Coastal Hazards, Impacts And Interventions

Rosanna D. Gonzales, Manolito E. Bernabe

Abstract- Community's participation in the activities like the preparation and creation of historical timeline. resource and hazard mapping as well as vulnerability assessment matrix (VAM) are effective tools in determining hazards, impacts and interventions of a certain locality. The most common hazards are typhoons, saltwater intrusion, floods and drought. Data were collected through focus group discussions (FGDs) from respondents along coastal areas. Findings revealed that natural calamities had great impact to livelihood, properties and health. The damaged business operations, fishing and agricultural livelihood led to loss of income, likewise the sources of water were also contaminated. Planned interventions include launching of periodic education and awareness program, creation of evacuation centers and relocation sites, rescue centers, installation of deep well water pumps and irrigation systems, solid waste management, drainage and sea walls construction, canal rehabilitation/dredging, tree planting and alternative livelihood programs.

IndexTerms- Climate Change, Hazards, Impacts, Interventions

1 INTRODUCTION

COASTAL hazards are believed to pose great and vicarious risks to community folks living near the coastal areas. These hazards are beyond the control of man, they are considered to be physical phenomena that expose people's loss of lives, damages to properties and environmental degradation. Rapid-onset hazards last over periods of days and that include major cyclones accompanied by high winds, waves and surges or tsunamis created by submarine earthquakes and landslides. Slow-onset hazards develop incrementally over longer time periods and examples include erosion and gradual inundation [1]. Pangasinan, being one of the western seaboard towns usually experience coastal flooding, erosion and landslides at the onset of rainy season and the prevalence of the southwest monsoon, thus; makes people living near the coasts to be constantly living under the threat of the said hazards due to the effects of strong Habagat and the recent parade of typhoons that brought storm surges, gusty winds and huge waves [2].The above mentioned scenario is linked to climate change and it cannot be denied that one critical area that will most likely be susceptible is the coastal zone [3]. Affected barangay residents' are expected to have a high resilience on the impacts brought about by these hazards. Identification and launching of appropriate interventions are highly desired to serve as a frame of reference in addressing coastal hazards along its impacts.

- *Rosanna D. Gonzales is a Doctor of Philosophy major in Development Education and is presently the Doctoral Program Chair and Research Coordinator of School of Advanced Studies in Pangasinan State University at Urdaneta City Campus and a faculty member of Infanta Campus. E-mail: rosanna_gonzales0906@yahoo.com*
- *Manolito E. Bernabe is a masteral degree holder and a faculty member of Pangasinan State Unversity-Sta. Maria Campus. E-mail: me_bernabe@yahoo.com*

Hence, such study is conducted to provide higher awareness and better grasp on the kind of hazards and risks associated with such phenomena. To improve them is to involve communities' intellectual adaptive capacity. Further, results will provide a better understanding of the coastal dynamics of climate change and serve as baseline information for barangay, municipal and provincial offices.

2 REVIEW OF RELATED STUDIES

Freetag,et.al [4] stated that coastal hazards are those natural hazards that occur at the interface between the lake and the shoreline, inclusive of the uplands that impact the lake throughout the coastal watershed. Danger in life and damages to properties on the coastline that are caused by coastal flooding, high winds and waves, short- and long-term shoreline erosion, and storm surges are some of the identified impacts. The risk that a natural hazard poses is considered by estimating the impact that it would have on the people, services, facilities, and structures in a coastal community. Risk in coastal community. typically pertains to the changes in climate system probability of an event time consequence" and the greater the frequency and/or impacts, the greater the risk. "Risk can be thought of as the product of the frequency that a significant change will occur multiplied by impacts. Changes are often referred to as hazards or threats, and impacts as consequences. Both elements must be present for there to be a risk. If a change (flood) occurs there is no risk unless the change (flooding) causes an impact to something of value (e.g. recharging aquifers, damaging homes…). These impacts can be beneficial or adverse. Possible adverse changes are commonly referred to as hazards. Similarly risks are most often used to describe the possibility of a hazard causing adverse impacts. Opportunities, and not risks, are often defined when referring to positive impacts result from change" [4].The types of hazards include flooding, lake levels, storm, erosion and water contamination [21]. According to National Oceanic and Atmospheric Administration (NOAA), it is critical to develop hazard-resilient communities to prepare for these threats and enhance the ability of these communities to absorb impacts and bounce back. This preparation will reduce the lives lost in disasters, secure the economic stability of these communities, and support the health of our coastal ecosystems, including wetlands which are essential for reducing storm impacts on our coastal communities [5].

3 METHODOLOGY

3.1 Research Design

The qualitative research is employed in the study wherein the participatory method/Focus Group Discussions (FGDs) with the members of the community from various sectors were done in the identified study sites.

3.2 Respondents

The 6 study sites identified in this particular study are from the municipality of Agno, Dasol and Infanta, Pangasinan. Specifically, these are Baruan and Boboy of Agno, Petal and Eguia of Dasol, Patima and Cato of Infanta. These selected study sites are rural barangays located along the coastal areas of Pangasinan in Region 1 facing West Philippine Sea. The people who lives along coastlines are believed to be extremely vulnerable to effects of climate change [18]. Its rural folks are Ilocano speaking people whose households are mostly engaged on fishing and farming [19]. They were composed of 90 men and 90 women from various sectors of the 6 barangays. The figure below shows one of the map of 1 of the study sites included in the study [4]. The study map site was considered to be very necessary in developing the resource and hazard map. Hazard (or risk) mapping is a visual method of showing local perceptions of areas or people in a community (such as settlements, infrastructure, and resources) that face different levels and types of hazard or risk. It will be very useful in identifying hazards, risks, effects of climate change; determining areas, resources or people that face different types and levels of risk and planning for risk reduction and adaptation measures [16].

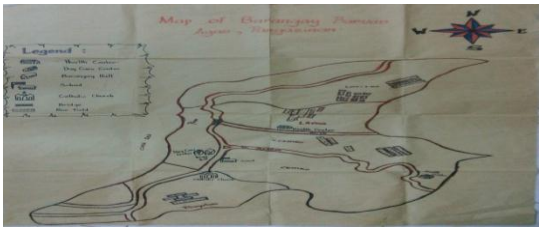

Fig. 1 *Sample barangay map of study site*

3.3 Procedure

Data were collected through analysis and qualitative assessment of the vulnerability of coastal communities to climate hazards. As in any vulnerability assessment, the bio-geophysical impacts of the climate hazards were identified and quantified. This involved delineating areas, resources, population, and capital at risk. The general approach taken in the implementation of a preliminary vulnerability assessment is a community-based/participatory approach. This was undertaken to generate a more in-depth understanding of the potential social impacts of the climate hazards as well as verify the existence of important issues related to climate hazards from the perspective of those who are directly affected, i.e. the communities [20].

4 RESULTS AND DISCUSSION

In the identification and determination of the hazards, impacts and interventions along coastal areas, the study reveals that the historical timeline (fig.2), resource and hazard mapping (fig. 3) as well as the vulnerability assessment matrix (fig. 4) that were developed from the usage of jarvi's adult learning theory [20] during the conduct of the FGD and the inclusion of activities that draw out the experiences of the people in their own locality were considered to be very contributory in producing the desired output as shown in succeeding tables.

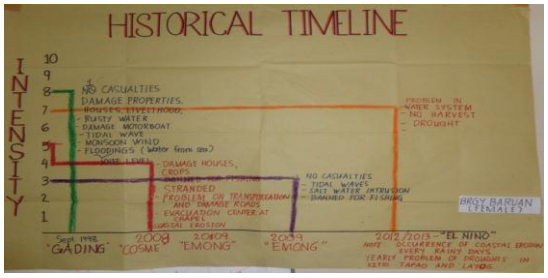

Fig. 2 *Sample historical timeline*

Specifically, these are Baruan and Boboy of Agno, Petal and

Fig. 3 *Sample resource and hazard map*

Fig. 4 *Sample Vulnerability Assessment Matrix*

Table 1 shows the 4 major coastal hazards, impacts and interventions identified by respondents.

Table 1. 4 *Major Coastal Hazards, Impacts and Interventions*

Hazards	Barangay	Impacts	Interventions
Typhoon	Baruan Boboy Petal Eguia Patima Cato	Damages Deaths Diseases	Preparedness Evacuation Purchase of rescue equipment Relocation Livelihood programs Sea wall construction
Saltwater Intrusion	Baruan Boboy Petal Eguia Patima Cato	Water contamination Low harvest	Use of water system Proper solid waste management Resource persons
Flooding	Baruan Boboy Petal Patima Cato	Water pollution	Irrigation system Tree-planting Canal rehabilitation Dredging Relocation Alternative livelihood
Drought	Baruan Boboy Petal Eguia	Unavailability of water supply	Irrigation system Water conservation Tree-planting

The respondents across all the study sites in the region as shown in table 1 as a result of the historical timeline output of the respondents (both male and female groups), had mentioned that typhoon affected them much. Planned interventions include disaster preparedness, evacuation to a safer place (evacuation center), available transportation, purchase of rescue equipment, relocation sites, livelihood program, sea wall construction and early warnings were some of the suggested solution of the respondents. Females particularly at barangay Cato had confirmed that typhoon is the number one hazard that caused lots of issues in their place wherein they told that some of its imp available transportation, purchase of rescue equipment, acts are on livelihood activities like fishing and farming. During this event fishermen cannot go out fishing for it entails danger due to large waves, damage to properties/assets due to damaged houses/boats, loss of lives, high intensity of waves, spread of animal diseases which also affected human health condition, food crisis and no electricity in the entire barangay. Coastal habitat degradation is the identified confounding resource and environmental issue. Planned interventions include disaster preparedness, evacuation to a safer place (evacuation center), available transportation, purchase of rescue equipment, relocation sites, livelihood program, sea wall construction and early warnings were some of the suggested solution of the respondents. Saltwater intrusion affected all the barangays which means that the water salinity across the study sites is of high level simply because it is within the coastal area apparently it caused water contamination that made safe drinking water unavailable for the households. Their crops died and incurred stunted growth and loss of income due to low harvest. Water pollution was found to be the important issue on environment because of its impact on health issues for all. Planned interventions include use of safe water system/deep well/ jetmatic/NAWASA/ BAWASA, solid waste management, invite knowledgeable persons to talk about the issue, construction of sea walls and relocation. Flooding affected five (5) barangays namely Baruan, Boboy, Petal, Patima and Cato which were considered to be un-elevated areas unlike in Eguia which is on elevated portion of the area. Based from the FGD result, activities like fishing and farming were directly affected which result into loss of income in addition to damaged properties/assets, because of flooded houses, boats used for fishing were destroyed and fishponds overflowed thus resulted to water pollution. Specified planned interventions include use of irrigation system/deep well/water system, tree planting, canal rehabilitation/dredging/, site relocation and alternative livelihood. Drought was found to be evident in barangay Baruan, Boboy, Petal and Eguia. According to the participants on FGD, this was experienced during the summer months which start from December to May. Its main effect was felt on agricultural sector particularly on the crops and poultry houses, furthermore, no water supply is available for drinking purposes and daily routine activities like washing clothes and dishes. Planned interventions include use of irrigation system/water pumps/jetmatic/deep well/water system/NAWASA, water conservation and tree planting. Table 2 shows the other 3 coastal hazards, impacts and interventions identified by respondents. Barangay Boboy, Eguia and Cato during the FGD activity had identified that storm surge affected them Tree-planting

Table 2. *Three (3) Other Coastal Hazards, Impacts and Interventions*

Hazards	Barangay	Impacts	Interventions
Storm Surge	Boboy Eguia Cato	Damages Low fish catch Low income	Seminars, workshops, trainings Sea wall construction Relocation Drainage construction
Nortada	Petal Eguia Patima	Loss of lives Low income Damages	Early warning device Alternative livelihood Emergency kits Educational information and dissemination
Land slide	Boboy	Non-transportation of products	Use of water system Tree-panting

appliances) were destroyed. It caused mangrove and marine damages in the area which result into decrease of fish catch and low income as well. Planned interventions include group discussions, seminars, workshop and trainings on livelihood, sea wall construction, site relocation and drainage construction. Three of the study sites namely barangay Petal, Eguia and Patima had pointed out that "Nortada"/ "Norte" is another hazard that is considered to be a problem in their barangay. It is characterized by unexpected big waves at the middle of the sea which usually happens during the months of December to February. It usually causes loss of life or death of fishermen with their boats as well as fishing equipment which resulted into no income for the family and brought marine life damages. Planned interventions include warning device, alternative livelihood, emergency kits, educational information and dissemination. Barangay Boboy respondents confirmed that landslide is a hazard in their barangay which caused no income due to road blockage which result into non- transportation of products which are intended to be sold. Planned interventions were the use water system and tree planting.

5 CONCLUSIONS AND FUTURE WORK

The hazards that affected much the region are typhoon and saltwater intrusion. These were experienced across all study sites namely in Barangay Baruan and Boboy of Agno, Barangay Petal and Eguia of Dasol and, Barangay Patima and Cato of Infanta. On the other hand, flooding and landslide were hazardous to five (5) barangays particularly at Baruan, Boboy, Petal, Patima and Cato Identified hazards have great impact on livelihood, decrease in population, disease and loss of properties The most common interventions are relocation, sea wall construction and water system. The result should serve as an initial input in the province to be able to identify the most affordable intervention that can increase resilience of coastal communities. Research institutions and the academe may wherein most of their properties (house) and assets (boats, technical expertise for capacity building, agriculture, fishing and provide timely information and current useful and relevant scientific findings for decision-makers and the public.

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