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COMMUNITY RESILIENCE TO CLIMATE RELATED DISASTERS IN BULAKAN, BULACAN: IMPLICATIONS FOR DISASTER MANAGEMENT SERVICE PROVISION

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ABSTRACT

The vulnerability of rural and coastal communities to extreme climate change impacts poses serious concerns about the ability of people to build resilience. Using an ecological approach in understanding how community resilience is situated within multiple settings, this qualitative study examines the lay accounts of 30 residents and authorities who experienced three major natural disasters. A thematic network analysis of the interview responses surface six dominant organizing themes: sense of preparedness, sense of togetherness, effective leadership of local authorities, service provision at the macro level, rebuilding in a self-reliant manner, and preparedness for future disasters. The dominant themes are considered relevant in sustaining the capacity of the participants to respond to, cope with, and recover from adversity. The findings reveal that collective actions, which are further strengthened by the presence of care, support, and assistance emerging from every system level, support community resilience. Hence, disaster management interventions necessitate increased efforts for the implementation of awareness and sensitization campaigns, additional social welfare services, and information dissemination activities through the use of published communication materials.

KEYWORDS: Community resilience, natural disasters, disaster management, thematic network analysis

INTRODUCTION

The frequency and intensity of natural disasters are projected to continue and increase in the future due to climate change (Intergovernmental Panel on Climate Change, 2007). The Philippines, in particular, has been identified as one of the top countries affected by severe climate-related disasters in the 2016 Global Climate Risk Index (Kreft, Eckstein, Dorsch, & Fischer, 2016). It also placed second third regarding climate change vulnerability, particularly on exposure to natural climate disasters based on the World Risk Index Report of the United Nations University Institute for Environment and Human Security (2014).

With the unpredictability and variability of extreme weather conditions, the capacity of communities to adapt to the short-term or long-term impacts of climate change raises serious concerns. Among these effects, which further worsen hydro-meteorological disasters, include frequent occurrences of heavy rainfall, dry season, sea level rises, and hot temperatures (Hiwasaki, Luna, Syamsidik, & Shaw, 2014).

Rural and coastal communities are prone and vulnerable to these extreme impacts and thus are more likely to experience increased natural disturbances such as floods,

droughts, tsunamis, and landslides (Krishnaswamy, Simmons, & Joseph, 2012). Such impacts may further lead to adverse effects directly or indirectly on people's health and livelihood which, in turn, are likely to increase community vulnerability.

In addressing the concerns posed by the threats of climate change, scholars have forwarded the concept of resilience, recognizing that the vulnerability of communities can be reduced (Ayyoob, 2016). As a multi-faceted concept, community resilience is linked not only to physical and ecological aspects of the environment but also to political, economic, and social contexts. It has taken various definitions which emphasize the ability of communities to absorb and recover from disturbances while remaining firm and organized regarding structures and functions (Joerin et al., 2012; Djalante & Tomalla, 2011; Traerup, 2012). In this regard, Boon et al. (2012) claimed that community resilience can generally be described in three forms: ability to bear perturbation (resistance), ability to recover from shocks and disturbances (recovery), and ability to continuously reorganize and strengthen its capacity in addressing adversity (creativity).

Some research has taken different approaches in analyzing the community resilience concept. Several studies have examined resilience from the socio-ecological perspective (Kulig & Botey, 2016; Hooli, 2016). Other authors have incorporated social, physical, economic, cultural, managerial, and environmental domains in evaluating community resilience (Joerin et al., 2012; Saavedra, Budd, & Lovrich, 2012; Ostadtaghizadeh, Ardalan, Paton, Khankeh, & Jabbari, 2016). Previous studies have also analyzed resilience in relation to vulnerability and adaptive capacity assessment (Guleria & Edward, 2012; Kaul & Thornton, 2014). The assessment of community resilience has recently applied an ecological approach in understanding the concept as situated at multiple system levels (Boon, Cottrell, King, Stevenson, & Millar, 2012; Kessel, Gibbs, & MacDougall, 2014). Bronfenbrenner's bioecological systems theory has been useful in examining internal and external factors that are influential in improving resilience to disasters.

This study, which attempts to conceptualize resilience using Bronfenbrenner's model, is based on the notion that a lay understanding of people's experiences during and after disasters is necessary for understanding how they develop resilience across multiple settings. In doing so, it adds to the existing small body of knowledge that has explored the resilience across multiple level systems (Masten & Obradovic, 2008). The results of this study are expected to provide implications for disaster management, specifically in terms of putting service provision into operation at multiple levels.

OBJECTIVES

The general objective of this qualitative study is to explore community-level resilience to climate-related disasters in the coastal municipality of Bulakan, Bulacan.

This research has the following specific objectives:

i. To examine the experiences and lay perceptions of residents and authorities in preparing for and responding to natural disasters.
ii. To identify the internal and external factors (characteristics and interventions), which contribute to community resilience.
iii. To determine how internal and external factors are situated on different system levels.
iv. To analyze the implications of the study for the provision of disaster management services.

THEORETICAL FRAMEWORK

The bioecological model advances the view that individuals are influenced by various processes that exist in an environment composed of sequentially nested structures (Bronfenbrenner, 1979). In this theory, development pertains to the "phenomenon of continuity and change in the biophysical characteristics of human beings both as individuals and as groups" (Bronfenbrenner, 2001, p. 3). Originally applied to the field of developmental psychology, the theory has been utilized in various disciplines to determine the internal and external factors that affect human development as situated in specific contexts.

Over the life course, individuals are surrounded by five environments namely microsystem, mesosystem, exosystem, macrosystem, and chronosystem (Boon, Cottrell, & King, 2016; Boon, Millar, Lake, Cottrell, & King, 2012). Within the microsystem are immediate settings that facilitate an individual's close and direct interactions with the social networks where he or she belongs such as family, friends, co-workers, relatives, and school. In an exosystem, the individual is not a participant but is affected indirectly by different political, economic, and social systems. Reflected in the first three systems is the macrosystem which refers to the dominant ideological views inherent in one's society and culture. The last system of influence is the chronosystem which highlights the importance of time in analyzing the events and processes that shape the individual.

METHODS

This study was conducted in July 2016 in Bulakan, a coastal municipality in the province of Bulacan. Based on the Disaster Risk Assessment and Climate Change Vulnerability Assessment (DRA/CCVA) report, the study site, which is located along the shorelines of Manila Bay, experiences tidal flooding due to an estimated annual 7-millimeter rise in sea level. The report also stated that the municipality's coastal communities are also prone to other hazards such as storm surge and tsunami. In particular, the study sites came from four coastal *barangay* or villages – Perez, Bambang, Taliptip, and Sta. Ana – which were identified in the report as areas with a high level of susceptibility to flooding and storm surge (Figures 1 and 2).

Figure 1: Flood hazard map of the Municipality of Bulakan, Bulacan (Source: Municipal Planning and Development Office)

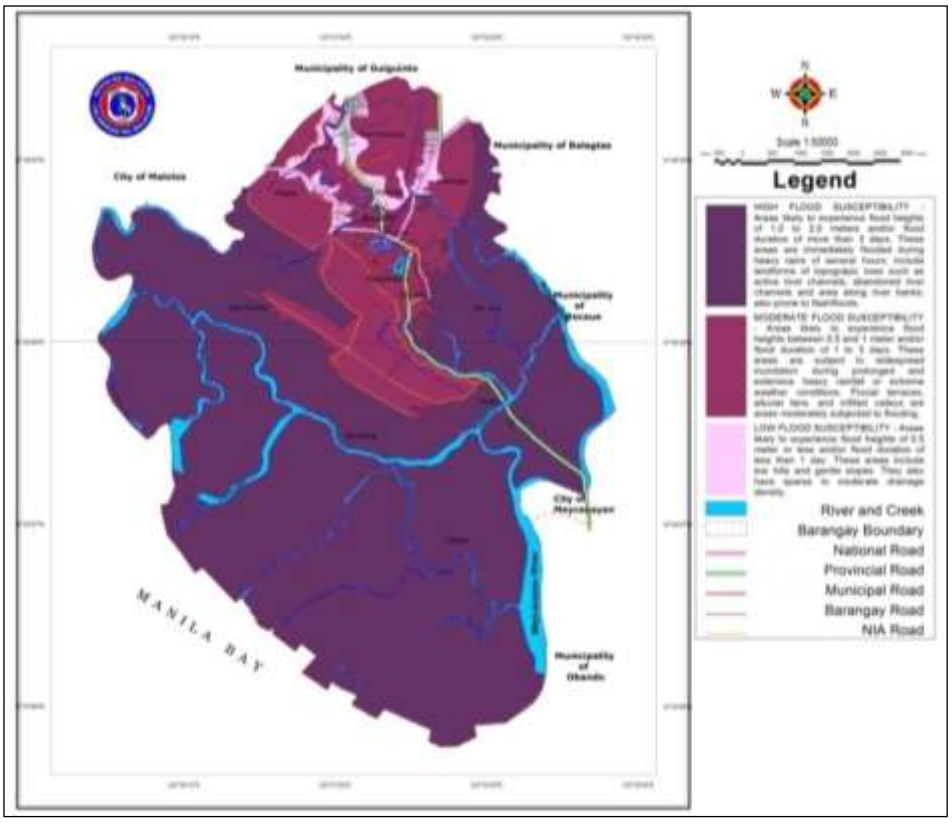
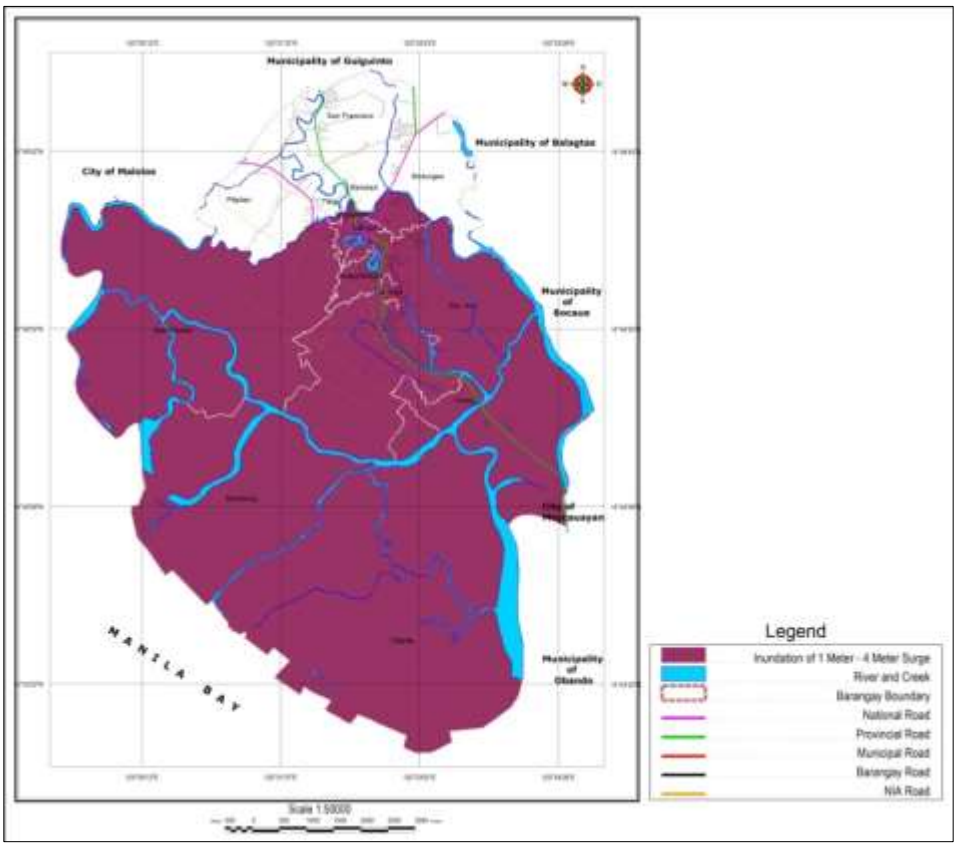


Figure 2: Storm surge hazard map of the Municipality of Bulakan, Bulacan (Source: Municipal Planning and Development Office)



Both primary and secondary data were collected. Primary data included 11 semi-structured key informant interviews and three runs of focus group discussions with 30 individuals. The participants included elected officials, volunteer workers, health workers, and residents who were directly affected by three major natural disasters: Typhoon Ondoy (Ketsana) in 2009, Typhoon Pedring (Nesat) in 2011, Habagat (Southwest Monsoon) in 2012. Their age ranged from 26 to 74 years. The majority (63%) of these participants who contributed to the results were female and were engaged in part-time work. Almost half (43%) of them finished high school.

An interview schedule used for both key informant interviews and FGDs was prepared and submitted to the scrutiny of experts. The key informants were asked to share their accounts on the following topics: (1) responses to the disasters before, during and after the disasters, (2) recovery after experiencing such disasters, (3) internal and external factors that contributed to community resilience. Prior to the collection of data, informed consent was obtained from the key informants.

All interviews were transcribed and subjected to a manual coding procedure. The coding process generated themes which were extracted and arranged using a systematic tool known as thematic network analysis. By employing such approach to analyzing qualitative data, coded text segments were translated into a thematic network composed of basic, organizing, and global themes (Attride-Stirling, 2001). Through this coding framework, recurrent themes or issues that were common across the interview responses were identified and interpreted.

RESULTS

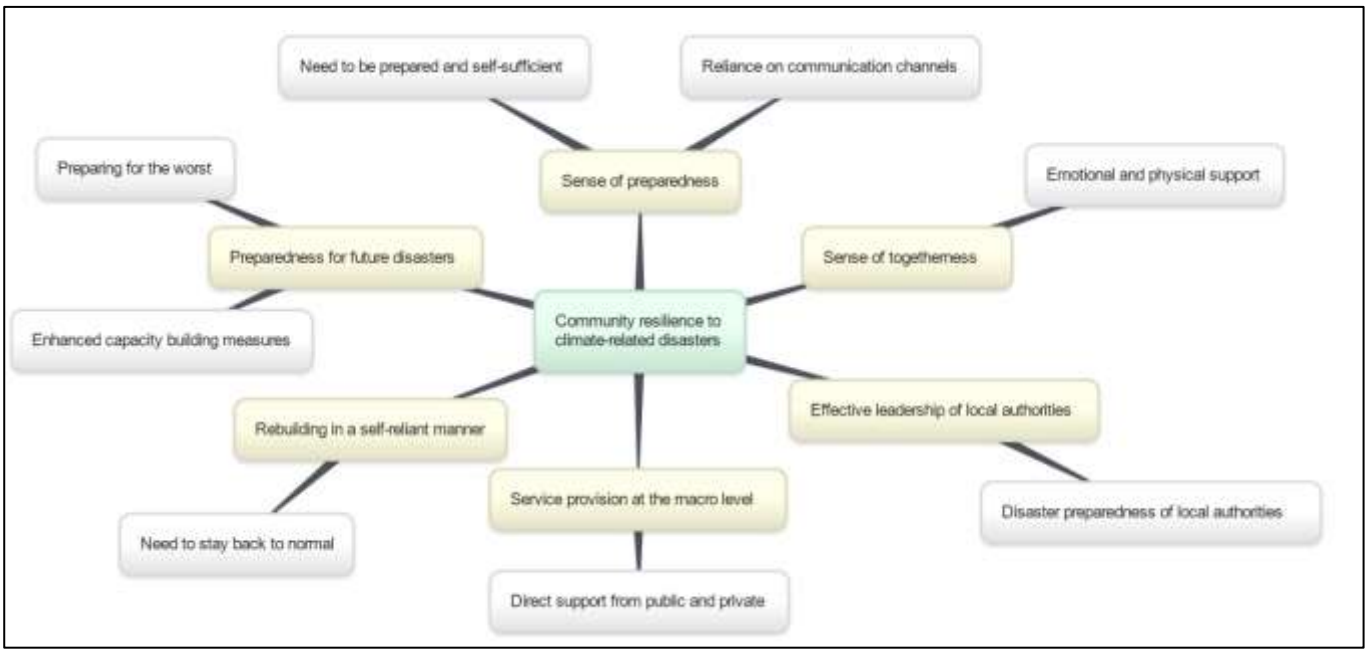
The thorough analysis of the texts generated 30 codes, which were further organized into eight basic themes and six organizing themes. As shown in Table 1, the thematic network analysis surfaced the following dominant organizing themes: sense of preparedness, sense of togetherness, effective leadership of local authorities, service provision at the macro level, rebuilding in a self-reliant manner, and preparedness for future disasters. Figure 3 illustrates the themes on which the global theme of community resilience to climate-related disasters was anchored.

Table 1: Global Theme: Community resilience to climate-related disasters

Codes	Basic Themes	Organizing Themes
Prior experiences with natural disasters Presence of mind Sense of urgency Stocking up on essentials Securing lives and properties	Need to be prepared and self-sufficient	Sense of preparedness
Reliance on television and radio Dependence on warnings issued by local officials Word of mouth	Reliance on communication channels	
Family and neighbor support during difficult situation Care from families and neighbors Presence of other individuals Generosity Strong community spirit	Emotional and physical support	Sense of togetherness
Issuance of warnings Evacuation of residents Volunteer workers Barangay Disaster Risk Reduction and Management Council (BDRRMC)	Disaster preparedness of local authorities	Effective leadership of local authorities
Donation of relief goods by public and private sectors Australian Aid Red Cross Municipal Disaster Risk Reduction and Management Council Provincial Disaster Risk Reduction and Management Council	Direct support from public and private sectors	Service provision at the macro level
Self-dependence Dependence on families Morale loss Restoration of the house Going back to work and livelihood	Need to stay back to normal	Rebuilding in a self-reliant manner

Being accustomed to disasters Alarming views of climate change Elevating the house Ensuring the availability of survival kits	Preparing for the worst	Preparedness for future disasters
Availability of rescue equipment Participation in disaster preparedness activities Creation of BDRRMC Restraints in resources	Enhanced capacity building measures	

Figure 3: Thematic network of Community Resilience to Climate-related Disaster



The analysis also identified codes as variables that were perceived by the participants relevant in supporting their resilience. As revealed in Table 2, these variables that reflected the characteristics of residents as well as the interventions done in the community occurred at different system levels. These variables are further explored in the succeeding sections.

Table 2: Variables that contribute to community resilience

Community Microsystem	Community Mesosystem	Exosystem	Macrosystem
• Prior experiences with natural disasters • Presence of mind • Sense of urgency • Stocking up on essentials • Securing lives and properties • Dependence on warnings issued by local officials • Family and neighbor support during difficult situation • Care from families and neighbors • Presence of other individuals • Strong community spirit	• Word of mouth • Issuance of warnings • Evacuation of residents • Volunteer workers • Barangay Disaster Risk Reduction and Management Council (BDRRMC)	• Donation of relief goods by public and private sectors • Australian Aid • Red Cross • Municipal Disaster Risk Reduction and Management Council • Provincial Disaster Risk Reduction and Management Council • Availability of rescue equipment • Participation in disaster preparedness activities • Creation of BDRRMC	• Reliance on television and radio • Generosity • Morale loss • Being accustomed to disasters • Alarming views of climate change • Restraints in resources

• Self-dependence • Dependence on families • Restoration of the house • Going back to work and livelihood • Elevating the house • Ensuring the availability of survival kits			

Sense of preparedness

The experiences of the participants with major natural disasters became instrumental in fostering a sense of preparedness at the microsystem level. In particular, their experiences with previous disasters taught them valuable lessons on securing their lives and properties. In particular, one participant stated: *"(Typhoon) Ondoy had become a lesson because most of the houses were affected by the flood."*

Hence for the subsequent occurrences of natural disasters, the participants demonstrated the presence of mind and sense of urgency. Once they were alerted about an impending calamity, they immediately stocked up on food, water, and medicines and put all their clothes at a higher place. Some participants even had to tie down parts of their houses. As shared by a local official:

"They were somehow ready. Upon knowing that a typhoon was coming, they started preparing. They secured the rooftops of their houses. They then started buying their food, candle, and flashlight. They had become more prepared."

Reliance on television and radio for updated weather information was substantial in alerting the community to prepare for disasters. At the mesosystem level, it helped that the local authorities roamed around the village to issue warnings to the residents. Participants who were near the fish ponds relied on their observations of the increase in water level. Word of mouth also became a crucial means of timely communication in the neighborhood. These practices were evidenced in the following statements:

"When they knew that flooding would occur, the barangay tanod (police officer) gave us signal and told us, 'You have to prepare.'"

"Once we heard from the TV reports that floodwater would rise, that water would be released from the dam, we started preparing for it. We immediately put our valuables at a higher place then started running everywhere."

Sense of togetherness

The participants regarded the support offered by families and neighbors beneficial to minimizing their stress and fear. They experienced both emotional and physical support, which enabled them to secure their lives and properties. More importantly, the support was translated into a sense of togetherness which allowed them to endure the difficult situation with fortitude. It was manifested during the evacuation period when the presence of other family members and neighbors was enough to ease their adversity. When asked what particular attribute helped them in coping with a difficult situation, a key informant answered: *"Certainly, we were together whatever happened despite being worried about when the typhoon would finally stop."*

There were also instances when selfless desires to help each other were exhibited in the neighborhood. The participants noted the generosity of affluent families who were willing to offer their houses as temporary shelters. The strong community support was also manifested during the calamity when some residents willingly provided food for the evacuees. A key local official remarked:

"There was 'bayanihan.' We were helping each other. Most of the time, for instance, women and children were invited to transfer to a nearby elevated house. There were also those who could afford to give food to the evacuation center."

Effective leadership of local authorities

The participants attributed the preparations made by the village council officials as beneficial interventions that increased the level of community resilience. They commended the local authorities for undertaking actions such as alerting the residents of an impending disaster and evacuating them when necessary. The interviewed officials shared that they would usually roam around the village and issue warnings via megaphones. They added that they sometimes encountered difficulty in forcing the residents to evacuate especially those living along the coast. As articulated by one of the local officials:

"During the rainy season, we start making preparations. We should have conducted meetings so that when a disaster comes, we already know what should be done. Here in our barangay, we make announcements through our patrol (vehicle). We have megaphones. We would roam around the village and inform the residents that a typhoon is coming, that their food, medicines, flashlight, and clothes should be ready . . . those things that they need for the next 72 hours."

The local authorities also tapped the services of some residents who served as volunteer workers, facilitating quicker response in the rescue efforts and distribution of relief items during and after the disasters. Evacuees and residents who came from disadvantaged households were

the foremost priorities. As explained by a focus group participant:

"Our phone lines were open in case there was a need for evacuation. Those who were rescued were brought to schools. We do not have a rescue boat. That's why, as early as possible, we would bring our rescue vehicles, go directly to their houses, and rescue them, especially the children."

The above-mentioned preventive measures were positive offshoots of the creation of the Barangay Disaster Risk Reduction and Management Council (BDRRMC), which provided a faster mode of responding to the needs of the community in all phases of response to and recovery after the disasters. The delegation of tasks among the local authorities, who were appointed to different committees (e.g., security, rescue, fire brigade, evacuation, warning, supply and logistic, relief, medical and first aid, transportation, communication), resulted in convenience and efficiency in carrying out disaster management objectives.

Direct support from public and private sectors

Aside from the support gained by the participants from families and neighbors, the support provided by various entities and organizations became critical to building resilience during and after the disasters. The exosystem support was clearly apparent in the outpour of relief goods from the government agencies. Many interviewees made references to their village leader, mayor, and governor as the key personalities who gave large amount donations. These were evidenced in the following verbalizations:

"When their stay in the school was extended for three days, we asked help from our mayor, our governor. Even when they were about to leave, our governor gave extra clothes and food since they could not instantly go back to their work."

"We received relief goods for our daily needs. We are thankful to our barangay captain who offered help because if it was just us, we could not survive on our own."

The support of the private sector was also evident during the evacuation period. Much of this assistance was also in the form of relief items such as food, clothes, utensils, and blankets which were brought directly to the evacuation centers. The participants cited the help given by local associations, religious organizations, and socio-civic organizations. However, not all those severely affected were given donations since according to a volunteer worker: *"We always prioritize those who are poor. Our barangay captain determines who should be on our priority list."*

Rebuilding in a self-reliant manner

While a sense of togetherness contributed to individual and community coping during calamities, it was evident that the participants exhibited self-reliance as they tried to "stay back to normal" after experiencing distress. Most of their responses indicated that they had to depend on themselves and their families while recovering from the impacts of disasters. As one of the key informants remarked:

"Nobody could really help you but yourself. My neighbors could not help me because they were also badly affected."

Instead of complaining about their situation, the participants were even grateful that they survived and safely went back to their homes. They had to move forward with rebuilding their lives by focusing on restoring their house as a clean haven and going back to their work and livelihood. As shown in the following comments of the residents:

"You just have to pray that despite everything that had happened, your house still stands. Now, the only thing that you have to do to recover is to go back to your work and persevere."

"For us, Filipinos, it is typical that even if we are affected by a disaster, we can still smile. We do not give up easily."

Service provision at the macro level

Attendance at disaster preparedness training sessions and seminars, which was mostly done by local authorities and volunteer workers, resulted in changes to planning and operations at the village level. Two notable examples given by the key informants were those sponsored by Australian Aid and Red Cross. The former led to the formation of a disaster risk reduction plan which contains pertinent information on the profile of the village, description of hazards and disasters, a situational analysis of the vulnerability and capacity of local residents, and plan of actions in all phases of disaster management. The latter strengthened the implementation of medical operations and increased the networks of volunteers.

The creation of a village-based DRRMC facilitated better coordination with its counterparts at the municipal and provincial levels. Its immediate outcome was the provision for rescue equipment by the provincial government. The elevation of the road was also recognized as a highly beneficial macro level intervention by the government. However, there were still areas that still need to undergo rehabilitation. In one of the focus group discussions, road construction was seen as a "solution to end the long-term flooding."

Preparedness for future disasters

Most of the participants ascertained their readiness for future disasters. Since they became accustomed to experiencing adversity, they had no choice but always to prepare for the worst. This perception was further strengthened by their alarming views of climate change, which they contended had become influential on their decision-making. Some households had already begun employing preventive measures such as elevating their houses and ensuring the availability of survival kits. As shared by the key informants:

"Before, we did not mind climate change. Now, we are experiencing it and that it should not be taken for granted. It is important to know more about it because we are really

affected. It is not only you. Everyone. That's why we should all be prepared."

"Since our place always experiences high tide, most of the houses here are already elevated. If you would notice, the floodwater level here cannot be easily determined. It keeps on rising."

The local authorities, for their part, enhanced their planning and operations to rebuild their capacity when responding to catastrophic events. They attributed their preparedness to the availability of rescue facilities, participation in disaster preparedness seminars and training, and the establishment of village-based DRRMC and Red Cross chapter. However, they admitted that their capacity building efforts were still restrained by limited resources.

IMPLICATIONS

The results of this study offer the following implications for disaster management service provision. First, priority should be placed on educating the public on disaster preparedness. It is commendable that local authorities are actively involved in seminars and training sessions conducted by government and non-government agencies; however, additional efforts are still required to engage the community in a massive awareness and sensitization campaign. Hence, the concept of preparedness among the residents should not only be focused on short-term precautionary measures but must also deal with long-term mitigation and adaptation strategies. Such strategies can then be tailored to each village or community depending on its geophysical and socio-economic conditions. Eventually, the people will become active actors in strengthening their capacities to respond to the adversity caused by natural disasters.

Second, the support and assistance provided during and after disasters should consider other essential services that can address the needs especially of those who are vulnerable. Aside from ensuring that relief items are well distributed, the provision of other social welfare services such as counseling, health assistance, and financial support should be given utmost consideration. These additional exosystem interventions can be beneficial in facilitating faster recovery. In this regard, associations within the village (e.g., mother leaders, Pantawid Pamilya Pilipino Program beneficiaries, religious organizations) can be transformed into support groups and networks to provide assistance to vulnerable individuals and households.

Lastly, the creation of a *barangay* disaster risk reduction plan necessitates the need to make relevant and updated information widely accessible to every resident. Concise versions of the plan can be communicated in the form of pamphlet, poster, or newsletter. Thus, relevant information on mitigation strategies and other disaster preparedness activities can be disseminated to vulnerable communities, particularly to those located along the coast. Moreover, such communication materials can be utilized in information and education campaigns which can be done in online spaces such as social media.

CONCLUSION

This qualitative study explored the factors that contributed to building community resilience to natural disasters. It has surfaced dominant themes that capture the characteristics and experiences of the participants based on their lay accounts of how they responded to and coped with adversity caused by calamities. Bronfenbrenner's model serves as a useful lens in further understanding how interventions have largely contributed to resilience at multiple system levels. It advances the view that resilience can be fostered not only through individual actions but also by collective efforts. In particular, the presence of care, support, and assistance within and between the system levels is considered vital to strengthening the community's capacity to adapt to and recover from adverse impacts. This study also highlights the activities employed by local authorities in preparing for future disaster events, which can be translated into more proactive efforts through well-informed planning. The preceding findings provide relevant implications for the provision of disaster management services.

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