

A Comparative Study of the Flood Control Programs of Malabon City and Candaba, Pampanga in the Philippines

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ABSTRACT

This research sought to compare the flood control program of Malabon City and Candaba, Pampanga, in Philippines. The study used a case study design. It involved community stakeholders and local government officials such as the officials of Municipal Disaster Risk Reduction and Management Office (MDRRMO), barangay captain, counselors and members of the community selected using convenience sampling in each of the locale. Coding of themes was done to analyze the collected data. Results showed that flooded area became a natural environment for the people of Candaba. Improper waste disposal is rampant that possess the biggest threat in flooding problem in Malabon. Early warning framework, concrete evacuation plan, order and security management, relief system, DRRM and reporting system, rescue and recovery plan are the contingency plans to delimit the effect of flood in these places. Systematic review on existing policies, sustainability measures and community involvement will provide more productive and significant results in the future.

Introduction

Floods continue to pose serious damage to our properties that costs billions of dollars. It also causes injuries and fatality to people (Brown, 2012, Zhang et al., 2016). Human activities greatly contribute to the main problem of the study. Thus, instilling awareness to people on the different roles and responsibilities to lessen the effect of flood is necessary (Huang, Li, Li, Zhang, & Zhang, 2016). The study highlights the

general contribution of the community in reducing the effect and solving problems related to flooding. The different initiatives of the government in addressing problems in flood mitigation are discussed throughout the course of the research. At the end of this paper, the researchers presented the different programs implemented by the government that helped in improving the current status of the problem on flooding in Malabon City and Candaba, Pampanga, Philippines.

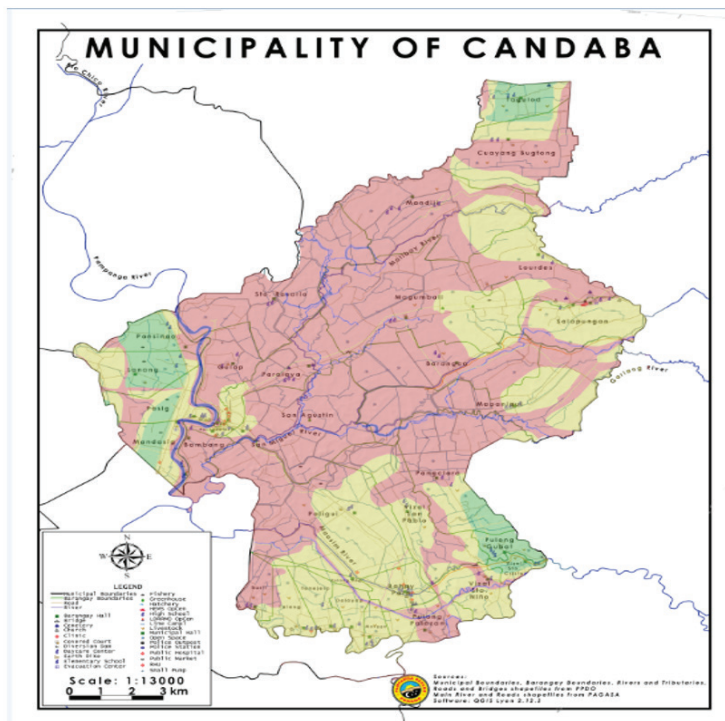
Flood control program in other countries abound the literature. For six years, China has already been investing on different programs to control flash flood in their country. These programs contributed a lot to the success in preventing unforeseen disasters (Guo et al., 2018). In Netherlands, they devised a strategy that will demonstrate accurate measurement of rainfall monitoring that will help in preparing for possible flood control (Overeem et al., 2013). Their program supports identifying flood prone area as very important in devising plans and mapping (Papaioannou et al., 2014). Such may be applied to the condition of Malabon City which is nearby the flood prone areas and Candaba, Pampanga being known as the catch basin of the different surrounding provinces. These preparations will greatly help in providing disaster risk reduction mapping sites for susceptible flood areas.

One of the components of flood management is pre-flood preparedness

that covers the ways and extenuation plans when flooding is experienced. To note, every year Candaba Pampanga and Malabon City experience flooding that lasted for one to three months. This problem in flood mitigation certainly affects the people's way of living. Throughout the year, the government is still resolving this issue and it appears that the problem remains the same. Hence, the present study would like to identify to what extend has the country improved in terms of planning and control, discipline and waste reduction by comparing the flood control programs of Malabon City and Candaba, Pampanga in mitigating the floods within their respective locality.

Geographical locations and Challenges

Canaba, Pampanga is one of the flood-prone municipalities in Pampanga due to its geographical location. Candaba is considered as the second-largest municipality in Pampanga in terms of geopolitical unit. On



(Source: Flood Contingency Plan (2017-2018), Local Disaster Risk Reduction Management Council (LDRRMC), Municipality of Candaba (Printed Materials))



(Source: *Malabon city: An economic coastal hub*. (2001, January 1). We are Dumaguete Info | Dumaguete's premier Life and Tourism website. <https://dumagueteinfo.com/other-destinations/metro-manila/malabon-city/>)

the average, its municipality experiences flooding twice a year. In extreme conditions, flood usually lasts for two to three weeks with a magnitude of at least four meters in swampy areas and an average of one to two meters in residential areas. It is triggered by the large volume of water coming from the nearby provinces such as Nueva Ecija, Tarlac, Aurora and Bulacan and aggravated by the release of water from the big dams in Bulacan namely, Pantabangan, Angat, and San Roque Dams.

Malabon City is the sub-region part of Metro Manila that belongs to the CAMANAVA (Caloocan, Malabon, Navotas, and Valenzuela) cities. Its geographical

structures make it more susceptible to flooding particularly during high tides, heavy rainfall, and dam overflow. The CAMANAVA cities are also affected by the interconnected rivers and one of these is the Tullahan River ("Malabon City", n.d.). Eighteen barangays of Malabon City out of twenty-one belongs to the flood risk areas. Asian Development Bank mentioned that the city of Malabon was tagged as one of the flood-prone areas in Metro Manila. In addition, the city was also recorded as one of the seven cities in the Philippines to be exposed once the sea level reaches one meter. Due to these occurrences, the city government is trying to alleviate flood by building river walls and pumping stations. Today, the city has 43 operational

pumping stations and 102 operational flood gates supplemented by regular unclogging and cleaning of canals, rivers, and creeks. However, human activities such as improper waste disposal, specifically throwing of plastics contribute to the clogging of pumping stations which may possibly lead to the rise of water (Francisco, 2017).

Various countries innovate different ways on how to manage the flood problem. In the Philippines, we continue to seek for an answer to this problem that affects the livestock, properties and sources of funds of many ordinary Filipinos. Thus, this study determines the different practices and various existing programs which can provide a wider perspective on how to deal with the current flooding problems. Specifically, this study sought to answer the following questions:

1. What is the general contribution of the communities in reducing the effect and solving problems related to flooding?
2. How does the government address the different related problems on flood mitigation?

3. What are the programs implemented by the government that help in improving the current status of the problem on the flood?

Methodology

Research Design

The research utilized case study to describe the current situations in the aforementioned communities in terms of the perennial problems in eliminating the effect of flood in the community. The study explored the contributions of the society, government and different non-government organizations (NGOs). This current case study compared the Flood Control Program of Malabon City and Candaba, Pampanga to provide information in understanding how these two communities implement their practices and governance. The resulting comparative outcomes were envisioned to provide awareness to capacitate the communities to anticipate and adapt to changing world problems due to natural calamities. The summary of the full research process is presented in Figure 1.

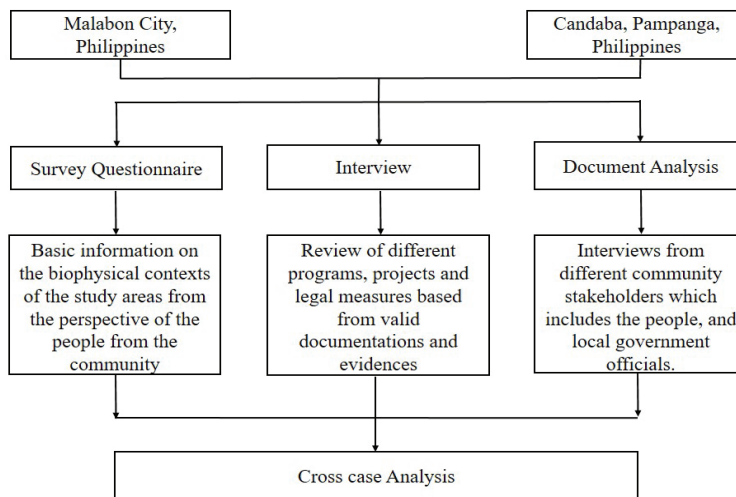


Figure 1. Summary of Research Process

Participants of the Study

There was a total of 38 participants in the study, 10 from the municipality of Candaba and 28 from Malabon. They were selected using convenience sampling. Participants of the study are local government officials such as: MDRRMO officers, Barangay Captain, and Barangay Tanod and members of the community who are living in the study site from the two municipalities. They were selected based on the following criteria: (1) individuals residing in their community for at least three years and above; and (2) officials of the government with direct participation in the project. The number of years of residency was considered because it will help the researchers determine the possible improvement that happened after the implementation of different programs. Officials with direct participation basically are more informed of the previous and current plans being implemented.

Instrument

Survey questionnaire

The survey questionnaire adopted the Citizens' Participatory Audit (CPA) technique used by the Commission on Audit CPA Report No. 2013--002 Pilot Audit 1: KAMANAVA Flood Control Project. Used in conducting a performance audit of the Kalookan-Malabon-Navotas-Valenzuela (KAMANAVA) Flood Control Project of the Department of Public Works and Highways (DPWH) for the period April to July, 2013 (Camon, 2014). The survey questionnaire consists of basic information on the biophysical contexts of the study areas from the perspective of the people from the community. Public records such as Annual Report and records of an organization's activities was used in the research study. Municipal annual reports were the main source of data. It is a public document uploaded in webpage of the city for public information, therefore no ethical issues were violated. Four-year annual

reports from 2014-2017 were used in the study to widen the range of data (Bowen, G. A., 2009), and be able to observe the improvement of programs per year. The consistency of the report and completeness of parts were also observed (Bowen, G. A., 2009).

Interview

In the interview conducted, a semi-structured questionnaire was used, which cover the following themes: (1) first two questions involved their observations in their physical surrounding; (2) another two questions queried on their ideas in the different projects of the government related to flood; and (3) the three remaining questions focused on different scenarios such as: why flood still exist in the area, their contribution in order to help the government in mitigating flood, and their suggestions or possible solutions that can help in improving the current situation. Before the start of the dialog, the interviewers introduced themselves for identification purposes only. Conversations were audio recorded with the participants' prior written consent. All responses were kept strictly confidential. Probing questions were also considered but only part of the adlib to encourage more sharing of information and clarifications (Jacob & Furgerson, 2012).

Data Collection

Data collection had three primary components: 1) basic information on the biophysical contexts of the study areas from the perspective of the people from the community; 2) review of different programs, projects and legal measures based on valid documentations and evidences; and 3) interviews of different community stakeholders which includes the people, and local government officials. To establish the basic data on the study areas from the perspective of the people in the community, the survey questionnaire was given to the

participants. A four-year annual report from the City Planning and Development Department, Malabon City Annual Report year 2014 – 2017 was used as reference for document analysis. The report contains the different sectorial reports such as: 1) social development sector, 2) environmental & natural resources management sector, 3) economic development sector, and 4) infrastructure development sector which are deemed necessary for the study. To delineate the different experiences of the people in the setting of the study, the researchers employed a case-by-case analysis that explores patterns, similarities, and disparities from the survey, interview and document analysis.

Data Analysis

Data gathered from survey questionnaire were tabulated, organized, analyzed, interpreted and presented in textual and tabular forms. The different programs, projects and legal measures which were based on understanding from experiences and knowledge of individuals involved in different programs, activities and action plans of the local government and the respective roles they do were reviewed. Data were organized based on the problem stated in the study. Researchers marked the documents with the official seal of the city to make them authentic. They, too ensured that the facts were explored to avoid latent contents (O'Leary, 2014). Then, they clustered the coded data into categories and gathered the textual documents. Lastly, they noted the meaningful segments of the data and registered the emerging themes.

Ethical Consideration

Ethical principles were strictly observed in this study. Informed consent was accomplished, signed by the participants and secured prior to the conduct of the study. Participation in the study was voluntary and could be withheld by participants who consented at any time. The participants were

provided with full disclosure information that helped them make an informed decision to participate, and that translated into an uncoerced, self-directed decision. The identities of the participants were not disclosed, for confidentiality and anonymity. As research participants, they were also granted the right to withdraw at any time.

Findings

1. MALABON CITY

1.1. General contribution of the community in reducing the effect and solving problems related to flooding.

Based on the status of the participants, 28 live in the community for more than three years and four of them live only for 1-3 years, 12 experienced flooding and only two did not. Sixteen of the participants say that flood is because of the rainy season, 20 during typhoon and 13 during high tide. During high tide the people experience flooding from above 1 meter up to below 0.5 meter which shows the gradual lowering of the water level. During typhoon, majority of people experience above 1-meter water level and the majority fall below 0.5 meter during the rainy season. Ten of them explain that they are not familiar with the DPWH Flood Control Project.

Residents of Malabon City believe that flood becomes part of their living. The challenge of evacuating during a typhoon, and the struggles of drying and cleaning their furniture and surroundings, and the waste brought by the flood should be disposed of properly. During the interview, the participants identified different reasons why flooding is still a perennial problem. These are their common responses: "*marami kasing informal settlers dito sa amin at yung iba sa dami ng basura*" (there are many informal settler here and tons of garbage), "*burak*" (mud), "*pasaway kasi yung*

mga tao dito kaya siguro bumabaha”(people here are disobedient, that is the reason why there is flood), “Puro basura, barado kanal” (Tons of garbage, clogged waterways). From their statements, it was evident that improper waste disposal, lack of discipline, overcrowding and informal settlers lead to a big problem related to flooding.

The community, local government and private individuals are being involved in different programs that aim to solve the current problem. Based on the different documentations, plant nursery operations, greening, and beautification of parks, sidewalks and center islands, and other government facilities were part of the urban greening endeavors of the local administration. Planting activities were conducted in various barangays in the locality as part of the Greening Program of the City Government (City Planning and Development Department, Malabon City Annual Report, 2014-2017). The Philippine Commission for the Urban Poor, in cooperation with the Civil-Military Operations Battalion also performed free training and seminars on Disaster Risk Reduction Management. “May Kita sa Basura”, this policy aims to teach the community in recycling plastics and turn it into a livelihood program.

1.2. Government programs that addressed the different related problems on flood mitigation

Flood control program implemented by the government may have helped the community to elevate their living in spite of flooding problem. But the implementation and effectiveness of the program still rely on its constituents. Based on the interviews, participants believe that discipline is the number one solution for the program of the government to become effective.

The City government of Malabon promotes, “Iwasan ang Sakuna, Isulong natin ang Paghahanda” (To prevent disaster,

Planning beforehand is a must!), a part of Project SUCCESS (Strengthening Urban Communities Capacity to Endure Severe Shocks), and the existing pumping stations and flood gates system (City Planning and Development Department, Malabon City Annual Report, 2014). The collaboration of the local government, district office, and the National government, leads to the development of pumping stations and flood gates in the whole of CAMANAVA area. Reinforcing the policy on waste management through local ordinance will help reduce and eliminate waste. The City is also continuously intensifying the operation of the Anti-Littering Ordinance by constructing a two trash traps in two major river systems that served as mechanism that will help in trapping waste in the river.

1.3. Programs implemented by the government that help in improving the current status of the problem on the flood

Majority of the suggestion of the participants focus on discipline on waste management. The great deal in educating the people in proper waste management must be the priority. Giving emphasis on this issue may give rise to mitigation of the problem. In line with the government programs are Urban Greening and Solid waste management.

Based on the interview conducted, the following statements from the participants make known the changes that brought about the establishment of a flood control project. Some of their responses are: “*may kulang talaga*” (there is missing), “*wala naman*” (none), “*walang nangyayare*” (nothing is new), “*ganun pa din, lalo na tuwing gabi halos hanggang tuhod na yung baha*” (still the same, especially during nighttime the water almost reach the knees), “*Wala kasi, wala namang proyekto ginagawa ang DPWH*” (None, the DPWH has no project), “*Late nga eh.... Diba traffic*” (late... traffic), “*Oo, dina bumabaha. Dina masyadong malamok tas nakakalakad*

na kami sa kalsada kahit di naka bota” (Yes, no more flood, the mosquito also lessen, then we can now walk on the street without boots). From the fourteen participants, only two says that the project is beneficial in their daily living.

Different evidences from documentaries reveal that the City government is continuously upgrading and implementing maintenance of streets, canals, and creeks to prevent flooding which helps in boosting investments in the city. City Environmental and Natural Resources Office (CENRO) conducted a series of lectures in schools with the theme “Pamahalaan at Eskwela Para sa Kalikasan”, (City Planning and Development Department, Malabon City Annual Report, 2015). The hands-on collaboration of the Division of Malabon City with CENRO in implementing projects related to nature rehabilitation and Disaster Risk Reduction includes, “Kaya Naten” Caravan. This project focuses on information and education campaign related to how to take care of our environment that can help in easing the problem on flood (City Planning and Development Department, Malabon City Annual Report, 2016).

2. CANDABA, PAMPANGA

2.1. General contribution of the community in reducing the effect and solving problems related to flooding

The participants live in the community for more than three years and all of them experienced flooding. All of the 10 participants say that flood is brought about by typhoons and rain. All participants mention that the average level of water during typhoon rain is about 1 meter and above and that they are not familiar with the Flood Control Plan.

The adaptation of residents to the disaster in certain areas correlate to the residing years of the residents. All of the

participants said that they were residing in Candaba, Pampanga from the time they were born. Length of residency plays a major role in adapting to the different disaster for instance flood. In an interview, Mr. Bell Cramel said *wa, banwa-banwa atin kening Baha (yes, every year we experience flood here)* and because of this, people of Candaba were able to adapt to its yearly flooding problem. He even claim that they cope with such disaster by building elevated houses, while some locals actually own a boat as a means of transportation when the flood is high.

Drills and simulated exercises are regularly conducted in full participation of all sectors of society. Identifications and involvement of NGOs and their commitments in the implementation phase of the plan. After the disaster operation activities, the LDRRMC convene to evaluate and determine the strengths and weaknesses of the implemented plan. All issues are determined and recommendations would be made. The results were transmitted to LDRRMO.

2.2. Government programs that addressed the different related problems on flood mitigation

Aside from the natural disaster, there are several factors to consider why Candaba, Pampanga is continuously experiencing high floods and disasters: overflowing of water in the river, garbage that was not properly disposed of, limited knowledge on how to empower the Flood Control program, limited water paths and most critically is its geographical position. The geographical position of Candaba which stands as catch basin of its nearby provinces such as Nueva Ecija, Bulacan, and Tarlac worsens the flooding condition.

Flood mitigation is the lessening or limiting the adverse impact of flood in a certain area. According to LDRMMP Candaba, mitigation is structural or nonstructural management done to lessen the adverse

impact of natural hazards, environmental degradation, and technological hazards. Thus, mitigation can ensure the ability of communities that are at-risk to address the vulnerabilities by minimizing the impact of disasters. The MDRRMO has risk reduction strategies to address the flood disaster: 1) strengthening of flood control dikes, 2) implementing proper solid waste canal disposal provided adequate Evacuation Centers, 3) implementing pre-disaster plan, 4) strict implementation of zoning ordinance, 5) acquisition of resettlement area for informal settlers, 6) construction of slope protection along eroded riverbank and 7) declogging of drainage canal before the rainy season.

2.3. Programs implemented by the government that help in improving the current status of the problem on the flood

Knowing the project in the locality is important to residents. Project initiated by the government can help the citizens upgrade their living condition or help them during a disaster such as flooding. Based on interview, the people residing in Candaba are not aware or familiar with flood control development. Miss Carmen Fill said that (*hindi ko alam kung meron project ang DPWH para sa baha dito sa atin....kasi hindi naman nahihinto ang baha taon-taon*) the unawareness of the residents on the project initiated by the government is evident in the gathered data. Based on the statement of Mr. Rod Crust during the interview, that there is a project called Pampanga Delta Development Project, popularly known as “control” for Candabeños. Upon completion of the project, there were no major positive improvements in terms of alleviating the casualties and flood rates.

In addressing the issues and concerns, different systems and protocols were developed: 1) early warning framework, 2) evacuation system through the Municipal

Evacuation Plan, 3) order and security management, 4) relief system, 5) DRRM monitoring and reporting system, 6) rescuer deployment, and 7) recovery plan. The LGU adopted the use of sirens and/or another centralized warning system as the official means of relaying alert of signals. The local government also provide alternative contingency plans to help the people affected. *Kagaya dito sa opisina ko (MDRRMO-Operation) may mga contingency plan natin dito...yung mga cut off channel ginagawa...tumataas ang tubig dyan 3 o 4 feet. Nagkakaroon kami ng libreng sakay, ginagamit natin yung mga heavy trucks natin (Like here in my office (MDRRMO-Operation) we have here contingency plan... we are fixing the cut off channel... the water level there rises to 3 or 4 feet... we conducted free ride using our heavy trucks.)*

Discussion

Sustainable development goal (SDG) 13 which is focused on combating climate change and impact on people’s lives promote readiness and adaptive ability to climate-related threats and natural disasters (Doni et al., 2020). The study conducted emphasized: 1) defining the general involvement of the public and private individual in reducing the effect and solving problems related to flooding are important, 2) evaluating the response mechanism of the government in addressing various interrelated problems on flood alleviation, and 3) identifying the different programs, projects and ordinances that aims to improve the current status of the difficulty in eliminating the source of flood.

Community practices which involves the proper utilization of land resources, water management, and safety and risk regulation play vital role in integrated flood management (WMO, G., 2014). There should be collaboration with all stakeholders and government institutions in order to properly execute the different plans in upgrading the

standard of living of the common residents. All of these ideas should be put into practice and not just advertise in social media and public archives. Consistency and inclusivity of projects will help in improved practices. The public usually take for granted the law because of ignorance and lack of education. Raising the level of awareness through integration of home and school training will reinforce the expected behavior. The belief system will play an important role in correcting the different faults in the present way of living. The natural response of every individual towards disaster should reflect in their daily living. The practices in their respective homes should give a positive impact on national and local scenarios. Najafi and colleagues (2017) emphasized that attitudes, social expectations, and perceived behavioral influence over disaster preparedness behaviors (DPBs); and actually practicing DPB was directly linked to the control goals and beliefs measured in prepared people. The effectivity of the solutions does not only focus on influencing the people to do what is right, but also imparting the good intentions and motivation in carrying out their responsibility as Filipino citizens. The study wants to highlight the role of every individual's attitude, perceived behavior, and personal standards in creating positive intention. This behavior will create a community of law-abiding people. Similarly, the government should continue to provide helpful information, capacity building and resources to do it.

In spite of different problems, the city government is still moving to address the problem. Road network and bridge improvement, the establishment of Green police to apprehend violators on cleanliness/no littering campaign. It is being supported by different capacity building and equipment enhancement. The city government established a lot of programs in support of its advocacies to lessen the scenario of flood in the premise such as: (1) strengthening civic awareness and preparedness on Disaster

Risk Reduction; (2) encouraging the people to plant more tress as part of greening program; (3) anti-littering campaign; and (4) construction of trash traps system. Through the help of the National government, they were able to acquire pumping stations and flood gates system. On the other hand, the local government of Candaba, Pampanga is facing problems because the area was a catch basin of water. Flood became a natural environment for the people. Early Warning Framework, Evacuation System through the Municipal Evacuation Plan, Order and Security Management, Relief System, DRRM Monitoring and Reporting System, Rescuer Deployment, and Recovery Plan are the contingency plan to delimit the effect of flood in the place. The diverse measures of Candaba, Pampanga include the creation and implementation of plans, programs, and projects, awareness campaigns, policies on land-use and resource management. Moreover, it is also necessary for the enforcement of comprehensive land-use planning, building, and safety standards. It appears that proper waste disposal, and discipline of the people in the community play the biggest role in the problem of flooding in both places. Clog canals caused by improper waste disposal, informal settlers and proper maintenance of facilities. Consistency is very important in the project, after that there is no known means established by the people to help in alleviating flood problems. As part of the growing community, people and the citizens should learn how to love the environment. Proper discipline in waste disposal will make a big impact on our environment. As a governing body, the government, there should be consistency in the implementation of policies so that people may also learn how to be consistent. Providing livelihood and shelter to informal settlers, campaigns, and urgency of the law. Continuity of the program should be observed, involving all the stakeholders from the very basic unit of the community and up to the highest form of government. The study is indeed very important for us, for the local

government and for the benefit of the whole country. It is an eye-opener for all of us, the cause and effect of lack of discipline, love for our country and consistency of policies of the National government. Proper allocation of budget to maximize the capacity of each individual and program implementation. The integration of different measures on our national policies, strategic planning and capacity building of every member of the community. The people's initiative enhanced by improved policies will give way to more productive outcomes. The City of Malabon is resilient in policy implementation, corpus of documentations will attest. In order to increase the human and institutional capacity on flood mitigation, and lessen the impact of possible difficulties, the city government should raise the awareness of the public, help the people in providing opportunities to make a living and visibility of the law. Provide the means and ways in some distressed areas that contribute in the problem. This is congruent to Candaba, Pampanga, people need innovative solutions since this is already brought by nature.

Malabon City invest a lot of effort in preparing and alleviating flood. Series of campaigns involving different sectors of the government including Department of Education, Civil-Military Operations, and local administrations. Projects such as recycling plastics and turn it into livelihood programs. Based on the different feedback of the study, the effectivity of the project was jeopardized by different negligence of the community stakeholders as mentioned in the previous literature. This may serve as evidence for improvement and big challenge to improve our living. The effectivity of flood control program of the local government unit will be realized if we agree to contribute and play the role of responsible citizens. On the other hand, villagers of Candaba, Pampanga are not aware of the flood projects implemented to address the problem compared to Malabon city which maintains and develop projects that will help

the community eliminate flood. The level of adaptation of the people of Candaba lead them to develop a lifestyle that suits their present conditions. Mitigation, planning and assessment are important stages in managing the risk of possible disaster (Grobicki et al., 2015). Revisiting the process, functions, and duties of the government officials should also be considered and not just the lapses in the community (Burch, Sheppard, Shaw, & Flanders, 2010): 1) poor emphasis on vulnerability in the social, economic and environmental aspect; and 2) inclusiveness and public participation in assessing vulnerabilities. Capacitating the administration in running the flood gates project will help in gathering information and data that will help future development. Protocols and early warning system will be further enhanced through effective communications to the national and local government (Dutta et al., 2015). Knowing the awareness level of all stakeholders on their specific roles and responsibilities will give us input on proper strategy and planning. Considering the gaps, it may now be possible to determine the probable outcomes of the existing solutions and the possible ways on reconstruction of current programs. Identifying the most vulnerable areas will help in alleviating the most critical point for policy interventions. Based on the study of Razafindrabe and colleagues (2015), in order to augment resiliency, the capacity of barangays to create and impose disaster risk reduction initiatives needs to be strengthened. Sound analysis on the evolution and varying approach on addressing impact of flood will help in devising future remediation. The sustainability of projects will support human safety, health and give rise to a more active trade and industry (Traver et al., 2014). Long term plans are needed and concrete policies in order to achieve economic efficacy, sustainability and public equity (Grobicki et al., 2015).

Conclusion

The research focusses only on the physical environment, existing policies, and community feedback. An in-depth investigation, and interview to policy makers and environmental conditions are necessary to come up with a more coherent comparative study. Poverty comes up as the number one reason why there are still informal settlers in spite of having housing projects. Opportunities should be provided for them to survive and live in an ideal place of living. A more concrete policies and concrete plans are very important to capacitate the government agencies, community, and other stakeholders in order to address the recurring problems in flood mitigation in the area. Everyone deserves a better life and security against harmful effects of human activities. Educating citizens before disasters occur, particularly in disaster-prone areas, through seminars, short courses, basic training of health workers and simulation exercises will equip the community to ease flooding (Calderon, 2010). The findings of the study will serve as the key in successful implementations of different policies, measures, programs, and improving the participation of the community. Awareness will give way to the best solutions to diminish the recurring problems on flood. The study wants to suggest a comprehensive exploration on climate change that results to more natural calamities. Although, there are progress in the different policies implemented by the city, it is known to us that there are difficulties when it comes to implementation. Deep understanding on the structural design suited for each locality was not being explored in the study. Detailed investigation on standards and process mechanism of flood gates are not being discuss because of the several limitations of the researchers. The engineering aspect of research is integral part for future research. Using technology-based monitoring, parameters, and data analytics for future forecasting on amount of rain,

zoning and possibility of flood based from geographical location will be the future trend of this research.

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Appendices

Appendix A

Semi-structure Questionnaire

The following questions are used in the study:

1. Ilang taon na kayo nakatira dito sa lugar na ito? (How many years have you been residing in this place) (Pls. indicate specific years in the remarks column).
2. Naka experience na ba kayo ng pagbaha dito? (Have you experience flooding in your area?).
3. Kung OO ang iyong sagot sa itaas, ano ang dahilan ng pagbaha at gaano kadalas? (If yes, what are the reason/s and how often flooding occurs?).
4. Gaano kataas ang baha sa mga sumusunod na panahon? (What is the height of the flooding during the following season?)
5. Alam ninyo na ba may proyekto ang DPWH para makontrol ang pagbabaha dito sa inyong lugar? (Are you familiar with the Flood Control Project in your area?)
6. Ngayong nagawa na at gumagana ang proyekto, may pagbabago ba sa taas ng tubig sa mga sumusunod na panahon? (After the completion of the project, are there any changes in flooding during the following season?)
7. Ano sa inyong palagay ang dahilan kung bakit hindi nabawasan ang baha sa lugar ninyo kahit na may nagawa na ang proyekto ng DPWH? (In your own opinion, what are the reason/s why flooding were not mitigated?).
8. Ano ang maitutulong ninyo bilang mamayan para humupa at mabawasan ang pagbaha? (As part of the community, what can you contribute to the government to mitigate flooding in your area?).
9. May mga mungkahi o suhestiyon ba kayo para mas masolusyonan ang problema ng pagbaha? (Do you have any suggestion(s)/solution(s).