. Venn Diagram showing the organizations and individuals who donated to Brgy. Malinta

Rotary Club of Los Banos, ABS-CBN, and SM Calamba while the rest came from individuals and other organizations. The donations varied from medicines, groceries (canned goods and toiletries), construction materials, mineral water, and freshly cooked meals. Though the number of donors were countless and their donations greatly helped the residents, these only lasted for a short while.

Aside from the aid of various organizations and institutions, a program called “Oplan Linis” was organized and implemented by the barangay local government unit wherein all residents were enjoined to clean the community and environment after the flooding incidence.

The study of Mohd. *et al.* (2016) of flood victims of Kelantan, Malaysia found out that all aids were moderately effective in improving the victims’ quality of life. With this situation, the Malaysian government in collaboration with non-government organizations thought of providing aid that would have a long term effect.

Cultural

Praying is a common response of the residents during flooding. In one of the in-depth interviews, a resident shared that she prayed hard in order for her grandson to survive what she referred to as an undetectable disease resulting from flooding. Likewise, in Purok 1, the practice of *bayanihan* (one of Filipino values wherein the whole community extends help to those who are in need) was observed among the residents particularly in building of the make shift bamboo bridges. There were also families who opened their houses or offered their vacant lots to accommodate residents of the village devastated by flooding.

Capabilities of LGU in addressing issues in the flood prone area

The barangay plays a very important role in disaster management. They organize evacuation plans and evacuation sites as well as manage distribution of relief goods. To determine the barangay’s capabilities in managing disasters, a SWOT was conducted with selected barangay officials, municipal representatives and residents. The SWOT identified the strengths, weaknesses, opportunities and threats of the barangay during times of typhoon and flooding (Table 3).

The barangay still practices the value of *bayanihan* which is their key strength. Although no specific roles were assigned to any individual, everyone in the community was able to offer some kind of assistance to those in need. The barangay was given an early warning system after the flooding to facilitate the evacuation of residents to higher places. However, the weaknesses outnumbered the barangay’s strengths. The matrix shows that there were a number of weaknesses pertaining to overlapping roles and functions of the barangay council, lack of understanding of the law, apathetic attitude of the people, inadequate skills in managing disasters, and lack of training, among other things.

In terms of opportunities, there exists a law mandating the formation of a committee at the municipal and barangay level for disaster risk management. Rules on distribution of relief goods for example are defined. In addition, the municipal office of Los Baños has a list of identified partner organizations to provide relief goods to the barangay.

In terms of the threats, one of the issues raised are piles of garbage along the coastal areas of the lake which contributes to flooding as it clogs water ways. Though there is a regular schedule for the collection of garbage from houses, segregation of biodegradable and non-biodegradable wastes is no longer practiced by the households.

The participants were also asked for their recommendations on how to turn their weaknesses into strengths. Their recommendations are as follows: identify private lands that could be converted into evacuation centers at the beginning of the typhoon season; timely release of calamity fund; crafting of policy on the distribution of relief goods; creation of group, or committee in each purok to spearhead disaster relief; assign a specific group per purok to disseminate and echo information or training programs attended on disaster risk management in their respective area; strengthen and enforce the policy on garbage disposal and waste segregation.

CONCLUSION

The barangay is clearly flood prone and history shows that recent floodings have worsened as the level of flood waters became higher and stayed longer. Displacement, disruption of livelihood, inconveniences in their day to day life, and health problems were identified as common effects of flooding. In terms of economic coping mechanisms, the women had to look for spaces where they can launder the clothes while the men resorted to other sources of livelihood such as carpentry, using their boats to ferry residents and for the rest, look for opportunities where they can apply their skills such as driving. The provision of food for work and donations were welcome relief for the residents. The technologies used to cope with flooding involve using whistles to warn residents, ropes to hold on to during evacuation, and building of bridge walks out of bamboo poles. The practice of *bayanihan* is clearly evident in the village as people worked together to build the bridge walks and opened their houses to those most severely affected. It is apparent that these coping mechanisms are reactionary in nature. Thus, the unfinished “rip-rap” seen during the village walk indicates that the safety of the community was not prioritized.

As a result of the series of PRA methods conducted, the barangay officials were able to analyze the strengths of their community focusing on the available facilities and reflecting on the level of readiness of people when faced with flooding. Numerous weaknesses were also identified related to logistics/ budget, attitude of the people, and the specific roles and functions the barangay has to perform regarding disaster risk management. More opportunities than threats were identified.

RECOMMENDATIONS

Since many people were affected by this climatic hazard, it is necessary to inform them and increase their awareness of the effects of flooding to their lives and environment. Information, Education and Communication (IEC) campaigns regarding policies on coastal area management, climate change and community-based early warning system on flooding should be undertaken. The local government unit can coordinate with the nearby University of the Philippines Los Banos particularly the College of Development Communication whose students can be tapped to conduct IEC campaigns. These IEC interventions could be in the form of training programs, posters, news/feature articles, campaigns on flooding, and many more.

Establishment of a system for distributing relief goods is also necessary since this has been a perennial problem as perceived by the residents. Planning of relief goods distribution and initial disaster response should be done in a participatory manner

Table 3. SWOT Analysis of the LGU's capabilities in addressing flooding in the barangay.

STRENGTHS	• Rescue Response– Roles are not defined; everyone has their own way of helping each other • The barangay has complete data pertaining to flooding issue • There is a clean-up that is scheduled once a month in each purok. • An early warning system has been set up in the area
WEAKNESSES	<u>Roles/ functions/membership of DRM</u> • Most jobs are performed by councilors and barangay <i>tanod</i>. • Membership on disaster related activities overlapping among councilors. • No regular meetings for DRM • No regular member from the community for disaster management <u>Distribution of relief goods</u> • Problem on the distribution of goods: -Others directly go to the community -Too much of the goods were provided in the evacuation center • Distribution of relief goods performed by BNS <u>Attendance to training on DRM</u> • Cannot participate to the disaster training because they need to earn a daily living. • Difficult to get members from communities because people need to earn for a living. <u>Budget</u> • The release of calamity fund worth P30,000 can be easily disbursed but the amount is not sufficient. <u>Law</u> • There are many squatters along the danger zones • None implementation of the law prohibiting people to stay along the coastal area. • People are not following warnings on flooding • The people do not understand the law on DRM <u>Partnership</u> • The barangay has no institutional partnership with organizations unlike the municipality LGU <u>Capacity of barangay</u> • Lack of evacuation centers- private lands are also being used • The barangay has no capacity for the coastal clean up <u>Attitude of people</u> • The people have no initiative to help the barangay in cleaning the streets after the typhoon.

Table 3. Result of SWOT Analysis (Cont'd)

OPPORTUNITIES	<u>Roles/function/Rules</u> • There are rules on proper distribution of relief goods by DSWD and municipal office • Law specifies formation of committees at the local levels
	<u>Partners</u> • Municipal Engineers' Office helps together with partner institution regarding provision of tent, water, <i>Kawayanan</i> • There are different government officials from different barangays and provinces that helped in the distribution of goods • The Municipality Office and MSWD provided tent. • There are so many organizations that helped and donated relief goods. • There are also officials that helped the barangay every time there are problems and they are: Bagnes, Unico, Nocon
	<u>Funds for the rip-rap</u> • The Los Banos Municipal Office provide funds for the rip-rap construction
THREATS	• The piles of garbage found along the coastal areas came from the bay. These piles of garbage just come and go. • Piles of garbage are collected from the resident houses. However these are segregated at the household level • Stealing is rampant

together with the residents and other stakeholders. This strategy ensures that relief operations will be efficiently implemented. It will also declog the work load of barangay officials who are often deluged with other job related concerns. Collective action can be considered as one of the significant factors in enhancing the community's adaptive capacity.

Concerning relief distribution, the barangay used their old sketch map as guide to identify the various zones in the area. However, the said sketch map lacked houses with names of families living in the community. It also does not reflect the narrow pathways (*iskinita*) that exist in the area. The improved village map for Purok 1 and Purok 2 accomplished by the residents in this study can be used to facilitate the distribution of relief goods and identification of families submerged in water. The improved map can also be used as a hazard map and as an evacuation map.

There is a need to define concrete roles for each of the barangay officials who are members of the DRRM committee at the barangay level to ensure that there will be no duplication of functions or overloading of tasks. Likewise, the DRRM committee should have a youth counterpart since majority of the council members are already in their 50's and 60's. Young and energetic individuals particularly from Brgy. Malinta should therefore be recruited to guarantee that DRRM is in place.

To prepare for the rainy season, the residents should also be ready with their coping strategies which should include the following: finishing of rip-rap, conducting information campaigns, creating a committee to actively address issues in the distribution of relief goods; and identifying the official evacuation sites for residents who will be affected by floods.

More importantly, the implementation of a no build zone policy within the flood prone areas should be strictly imposed to avoid loss of lives. Strict imposition of the law goes well with the previous suggestion on the conduct of IEC. Knowledge and understanding of the various laws can help community members easily abide by these.

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