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## **Implementation of disaster risk reduction management activities in flood-prone communities of a highly urbanized city in Central Visayas**

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**Abstract. Background.** The study aimed to determine the extent of implementation of the disaster risk reduction management activities on flooding in the areas of prevention and mitigation, preparedness, response, and rehabilitation and recovery in the flood-prone communities in a highly urbanized city in the Philippines as assessed by DRRM implementers and community leaders. Likewise, it identified the challenges in implementing the disaster risk reduction management activities on flooding encountered by the implementers. The study sought if there is a significant difference in the extent of implementation of disaster risk reduction management in the area of prevention and mitigation, preparedness, response and recovery when respondents are grouped according to income classification, population size, and land area. **Method.** In this study it use a descriptive-comparative research approach. The respondents were the DRRM implementers and community leaders of flood-prone communities in a highly urbanized city in Central Visayas. They were determined using incidental sampling. Before conducting the study, the request letter stipulating the nature and the details of the research of the Implementation of Disaster Risk Reduction Management Activities on flood prone areas in Central Visayas was obtained. After which the researcher prepares the questionnaire to be distributed to the proper respondents. Before answering the actual research instrument, the identified respondents were advised about the study, specifically its purpose, scope, nature and the parts of the questionnaire. They were ask to answer the questionnaire and the data collection proper commenced after the agreement. After the data collection, they submit the questionnaire and treated with confidentiality with respect to the respondent of the study. The information gathered was analyzed with the help of the statistician. Descriptive and comparative analysis were utilize using the appropriate statistical tools in analyzing and interpreting the data on the implementation of disaster risk reduction management activities in flood-prone communities of a highly urbanized city in Central Visayas. **Results.** Overall the extent of implementation of DRRM activities in flood-prone communities as a whole is great extent. In terms of the thematic areas, recovery is in moderate extent, while the other areas are great extent. There is no significant difference in the extent of implementation of DRRM activities in flood-prone communities when respondents are grouped according to income, population and land area in all the thematic areas except for preparedness. Improper disposal of solid waste by the local people is the most common challenge observed in prevention and mitigation by the respondents. Delayed implementation of city/barangay projects for disaster risk reduction is the most common challenge observed in preparedness by the respondents. In response, delayed responsive action is the

most common challenge observed by the respondents. Lastly, in recovery, the lack of local attention to those affected people is the most common challenge observed by the respondents. Overall, Improper disposal of solid waste by the local people is the most common challenge observed on the DRRM activities on flooding. **Conclusion** The great extent of the implementation of disaster risk reduction management activities in flooding revealed a need for continuous improvement in terms of disaster preparedness, prevention and mitigation, response, and recovery. Moreover, when respondents were grouped according to income, population, and land area, these variables showed no significant difference. This implies that regardless of their categories, the implementation of both classes showed no significant difference, except for the thematic area of preparedness. This means that the implementers are resilient and objective driven in their assignments on DRRM activities on flooding. There is also room for improvement where the implementation of DRRM activities on flooding can be improved up to a very great extent. In the area of preparedness, the implementers and community leaders must focused on the difference on the variables for the reason that regardless of income, population or land area, the implementers and community leaders must focus and implement all the thematic areas of the DRRM activities on flooding especially in the area of preparedness. The implication on the result reflects the actual implementation by our implementers and community leaders and can be basis for future studies. **Limitation of Findings.** The study's findings are limited since the study was conducted in a highly urbanized city in the Visayas. They do not reflect the opinion of the office where the respondents are employed or served. They do not also reflect the opinion of the City of Bacolod and the barangays involved in this study. This study also identified the challenges in implementing disaster risk reduction management activities on flooding. Other limitation on the findings is other persons did not give their approval to be subjected to the study. There is also limitation to the sampling and instrument since only incidental sampling is used and not stratified random sampling. The interpretation of the results in the study is not approximate in the result on the actual implementation of the activities. There are also limited studies relating to the extent of implementation on DRRM activities in flood prone areas. Lastly, the study is limited to only 102 respondents which only a small number compared to the implementers and community leaders in the whole city. **Practical Application.** The researcher proposed a Strategic Plan to strengthen the implementation of the DRRM activities on flooding in their local communities. Furthermore, observing these proposed programs, projects, and activities would create a positive outlook for the community and reach a very great extent of implementation to ensure that they follow all the measures all the time for their safety. **Direction for Future Research** They may explore other variables that affect the implementation of disaster risk reduction management activities in flooding. Moreover, another study may be conducted exploring the DRRM measures and fund utilization of the community leaders in addressing disaster-related concerns. Furthermore, the future researchers can enhance their research by lifting the limitations mentioned in this study. An example is to involve many respondents and barangays or choose a more sound sampling instrument to the study.

**Keywords.** Disaster, Flood control

## **Introduction**

### **Background of the Study**

According to a World Bank assessment, any region in the world might be regarded as a catastrophe hotspot due to the growing intensity, geographic dispersion, and frequency of natural, particularly those caused by climate change (Bronfman et al., 2019). Studies on disaster risk reduction involving government and non-government organizations have been conducted in several places worldwide. The government's attitude toward disaster risk reduction in Nigeria has also

been examined in a study. This study focused on the case of Nigeria and examined three case studies of catastrophe incidents in three different states of Nigeria. Each community in 2012 was severely impacted by flooding (Okoroji et al., 2018).

From the perspective of the ASEAN region on the disaster risk reduction management of flood-prone areas, one typical example is the ASEAN Coordinating Centre for Humanitarian Assistance on Disaster Management (AHA Centre) established in Jakarta to implement decisions on disaster management which is a focal point for international organizations and external countries as a member state seeks to respond to the human suffering that accompanies natural disasters. The AHA Centre was established with substantial material and political support from Indonesia, where it is headquartered. It quickly sought to clarify two key questions: what would it do, and who, exactly, would do it? One answer to the “what” question can be found in the statements of ministers at the time. Even Indonesia, which generally is the strongest supporter of more intrusive ASEAN organs, acknowledged that the Centre’s operations would be limited to co-ordinating collective responses to natural disasters This perspective is consistent with AHA Centre practice. The Centre played a leading co-ordinating role in the aftermaths of Typhoon Bapha in the Philippines in December 2012, Cyclone Mahasen in Myanmar in May 2013, Aceh’s Bener Meriah earthquake in July 2013, Typhoon Haiyan in the Philippines in November 2013, flooding in Laos and an earthquake in Indonesia in 2018 (Suzuki, 2021). Another study covers natural disasters specific to floods in the ASEAN region. Flood is a type of hazard that affects more people, as shown in the disasters in Thailand, Philippines, Indonesia, Cambodia, and Loa every year. People are economically and socially impacted by floods, as demonstrated by the 2011 flood disasters in Thailand and the Philippines. Consequent to the ASEAN community in 2015, a study was conducted to assess the effectiveness and efficiency of disaster management communication in ASEAN (Jongsuksomsakul, 2013).

A societal problem that persists necessitates an immediate solution if the very nature of the community's existence is in peril. Year after year, the Philippines is devastated by calamities that result in numerous loss of lives, damage to property, and economic losses by the billions. In 2011 alone the Philippines was hit by at least 3 devastating storms eroding progress on poverty reduction and developmental gains in the country. Tropical Storm Washi and its consequent floods, killed 1257, injured 6071, and affected 1,141,252 families in Luzon. Through the use of science and technology and in partnership with the academe and other stakeholders, the Department of Sciences and Technology takes a multidisciplinary approach in developing systems, tools, and other technologies that could be used by the government, in particular the National Disaster Risk Reduction and Management Council (NDRRMC) and the Office of Civil Defense, in efforts to mitigate the adverse impacts of extreme natural events. By investing in new technologies and new scientific approaches to disaster mitigation, Project NOAH seeks to enhance disaster management and prevention capacity of the Philippines. There are also several studies on the flood-prone areas in the Philippines. A study examined flood modeling and socio-economic analysis to assess Santa Maria and Mabitac's vulnerability to flooding (Pati et al., 2014). Another study is on flash flood which identified similar danger zones and created a social vulnerability profile of the afflicted people in the Philippines using freely accessible biophysical and social data. The data were processed and integrated using a GIS, and the findings were validated against a case study of a flash flood in Cagayan de Oro City (Ignacio & Henry, 2013).

On January 1, 2021, floods in various Negros Occidental areas forced thousands of residents to leave their homes, particularly in the cities of Victorias, Silay, and Talisay (Hoffarth, 2022). Another study on a flood-prone area in Negros Occidental is in Bacolod City when it experienced flooding eight days after flooding in several Negros Occidental areas due to torrential rains brought on by a low-pressure area and the combined effects of the frontal system's tail end (Villanueva et al., 2021). Several studies in Negros Occidental were disaster risk reduction and management practices in the extent of the practice of DRRM measures of Augustinian Recollect schools in the Negros Island (Sumbillo & Madrigal, 2020) and disaster preparedness level in Sagay City Division as perceived by school administrators, teachers, and students (Pardillo & Perigua, 2020). Lastly, study determined the extent of disaster preparedness practices of households in the coastal communities of a congressional district in the Philippines, particularly on typhoons, in terms of disaster preparedness literacy, participation in community disaster preparedness, and disaster preparedness on supplies and kit contents. The findings revealed a great extent of disaster preparedness practices with significant differences when respondents were grouped according to household income and educational attainment of the household members.

Despite several relevant research of Villanueva et al. (2021) on Bacolod City, and the extent of the practice of DRRM measures of Augustinian Recollect schools in the Negros Island by Sumbillo and Madrigal (2020) on disaster risk reduction management plans and Disaster Preparedness Practices of Low and Middle-Income Households in the Coastal Communities in Negros Occidental, Philippines by Lopez (2022), no study were found on the degree of implementation of disaster risk reduction management actions on floods in Negros Occidental, a heavily urbanized metropolis. As a result, this research was conducted to fill the gap in the literature.

Hence, this study aims to determine the extent of implementation of the disaster risk reduction management activities on flooding in the areas of prevention and mitigation, preparedness, response, and rehabilitation and recovery in the flood-prone communities in a highly urbanized city in the Philippines. The study's findings were used to Proposed Strategic Plan to improve the implementation of flood risk reduction management activities especially in the area of Recovery.

### **Statement of the Problem**

The study aimed to determine the extent of implementation of the disaster risk reduction management activities on flooding in the areas of prevention and mitigation, preparedness, response, and rehabilitation and recovery in the flood-prone communities in a highly urbanized city in the Philippines as assessed by DRRM implementers and community leaders.

Likewise, it identified the challenges in implementing the disaster risk reduction management activities on flooding encountered by the implementers.

Specifically, it sought to answer the following questions:

1. Is there a significant difference in the extent of implementation of disaster risk reduction management in the area of prevention and mitigation when respondents are grouped according to income classification, population size, and land area?

2. Is there a significant difference in the extent of implementation of disaster risk reduction management in the area of preparedness when respondents are grouped according to income classification, population size, and land area?

3. Is there a significant difference in the extent of implementation of disaster risk reduction management in the area of response when respondents are grouped according to income classification, population size, and land area?

4. Is there a significant difference in the extent of implementation of disaster risk reduction management in the area of rehabilitation and recovery when respondents are grouped according to income classification, population size, and land area?

### **Hypotheses**

1. There is no significant difference in the extent of implementation of disaster risk reduction management in the area of prevention and mitigation when respondents are grouped according to income classification, population size, and land area.

2. There is no significant difference in the extent of implementation of disaster risk reduction management in the area of preparedness when respondents are grouped according to income classification, population size, and land area.

3. There is no significant difference in the extent of implementation of disaster risk reduction management in the area of response when respondents are grouped according to income classification, population size, and land area.

4. There is no significant difference in the extent of implementation of disaster risk reduction management in the area of rehabilitation and recovery when respondents are grouped according to income classification, population size, and land area.

### **Definition of Terms**

To promote a better comprehension of the study, the following terms are defined:

**Extent of implementation of the disaster risk reduction management activities on flooding** is a measure of the implementation of disaster risk reduction management activities on flooding relative to the areas of prevention and mitigation, preparedness, response, and recovery.

**Disaster prevention and mitigation** refer to the outright avoidance, lessening, or limitation of adverse impacts of hazards and related disasters.

**Disaster Preparedness** refers to the knowledge and capacities developed by the government, professional response, other organizations, communities, and individuals to effectively anticipate, respond to, and recover from impacts of likely, imminent, or current hazard events.

**Disaster Response** refers to the provision of emergency services and public aid during or shortly following a disaster to save lives, limit health consequences, protect public safety, and satisfy the people's basic subsistence needs.

**Disaster recovery and rehabilitation** refer to the efforts that enable impacted regions to return to normal functioning by restoring livelihoods and destroyed infrastructure and boosting community organizational capacity.

**Challenges in the implementation of the disaster risk reduction management activities on flooding** refer to the issues, problems, and concerns faced by the stakeholders in implementing the activities.

**Flood-prone communities** in the highly urbanized city refers to the areas that are susceptible to flooding. They include the following barangays with their land area, population, and income.

Barangay	Size (km <sup>2</sup> )	Population	Income
Barangay A	4.957	42052	38198122.16
Barangay B	0.05270	888	3399933.88
Barangay C	15.44	51863	22344604.77
Barangay D	3.603	22608	45596875.39
Barangay E	4.11	20456	28997215.01
Barangay F	0.1717	1321	4178429.41
Barangay G	0.06476	632	3572293.17

**Implementers** are people tasked to implement activities of the DRRM.

*City-level implementers* are members of the city disaster risk reduction management council.

*Barangay-level implementers* are members of barangay disaster risk reduction management committee.

*Community leaders in flood-prone communities* are officers of the barangay.

### Review of Related Literature

**Disaster risk reduction management activities on flooding.** Octastefani et al. (2019) concentrated their research on the influence of young millennials in reducing the risk of tidal flooding along Semarang's northern shore. Digital revolutions in disaster management have grown in importance, and young millennials have gained special attention in disaster management. The study discovered that millennials' engagement is crucial owing to their inventive abilities to provide methods for addressing the difficulties created by tidal floods and their detachment from political interests. Finally, in terms of ramifications, the study on active public engagement may aid catastrophe risk reduction efforts. This research also indicated that passionate public participation in disaster management could only be achieved under democratic conditions.

A study also mentioned professionalism as a critical point in disaster management activities on the importance of collaboration in disaster management activity as one of the focus of the study. They can no longer handle it because of the limitations of a single authority. Thus, a set of disaster management concepts, such as Incident Command Systems (ICS) and professional management, command, control, and collaboration, becomes more debatable. The government's role as first responders in disaster management has aided the close relationship between local government and communities, influencing disaster response effectiveness. The reason why collaborative disaster management efforts are impaired is that the challenges to collaboration abound, such as differing attitudes, willingness, political will, and expectations (Raungratanaamporn et al., 2014).

**Prevention and mitigation.** A study found that communication gaps and assumptions made in disaster media contributed to death, injuries, and property loss. It demonstrates how vulnerability and inequities are felt during disasters and created within disaster mitigation and relief infrastructures. Communication is essential while dealing with calamities. On average, the Philippine islands are struck by 19 typhoons every year. Typhoon warnings assist people in preparing for and surviving typhoons. The media such as television and radio assist the public in understanding state-issued advisories.

Another study found that women were more vulnerable to flood catastrophe than men due to differences in job status, money, gendered social roles, cultural norms, and behavioral restrictions. Even though the communities saw a considerable reduction in flood damage after the effort was introduced, the community's effect may have been far greater if the project had been designed with gender in mind. Consequently, the study supports the view that gender planning is critical for all development initiatives. Thus, the study indicated that, while catastrophes affect both men and women, the impact may differ, and mitigation efforts must address such differences if both men and women are to be robust to floods (De Silva & Jayathilaka, 2014).

Furthermore, prioritizing flood disaster risk reduction (FDRR) and planning is typically time-consuming and crucial for planners and decision-makers. Flooding is a chronic concern that necessitates frequent inspections and updates to Metro Manila's municipal-based FDRR management systems in the Philippines. A basic but practical way of identifying priority schemes may be helpful, especially when resources are limited and the need for change is urgent. Based on a fuzzy multiattribute decision-making technique, this research presents a simple quantitative approach to gap evaluation for FDRR management systems. The Metro Manila study's findings indicate that gaps may be rated and quantified to set priority schemes for enhancing FDRR management systems, focusing on the following FDRR management systems: prevention, readiness, response, and disaster recovery (Gilbuena et al., 2019). According to Andrew (2018), the government also invested in physical mitigation measures to preserve vital infrastructure, such as major roadways and hydropower plants. However, no strategy, plan, or program existed to address the vulnerabilities that disadvantaged communities confront (McVittie et al., 2018).

**Preparedness.** In addition, a study in Nigerian cities looked into capacity building and readiness for dealing with urban floods. The frequency, causes, and consequences of urban flood hazards were investigated first. Second, for much of the urban population, the role of urbanization as a major source of flood risk was investigated. Third, coping methods discussed in the face of these threats were people's vulnerability and readiness. Finally, the role of spatial planning, sustainable drainage systems, and land use management in establishing flood-resilient capacities was investigated. The paper concluded that the reason for the exacerbated cases of urban floods in Nigeria is the lack of proper land use management and spatial planning, coupled with the incapacity of governments to ensure good urban governance (Adedeji et al., 2012).

Finally, being prepared and monitored can help to lessen the risk of flooding. Another research emphasizes the growing significance of the Global Flood Partnership (GFP), a global network of scientists, users, businesses, and government agencies interested in global flood risk management. GFP flood products have been employed on many occasions by national environmental authorities and humanitarian groups to lessen the overall socio-economic consequences of catastrophes and help emergency operations (Alfiere et al., 2018). In another

study by Karlan et al. (2016), the majority identified public hazard risk communication as educating the public concerning risks or potential hazards that may trigger an emergency event, emphasizing disaster preparedness where the participants come from small rural areas.

**Response.** Along with the large-scale loss of life, infrastructure damage, and material losses, health issues have emerged as critical issues following natural disasters. Survivors must face the prospect of health concerns, particularly infectious diseases, because of restricted health supplies, services, and facilities. Inadequate awareness contributes to the spread of infectious illnesses and a lack of understanding about health concerns following disasters that are often avoidable. The research was carried out to examine eight significant natural disasters in Indonesia that were followed by epidemics of infectious illness. The findings emphasize the importance of integrated health education in schools and community-based disaster risk reduction (DRR) initiatives, including information sharing, in developing resilient communities. Water-borne and air-borne infectious diseases are the most prevalent illnesses caused by the eight major natural disasters' aftereffects. Schools and community centers may be agents of health promotion information in the face of obstacles so that people become more aware of health hazards and engage in good behaviors linked to prevention, response, and recovery. Promotion and health education can be integrated into training-based DRR programs as modules, short courses, drills, and printed and visual media or curriculum-based (Pascapurnama et al., 2018).

The reason for the vulnerability to various disasters is that Nepal has a complex geophysical structure. Nepal is the world's most disaster-prone country, struck by multiple natural disasters resulting in significant property and life losses. Human activities can cause disaster, and not only natural processes are the reason for disaster. In Nepal, a study analyzed the existing legal framework and disaster risk profile. Similarly, properties worth millions of dollars in the United States have been harmed. Floods and landslides are becoming more common, and if corrective action is not taken, they will likely become more common. The Nepalese government prioritizes disaster response over disaster preparedness (Gaire et al., 2015).

Massive floods in Myanmar from July to August 2015 caused extensive and catastrophic devastation. The Bago River Basin's river infrastructure, the government of Myanmar's response to disasters, and the local climate were examined. Disaster risk reduction was identified to be regulated by the Emergency Operation Centre and was incorporated in the 2013 National Natural Disaster Management Law. The Emergency Operation Center oversaw the National Natural Catastrophe Management Law, which was established in 2013. Decision-makers in the Bago River Basin had learned from the 2011 floods and implemented structural and non-structural flood risk reduction measures (Hashimoto et al., 2017).

**Recovery and rehabilitation.** The study of Tselios and Tompkins (2019) concludes that natural catastrophes' effects on people hinder poor countries' economic development. While there is no proof that national wealth or income disparity determines the human impact of technological disasters, it was found that greater human impact in poorer nations impairs economic progress. In another study by Yodmani (2001), it is also believed that people will spend more on disaster risk management to safeguard their property if they have better sources of income and higher incomes because they have savings to invest for this reason because of higher incomes. However, spending on catastrophe management becomes the lowest priority concerning the ongoing survival

challenges if they have no funds. For people's ability to manage and recover to improve, it is crucial to have a variety of sources of income.

**Challenges in disaster risk reduction management activities on flooding.** While attempting to stop the spread of COVID-19, the world faces challenges managing calamities. A paper to outline management strategies for the simultaneous disasters of flooding and COVID-19 examined the ongoing work being done by organizations in the fields of disaster management, water and sanitation, humanitarian assistance, and health. The policy was recommended based on the review works. The policy's purpose was to protect human life, particularly that of vulnerable people, from the position of human security. Local organizations and communities must have access to risk information supported by scientific understanding to manage catastrophes successfully. The crisis management experience shows that it is critical to coordinate the efforts of numerous organizations, such as those in charge of water and health (Ishiwatari et al., 2020).

**Prevention and mitigation.** Despite significant expenditures and ongoing flood-control measures in India, socio-economic losses and the mortality toll remain severe. Flood management in India is undoubtedly difficult due to the effect of numerous socio-hydro climatological components such as climate change, sea level rise, and socio-economic dynamics. While these factors influence the severity and frequency of flood events, flood management process variables, such as improper application of traditional structural measures, improper scheme implementation, careless application of traditional structural measures, and end-to-end management of flood management programs/practices, only provide partial protection. Specific gaps were found and highlighted concerning the long-term efficacy of these approaches. The suggestions could serve as a roadmap for stakeholders and policymakers as they create and carry out sustainable flood control strategies for increased flood resistance (Mohanty et al., 2020).

The disaster risk management cycle is a well-known tool for dealing with disasters and their effects. However, the cycle's usefulness in many urban settings has been questioned. The research takes a hands-on approach to identify problems with the typical disaster risk management cycle and its stages in the context of urban floods in Pakistan. Semi-structured questionnaires were used to interview flood risk management institutions. Three focus group conversations were also held to understand different cultures' viewpoints better. According to the report, despite introducing catastrophe risk reduction measures, local institutions continue to use reactive techniques and manage flood risk on an ad hoc basis. Poor governance and a lack of adequate corrective actions for current growth patterns make managing flood risk challenging. It is critical to conduct multi-hazard vulnerability and risk assessments, develop specialized solutions, and adhere to catastrophic risk reduction and climate change adaptation philosophies. The study suggested incorporating climate change adaptation and resilience into the existing management cycle to reduce future urban risks (Rana et al., 2021).

**Preparedness.** The study of Setiadi and Frederika (2022) demonstrates that although only a small percentage of the households implemented financial planning and considered it for (tidal) flood preparedness, family literacy on financial planning for disaster preparedness is quite considerable. Additionally, digital money can be employed as a personal solution for family disaster preparedness and a group solution for communal financial catastrophe preparedness. However, it continues to be underutilized, and young adult families make up most of its users.

**Response.** Flood response was hampered as COVID-19 spread to Japan, Canada, and the Pacific nations. Organizations involved in crisis management, water supply, humanitarian help, and health have issued guidelines and plans in response to COVID-19. After examining these, the research proposed a unique method for controlling flood catastrophes in the aftermath of the COVID-19 pandemic. The policy was formed by restructuring and refining already-existing processes and policies that the review of the relevant sectors had revealed. The policy's purpose was to protect human life, particularly that of vulnerable groups, in the cause of human security. To successfully manage catastrophes, local organizations and communities must have access to risk information supported by scientific knowledge. The experience of managing disasters demonstrates that it is important to coordinate the actions of many institutions, such as those in charge of water and health. Additional research is anticipated to look at specific actions based on regional circumstances. In the middle of the COVID-19 pandemic, research is also required to prepare for further disasters, such as droughts, heat waves, and earthquakes (Ishiwatari et al., 2020).

**Recovery.** The study of Tselios and Tompkins (2019) concludes that natural catastrophes' effects on people hinder poor countries' economic development. Although there is no evidence that national wealth or income disparity affects human impacts in catastrophes connected to technical risks, it was uncovered that bigger human impacts in poorer nations inhibit economic advancement. While there is no evidence that national wealth or income disparities influence human impacts from technical risks, it was found that larger human impacts in poorer countries impede economic growth.

**Implementation of disaster risk reduction management activities on flooding.** According to a study on the communication and coordination in DRRM in the two municipalities in the province of Iloilo, disaster preparedness needs to be improved. Both towns' coordination systems were ineffective and were only used before, during, and after the tragedy. The degree of community preparedness for disasters was not increased by governance communication and DRRM initiatives. Community stakeholders are not prepared for disasters (Becodo, 2015).

Research was conducted in Vietnam's Quang Nam province to learn more about local flood risk management (FRM) activities and the institutional and legal frameworks designed to direct but frequently hinder policy and practice. That country's legislative and institutional frameworks were examined for a general idea of the range of FRM operations now taking place in Vietnam. It was evaluated how closely FRM in Vietnam corresponds to acknowledged theoretical frameworks and found opportunities for improvement in practice. Based on this perspective, 27 individual interviews were performed in the province of Quang Nam with FRM decision-makers at the provincial, district, and commune levels. It was also revealed that steering committees needed more professional, researcher, and scientific participation. More public involvement in FRM at the local level is also urgently needed (Luu et al., 2018).

Moreover, flood disasters are becoming more frequent and disastrously affecting cities worldwide. This problem can result from community leaders in flood-prone areas not being included in developing flood risk management strategies. Institutional barriers, a lack of technical expertise, and conflicts may cause stakeholders to be excluded from flood control. According to Accra, the study looked into how flood-prone community leaders participated in developing flood risk management strategies in communities that experience flood damage. Community leaders can impact flood risk management in their neighborhoods if they participate in the city's strategy-

making. However, it is unclear whether flood-prone community leaders are involved in developing flood catastrophe risk management strategies in Accra. In the city of Accra, which is prone to flooding, a study aimed to ascertain whether and how local community leaders are involved in the formulation of flood risk management strategies. The study's conclusions showed that community leaders in flood-prone areas only take part in the flood risk management plans' implementation phase. The study concluded that leaders from flood-prone communities must actively participate in creating and implementing flood risk management strategies (Atanga, 2020).

Finally, flood risks are significantly increasing in developing countries worldwide due to intense development activities and climate change. The severe mortality and losses caused by floods in Uttarakhand, India, in June 2013 have raised governance challenges in formulating and implementing policies to regulate human activities. Aside from excessive rainfall, the tragedy was caused by uncontrolled growth, a slack legal framework, and governance issues. The current study looked at the environmental consequences of existing land use and development rules concerning floods. The current investigation focused on the environmental aspects of existing practices. The current study examined the environmental elements of existing policies in order to aid policy formation. It also sought to determine the high flood level and flood risk region along the Bhagirathi river for 2013 using hydrological and hydrodynamic models. This study made a compelling case for local planning officials and stakeholders to collaborate with state and federal politicians to achieve collaborative governance (Dash & Punia, 2019).

### **Theoretical Framework**

This study theorizes that the great extent of implementing disaster risk reduction and management activities on flooding will result in resilient flood-prone communities. The implementation of activities may vary in terms of the income, population, and land area of the community. This means that the higher level of implementation of the disaster risk management plan in a highly urbanized city will mitigate significant city problems. Not only will the level of implementation lessen the casualties and injuries due to the disaster, but it will also boost the city's economy and decrease the poverty rate.

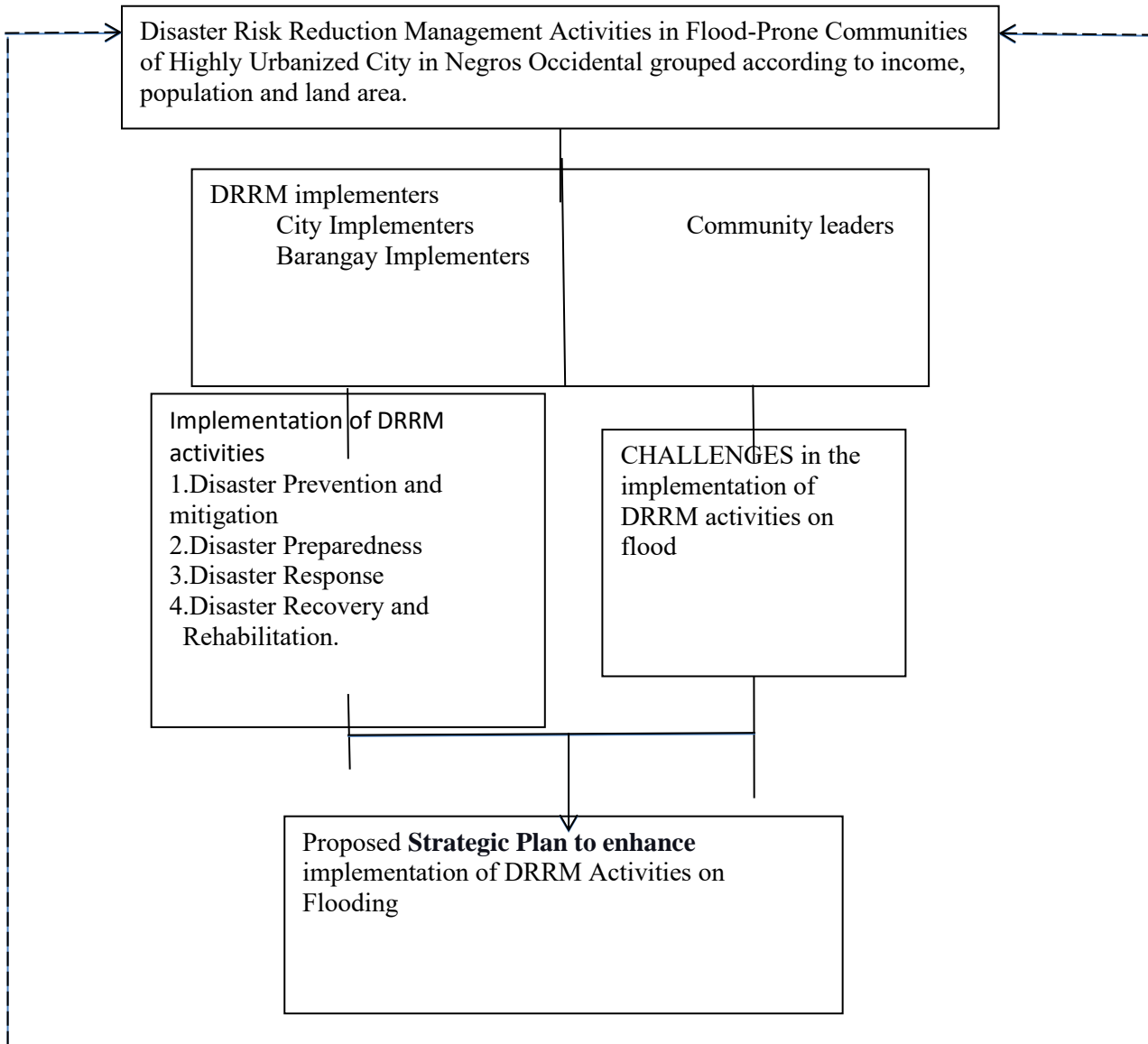
The Theory of Planned Behavior (TPB) was developed by Ajzen (2015) as an attempt to predict human behavior. The TPB posits that attitude toward the behavior, subjective norm, and perceived behavioral control influence behavioral intention (Asare, 2015).

Theory of Planned Behavior is relative to the study because in implementing DRRM activities on flooding, the attitude towards the behavior of implementers and community leaders in relation to their conduct of implementing the DRRM activities on flooding affects the extent of implementation of disaster risk reduction and management activities on flood-prone communities. Hence, the resilience of flood-prone communities in the implementation of the DRRM activities will depend on the attitude towards the behavior of implementers and community leaders.

### **Conceptual Framework**

This study is anchored to Republic Act No. 10121, which strengthens the Philippine disaster risk reduction and management system, provides the national disaster risk reduction and management framework, and institutionalizes the national disaster risk reduction and management plan. The Act transformed the policy environment and how the government responds to disasters from reaction to preparation. The law also encourages the development of disaster management capacities at the individual, organizational, and institutional levels.

DRRM Implementers and community leaders in the Disaster Risk Reduction Management Activities in Flood-Prone Communities of Highly Urbanized City in Negros Occidental grouped according to income, population, and land area, implements the thematic areas of the DRRM activities, they are disaster prevention and mitigation, disaster preparedness, disaster response, and disaster recovery, and rehabilitation There are also challenges in the implementation of DRRM activities which the implementers and community leaders encounter. The findings of this study determine and compare the extent of implementation of each thematic area and when they are grouped according to income, population, and land area. The major challenges in the implementation of DRRM activities on flood will be discussed in this study. The result of this study will help formulate a Proposed Strategic Plan for the enhancement of the implementation of DRRM Activities on Flooding to improve the extent of implementation of Disaster Risk Reduction Management Activities in Flood-Prone Communities of Highly Urbanized City in Negros Occidental grouped and to guide the implementers and community leaders.



### **Methodology**

**Research design.** In this study, the features of a population or phenomena were described using a descriptive-comparative research approach (Creswell & Creswell, 2017). A Descriptive-comparative design is used to describe variables and examine differences in variables in two or more groups that occur naturally in a setting. According to the description design, the city's disaster risk reduction management plan will be implemented to the fullest degree possible. The design was also used to compare each variable of the study and also the different thematic areas of disaster risk reduction management.

**Respondents.** The respondents were 102 city and barangays DRRM implementers and community leaders of flood-prone communities in a highly urbanized city in Central Visayas. They were determined using incidental sampling. Table 1 shows the distribution of the respondents. Incidental or Accidental sampling is a method of non-probability sampling where researchers will choose their sample based solely on convenience. Non-probability sampling means that researchers choose the sample as opposed to randomly selecting it (Simkus et al., 2022).

**Table 1. Distribution of Respondents**

Respondents	f	%
Implementers		
City Level	32	31.4
Barangay Level Implementer	31	30.4
Community Leader/Resident	39	38.2
<b>Total</b>	<b>102</b>	<b>100</b>

**Research instrument.** The study utilized a researcher-made survey questionnaire based on RA 10121 and a checklist. This instrument includes questions on the level of implementation of the disaster risk reduction management activities in the four thematic areas of preparedness, mitigation, response, and recovery. This questionnaire also contained a checklist for the respondents to check the challenges encountered and recommendations for the DRRMP of the city.

The content validity ratio by Lawshe (1975) was employed on 10 experts on DRRM. The validity instrument has a result of 0.99 which means that the survey questions were found to be valid using the criteria of Content Validity Ratio. After the validation of the survey instrument, a reliability test was conducted on thirty DRRM implementers and it was found reliable using Cronbach's Alpha with a score of 0.769, indicating that the questionnaire has good internal consistency. The results were interpreted statistically.

**Interpretative Scale for the Level of Implementation of the Disaster Risk Reduction Management Activities**

Scale	Mean Range	Description	Interpretation
5	4.21-5.0	VGE	DRRM activities are always implemented
4	3.41-4.20	GE	DRRM activities are often implemented.
3	2.61-3.40	ME	DRRM activities are sometimes implemented
2	1.81-2.60	PE	DRRM activities are seldom implemented.
1	1.0-1.80	VPE	DRRM activities are never implemented.

**Data collection procedure.** Before conducting the study, the request letter stipulating the nature and the details of the research on the Implementation of Disaster Risk Reduction Management Activities in flood-prone areas in Central Visayas was obtained. After this, the researcher prepares the questionnaire to be distributed to the proper respondents.

The administration of the survey instrument started and the identified respondents were oriented about the study, specifically its purpose, scope, nature, and the parts of the questionnaire. They were asked to sign the informed consent form to indicate their voluntary participation in the study before they were asked the questionnaire,

After the retrieval of the survey questionnaire, the data were tallied, recorded, and prepared for statistical treatment.

**Data analysis procedure.** Descriptive and comparative analysis was utilized using the appropriate statistical tools, The descriptive analysis determined and utilized the mean, standard deviation, frequency count, and percentage distribution.

Kolmogorov-Smirnov was used to determine the normality of the variable. The normality test revealed that the variables prevention and mitigation [KS=0.309, p=0.000], preparedness [KS=0.220, p=0.000], response [KS=0.311, p=0.000], rehabilitation and recovery [KS=0.208, p=0.000] are not normally distributed.

Mann Whitney U test was used to determine the significant difference in the extent of implementation of disaster risk reduction management in the areas of prevention and mitigation, preparedness, response, and rehabilitation and recovery when respondents are grouped according to income, population, and land area.

**Ethical considerations.** The researcher confirmed the Philippine Health Research Ethics Board's ethical guidelines and address the general ethical principle of respect for persons, beneficence, and justice to ensure the ethical soundness of the study.

**Social value.** The research holds a strong social value for it contributed to the understanding of the extent of implementation of the disaster risk reduction management activities in flood-prone areas in the highly urbanized city of Central Visayas. The research findings benefited the DRRM implementers and residents. The local government unit heads can use the study's findings as a guide to what to improve in their implementation of the activities on flooding in their respective local government. Through this, the local government unit and the implementers can improve the extent of implementation of the activities in flood-prone areas in their respective local governments.

**Informed consent.** The researcher secured the informed consent of the respondents. In the informed consent, it was stated that their participation in this study is voluntary and that they have the right to withdraw if necessary. There is a face-to-face interaction with the respondents and informed consent was informed to them personally.

**Vulnerability of the respondents.** There is no vulnerability on the part of the respondents because they are already of legal age, literate, and with educational background.

**Risk and benefits.** Possible mental and physical risks are inconvenience and discomfort to the respondents as they answered the survey questionnaire concerning the extent of

implementation of DRRM activities in flood-prone communities as they took to answer the questionnaire 15-30 minutes to finish. In terms of benefits, the respondents expressed their experiences and feedback regarding the results of the study.

**Privacy and confidentiality.** The researcher strictly observed the respondents' right to privacy, anonymity, and confidentiality regarding whatever information they shared throughout the study. No information that discloses their identity was published without their consent or approval. Only the researcher, research advisor, panel members, and statistician have accessed the said data. After getting the information needed for tabulation, analysis, and interpretation, all collected data was permanently deleted from the storage device as it had served its purpose. Furthermore, the researcher has no right to share information about the respondent with people who are not connected to the study.

**Justice.** A fair selection of the respondents was observed through incidental sampling. The researcher has declared no other intention or interest aside from attaining the objectives of the study since the researcher would not gain any monetary or administrative benefits from conducting the study. There was no reimbursement or tokens given since almost all the respondents were serving the public.

**Transparency.** The researcher declared that the conduct of the study is solely to contribute to the research society, and no conflict of interest has risen in the entirety of the study. Upon the completion of the study, the results were made accessible to the respondents through a feedback session and to other researchers through a research conference and research journal publication, and other researchers through a research conference and research journal publication.

**Qualification of the Researcher.** The researcher is currently an Engineer in the Department of Public Works and Highways and has completed the academic requirements of the Master in Public Administration and Governance at the University of Negros Occidental-Recoletos. The researcher has also successfully taken Statistics, Quantitative and Qualitative courses. The institution has trained and continuously guided the researcher to achieve the goal of the study successfully.

**Adequacy of facilities.** The resources including the facilities and study expenses were all covered by the researcher and the institution with which the researcher is presently affiliated. The library resources where the researcher is currently enrolled also helped him in his research journey.

**Community involvement.** The members who made this study a success are the respondents which are the implementers and community leaders, validators, and other persons who approve so that the researcher can conduct and retrieve the necessary data for the study. They helped the researcher by participating in the conduct of the study. Their answers provided the data for creating sound conclusions, recommendations, and the output of the study. The findings of this study helped the implementers and community leaders enhance the extent of implementation of DRRM activities on flooding. The comments and suggestions of the respondents from the feedbacking of results and output made a great contribution to the involvement and utilization of this study in the community.

## Results and discussion

### Profile of the Respondents

Table 2 presents the demographic profile of the respondents of the study, composed of city-level implementers, barangay-level implementers, and community leaders/residents. Of the total respondents, 31.4 % (f=32) are city-level implementers, 30.4 (31%) are barangay-level implementers, and 38.2% (f=39) are community leaders/residents.

In terms of income of the barangays of respondents, 49.0% (f= 50) belong to the lower classification, while 51% (f=52) belong to the higher classification. In terms of population, 16.7% (f=17) belong to the lower classification, while 83.3% (f=85) belong to the higher classification. In the aspect of the land area, 16.7% (f=17) of the respondents belong to the lower classification, while 83.3% (f=85) belong to the higher classification.

**Table 2.** Demographic Profile of the Respondents according to barangay classification

Variable	f	%
Barangay Income		
Lower (less than 42.6M)	50	49.0
Higher (42.6M and above )	52	51.0
Barangay Population		
Smaller (less than 10,243)	17	16.7
Bigger (10,243 and above)	85	83.3
Barangay Land Area		
Smaller (less than 2.667 sq km)	17	16.7
Bigger (2.667 sq km and above)	85	83.3
<b>Total</b>	<b>102</b>	<b>100.0</b>

### Extent of Implementation of the Disaster Risk Reduction Management Activities in the Flood-Prone Communities

Table 3 shows that the extent of the implementation of disaster risk reduction management activities in flooding in a highly urbanized area is great (M=3.64; SD=0.29). Among the thematic areas in DRRM activities, the response was rated the highest (M=3.74; SD=0.33). Preparedness came as the second highest (M=3.70; SD=0.31), followed by prevention and mitigation (M=3.69; SD=0.42), and rehabilitation and recovery came last (M=3.31; SD=0.65).

The finding implies that the extent of implementation of various activities relative to disaster risk reduction management is often implemented. The response is the highest since the community actively participates when a disaster strikes the barangays especially when the disaster can cause major flooding. The government also speeds up its participation during the response phase of disaster risk reduction management activities. They speed up their participation in response to help those who are affected when a disaster strikes, especially in their needs. Examples are government and non-government organizations working together when a flood occurs in the cities and barangays. Recovery is the lowest among the thematic areas in the extent of implementation, and it is only to a moderate extent compared to other thematic areas. The difficulty in accessing or processing the funds allotted for the recovery projects and programs is one of the reasons why disaster recovery is to moderate extent.

The result is supported by the study of Tabilon-Tizon and Comighud (2020), which showed a great extent of implementation in the area of disaster response by providing support to speed up normal situations in the affected areas. It means that the people are proactive in their implementation during the response phase to the DRRM activities on flooding. Herrera Jr. (2021) indicated that the level of implementation of disaster risk reduction and management in the areas of disaster recovery and rehabilitation, as perceived by the participants, was average. The study of Malalgoda et al. (2018) provides a collection of sound practices on DRR that have been tested and implemented in different cities worldwide to reduce disaster risks within their cities. However, it is contrary to the study by Herrera Jr. (2021), wherein the level of implementation for this area in flood-prone barangays in one of the component cities in Negros Occidental was average when taken as a whole.

### **Extent of Implementation of the Disaster Risk Reduction Management Activities in the Flood-Prone Communities and Income**

Table 3 shows that Lower-income implementers are slightly higher ( $M=3.67$ ;  $SD=0.34$ ) in their extent of implementation of disaster risk reduction management activities on flooding compared to higher-income implementers ( $M=3.62$ ;  $SD=0.24$ ). Both income classifications of the implementers revealed a great extent of implementing disaster risk reduction management activities on flooding.

Lower-income implementers have the support of the government and other organizations because they are more vulnerable compared to high-income implementers. Lower-income implementers participate more in disaster risk reduction management activities on flooding in flood-prone areas and are resilient in this situation.

The result is contrary to the study of Satterthwaite (2011), where in most cities in low- and middle-income nations, the local government lacks the institutional capacity and government willingness to work with low-income groups. Higher levels of government provide little or no support to help them do so. The mentioned study also stated that low-income groups are always weak and will not get the support of the system unless they are organized. It is also contrary to the study of Samaddar et al. (2015), which implies that an increase in the income of the households leads to the adoption of multiple risk management tools by households compared to those with lower incomes.

### **Extent of Implementation of the Disaster Risk Reduction Management Activities in the Flood-Prone Communities and Population**

Table 3 shows that Implementers who belong to a smaller population classification ( $M=3.65$ ;  $SD=0.45$ ) were slightly higher in their extent of implementation of disaster risk reduction management activities on flooding compared to implementers who belong to a bigger population classification ( $M=3.64$ ;  $SD=0.26$ ). Both classifications of the implementers in relation to population are to a great extent

The bigger population is slightly lower in the level of implementation of disaster risk reduction management activities on flooding because they lack cooperation and participation. The bigger the population, the more coverage is needed to rely on the information on disaster risk reduction management activities on flooding. There is more unity and cooperation among smaller

population groups because the information and instruction pertaining to disaster risk reduction management activities are not difficult to rely on. Also, smaller populations are more manageable than bigger populations.

This is supported by the study of Cirella et al. (2018), which found that Nigeria's high urbanization rate has led to myriad problems, of which flooding has the most significant impact. Urbanization, where the population is bigger, has more problems, and it can be difficult for the implementers to implement disaster risk reduction management activities on flooding. Furthermore, the study of Rana et al. (2021) states that development issues like poverty, rapid urbanization, and population growth, along with political instability, insecurity, and terrorism, leave little room for disaster management. Local administrations have failed to introduce disaster risk reduction strategies, and neither has the community prepared itself for future disaster risks.

### **The extent of Implementation of the Disaster Risk Reduction Management Activities in the Flood-Prone Communities and Land Area**

Table 3 shows that Implementers who belong to smaller land area classification ( $M=3.65$ ;  $SD=0.45$ ) are slightly higher in their extent of implementation of disaster risk reduction management activities on flooding compared to implementers who belong to bigger land area classification ( $M=3.64$ ;  $SD=0.26$ ). Both classifications of the implementers in relation to the land area are, to a great extent, of implementation.

The bigger land area is slightly lower in the level of implementation of disaster risk reduction management activities on flooding because they lack cooperation and participation. The bigger the land area, the more coverage is needed to rely on the information on disaster risk reduction management activities on flooding. There is more unity and cooperation among smaller land areas because the information and instruction pertaining to disaster risk reduction management activities are not difficult to rely on. Also in smaller land areas, the implementers and community leaders are manageable compared to those who are in bigger land areas.

This is contrary to the study by Jamshed et al. (2020), which indicates that rural populations surrounding smaller cities are less exposed but more vulnerable than rural communities surrounding larger cities. This is large because rural populations adjoining large cities have better capacities to deal with flood hazards. This points to a need to focus on increasing the coping capacity of small and medium-sized cities and their rural surroundings.

**Table 3. Extent of Implementation of the Disaster Risk Reduction Management Activities on Flooding**

Variable	Prevention and Mitigation			Preparedness			Response			Recovery			Implementation		
	M	SD	Int	M	SD	Int	M	SD	Int	M	SD	Int	M	SD	Int
Income															
Lower	3.67	0.47	GE	3.77	0.33	GE	3.80	0.31	GE	3.26	0.74	ME	3.67	0.34	GE
Higher	3.71	0.37	GE	3.64	0.29	GE	3.69	0.35	GE	3.36	0.55	ME	3.62	0.24	GE
Population															
Smaller	3.53	0.55	GE	3.79	0.41	GE	3.86	0.27	GE	3.24	0.90	ME	3.65	0.45	GE
Bigger	3.72	0.38	GE	3.69	0.29	GE	3.72	0.34	GE	3.32	0.60	ME	3.64	0.26	GE
Land Area															
Smaller	3.53	0.55	GE	3.79	0.41	GE	3.86	0.27	GE	3.24	0.90	ME	3.65	0.45	GE
Bigger	3.72	0.38	GE	3.69	0.29	GE	3.72	0.34	GE	3.32	0.60	ME	3.64	0.26	GE
<b>Whole</b>	<b>3.69</b>	<b>0.42</b>	<b>GE</b>	<b>3.70</b>	<b>0.31</b>	<b>GE</b>	<b>3.74</b>	<b>0.33</b>	<b>GE</b>	<b>3.31</b>	<b>0.65</b>	<b>ME</b>	<b>3.64</b>	<b>0.29</b>	<b>GE</b>

Mean Scale: 1.00-1.80=Very Low (VLE), 1.81-2.60=Low (LE), 2.61-3.40=Moderate (ME), 3.41-4.20=Great (GE), 4.21-5.00=Very Great

**Difference in the Extent of Implementation of Disaster Risk Reduction Management in the Area of Prevention and Mitigation according to barangay classification.**

Table 4 presents the difference in the extent of implementation of disaster risk reduction management in the area of prevention and mitigation. This test was used to determine the significant difference in the extent of implementation of the disaster risk reduction management activities in terms of prevention and mitigation of flooding when respondents were grouped according to income, population, and type of land area. Results revealed no significant difference in the extent of implementation of disaster risk reduction management in terms of prevention and mitigation when grouped according to income [U=1240.000, p=0.658], population [U=600.0, p=0.226], and land area [U=600.0, p=0.226].

This implies that income, population, and type of land area do not impact disaster risk reduction management in terms of prevention and mitigation, for these variables do not affect their pre-emptive measures. It also indicates that other variables might impact the DRRM activities on flooding in terms of prevention and mitigation.

In the study of Andrew (2018), the government also invested in physical mitigation measures to protect strategic infrastructure such as major highways and hydroelectric plants. However, no policy, plan, or program existed to reduce the risks faced by poor communities. It was about empowered communities changing roles from objects to subjects in a very dynamic process of vulnerability reduction, enabling them to negotiate resources and support from local and central governments to undertake risk management measures at all scales. In other words, linkages across scales and between civil society and government were vital to unlocking the political and economic resources required to manage risks. McVittie et al. (2018) stated that in the mitigation of disaster risks, the actual management or implementation of measures might only reflect a relatively small area of a much larger site.

**Table 4.** Difference in the Extent of Implementation of Disaster Risk Reduction Management in terms of Prevention and Mitigation

Variable	U	z	p
Income	1240.000	-0.442	0.658
Population	600.000	-1.211	0.226
Land Area	600.000	-1.211	0.226

*Note:* The difference is significant when  $p \leq 0.05$

**Difference in the Extent of Implementation of Disaster Risk Reduction Management in the Area of Preparedness according to barangay classification.**

Table 5 presents the difference in the extent of implementation of disaster risk reduction management in terms of preparedness. Results revealed there is a significant difference in the extent of implementation of disaster risk reduction management in terms of preparedness when grouped according to income [U=922.500, p=0.012], population [U=485.500, p=0.026], and land area [U=485.500, p=0.026]. This implies that income, population, and land area have a bearing on disaster risk reduction management in terms of prevention and mitigation, for these variables affect their pre-emptive measures.

This implies that low-class income families have a significantly higher extent of implementation of disaster risk reduction management in terms of preparedness than high-class income families because low-class income families experience firsthand the effect of flooding in their households and communities compared to those high-class income families, also higher-income families tend to be more complacent than lower-income families. Implementers from a smaller population and land area group class have a higher extent of implementation of disaster risk reduction management in terms of preparedness compared to those from a bigger population and land area group class because the smaller classifications are more manageable than the bigger classification. These variables have an impact on the DRRM activities on flooding in terms of preparedness. The mean of preparedness as a whole is 3.70 with a great extent of implementation.

The result supported the study of Lopez (2022) which revealed a great extent of disaster preparedness practices with significant differences when respondents were grouped according to household income and educational attainment of the household members. The study by Setiadi and Frederika (2022) shows that family literacy on financial planning for disaster preparedness is relatively significant, though only a few of the families implemented financial planning and specifically considered it for (tidal) flood preparedness. Additionally, digital cash can be used as an individual solution to disaster preparedness at the family level and as a collective solution to financial disaster preparedness at the community level. However, its utilization remains low and is relatively concentrated in young adult families. Digital cash is a promising disaster preparedness resource for the next generation. In another study by Karlan et al. (2016), where the participants came from a small rural area, the majority of them identified public hazard risk communication as educating the public concerning potential hazards or risks that may trigger an emergency event with an emphasis on disaster preparedness.

**Table 5.** Difference in the Extent of Implementation of Disaster Risk Reduction Management in terms of Preparedness

Variable	U	z	p
Income	922.500*	-2.527	0.012
Population	485.500*	-2.231	0.026
Land Area	485.500*	-2.231	0.026

*Note:* The difference is significant when  $p \leq 0.05$

**Difference in the Extent of Implementation of Disaster Risk Reduction Management in the Area of Response according to barangay classification.**

Table 6 presents the difference in the extent of implementation of the disaster risk reduction management activities in terms of response. Results revealed no significant difference in the extent of implementation of the disaster risk reduction management in terms of response when grouped according to income [ $U=1031.500$ ,  $p=0.072$ ], population [ $U=533.500$ ,  $p=0.063$ ], and land area [ $U=533.500$ ,  $p=0.063$ ].

This implies that income, population, and type of land area do impact disaster risk reduction management in terms of response, for these variables do not affect their pre-emptive measures. It also indicates that other variables might have an impact on the DRRM activities on flooding in terms of response. This indicates further that, in terms of the variables, implementation

is to a great extent in the area of responsibility. It does not matter whether the variables are classified as high and low or smaller and bigger.

The study by Carcellar et al. (2011) states that the HPFPI is slowly but deliberately incorporating initiatives for risk reduction in addition to its disaster response initiatives as part of its avowed mission to organize and mobilize low-income communities in high-risk locations. At the heart of the federation's efforts on DRR is the identification of highly at-risk communities in cities and municipalities where the HPFPI is seeded. The lack of government documentation on poor communities, many of whom are in high-risk areas, pushes marginalized people further into invisibility.

**Table 6.** Difference in the Extent of Implementation of Disaster Risk Reduction Management in terms of Response

Variable	U	z	p
Income	1031.500	-1.797	0.072
Population	533.500	-1.862	0.063
Land Area	533.500	-1.862	0.063

*Note:* The difference is significant when  $p \leq 0.05$

**Difference in the Extent of Implementation of Disaster Risk Reduction Management in the area of Rehabilitation and Recovery according to barangay classification.**

Table 7 presents the difference in the extent of implementation of the disaster risk reduction management activities in terms of recovery. Results revealed no significant difference in the extent of implementation of the disaster risk reduction management activities in terms of recovery when grouped according to income [U=1254.500, p=0.761], population [U=717.000, p=0.959], and land area [U=717.000, p=0.959].

This implies that income, population, and type of land area do not impact disaster risk reduction management in terms of recovery, for these variables do not affect their pre-emptive measures. It also indicates that other variables might have an impact on the DRRM activities on flooding in terms of response. This further implies that implementation is to a great extent regardless of the variables, whether high or low or smaller or bigger.

However, it does not support the study of Tselios and Tompkins (2019), which concludes that the human impacts of natural disasters delay economic growth in developing countries. For the technological hazard-associated disasters, while there is no evidence that national wealth and income inequality determine human impacts, it was found that larger human impacts in developing countries undermine economic growth. It is also contrary to the study of Yodmani (2001), which assumed that if people have better sources of livelihoods and higher incomes, they will spend more on disaster risk management in order to save their property because due to higher incomes, they have savings to spend for this purpose. However, if they do not have any savings, then spending on disaster management becomes the least priority in comparison to the chronic issues of survival. Diversity in the sources of livelihood is very important for increasing people's capacity to cope and recover.

**Table 7.** Difference in the Extent of Implementation of Disaster Risk Reduction Management in terms of Recovery

Variable	U	z	p
Income	1254.500	-0.305	0.761
Population	717.000	-0.051	0.959
Land Area	717.000	-0.051	0.959

*Note: the difference is significant when  $p \leq 0.05$*

### **Challenges in the Implementation of the Disaster Risk Reduction Management Activities on Flood-Prone Areas.**

Table 8 shows the challenges encountered in implementing disaster risk reduction management activities on flooding. Improper disposal of waste by the local people is a common challenge for prevention and mitigation (f=84, 82.4 %), while delayed implementation of city/barangay projects for disaster risk reduction is a common challenge for preparedness (f=45, 44.1 %). Delayed responsive action is a common challenge for response (f=43, 42.2 %), while lack of local attention on those affected people is the common challenge for recovery (f=47, 46.1 %). The top five challenges are improper disposal of wastes (f=84, 82.4 %); lack of local attention on those affected people (f=47, 46.1 %); delayed implementation of city/barangay projects for disaster risk reduction (f=45, 44.1 %); delayed responsive action (f=43, 42.2 %); and poor implementation of the law (f=38, 46.1 %).

Despite the great extent of the implementation of the disaster risk reduction management activities on flooding, improper disposal of wastes remained a top problem because most respondents were low-class income earners. Most respondents observe that this is the most common challenge in implementing disaster risk reduction management activities on flooding. Improper waste disposal is on the top because many people lack discipline in their waste disposal. It is followed by delayed implementation of city/barangay projects for DRR and delayed responsive action. Many respondents believe that this delay causes major problems in implementing DRRM activities on flooding. Lack of disaster management plan, insufficient equipment, or lack of implementation on projects to mitigate flood control is the least of the concerns of the implementers.

In the study of Al-Dahash et al. (2016), recognizing these challenges will bridge the gaps and encourage everyone to prepare appropriately during disasters to mitigate these challenges. According to another study, despite introducing catastrophe risk reduction measures, local institutions continue to use reactive techniques and manage flood risk on an ad hoc basis. Poor governance and a lack of adequate corrective actions for current growth patterns make managing flood risk challenging. It is critical to conduct multi-hazard vulnerability and risk assessments, develop specialized solutions, and adhere to catastrophic risk reduction and climate change adaptation philosophies. The study suggested incorporating climate change adaptation and resilience into the existing management cycle to reduce future urban risks (Rana et al., 2021).

**Table 8.** Challenges in the Implementation of the Disaster Risk Reduction Management Activities on Flooding

Variable	f	%
Prevention and Mitigation		
1. Improper disposal of solid waste by the local people	84	82.4
2. Unwillingness of the community to participate in prevention and mitigation activities	30	29.4
Preparedness		
1. Delayed implementation of city/barangay projects for disaster risk reduction	45	44.1
2. Lack of disaster management plan	17	16.7
3. Insufficient equipment used or lack of implementation on projects to mitigate flood control	17	16.7
Response		
1. Delayed responsive action	43	42.2
2. Poor implementation of the RA 10121 and RA 9003	38	37.3
3. Mismanagement in local action in Disaster response.	19	18.6
Recovery		
1. Lack of local attention on those affected people.	47	46.1
2. Delayed implementation of the project for recovery	37	36.3
3. Others	2	2.0

### **Synthesis**

Overall, the result of the study validates the great extent of implementing disaster risk reduction and management activities on flooding. The findings show resilient and objective-driven flood-prone communities. The study also validates that there is no significant difference in the extent of implementation of disaster risk reduction management in all of the thematic areas except for preparedness when respondents are grouped according to income classification, population size, and land area.

This study is anchored on the Theory of Planned Behavior because in implementing DRRM activities on flooding, the attitude towards the behavior of implementers and community leaders in relation to their conduct of implementing the DRRM activities on flooding affects the extent of implementation of disaster risk reduction and management activities on flood-prone communities. Hence, there is the resiliency of flood-prone communities in the implementation of the DRRM activities in the study. The result of the study validates the Theory of Planned behavior because the findings show resilient and objective-driven flood-prone communities.

### **Summary and conclusion**

#### **Summary of Findings**

Overall, the extent of implementation of DRRM activities in flood-prone communities as a whole is a great extent. In terms of the thematic areas, recovery is to a moderate extent, while in the other areas is to a great extent.

There is no significant difference in the extent of implementation of DRRM activities in flood-prone communities when respondents are grouped according to income, population, and land area in all the thematic areas except for preparedness.

Improper disposal of solid waste by the local people is the most common challenge observed in prevention and mitigation by the respondents. Delayed implementation of city/barangay projects for disaster risk reduction is the most common challenge observed in preparedness by the respondents. In response, delayed responsive action is the most common challenge observed by the respondents. Lastly, in recovery, the lack of local attention to those affected people is the most common challenge observed by the respondents. Overall, Improper disposal of solid waste by the local people is the most common challenge observed in the DRRM activities on flooding.

#### **Conclusion**

The findings of the study are reflective of the disaster-resilient communities that are Flood-prone communities in their disaster risk management. They are also objective-driven in their assignments on DRRM activities on flooding. There is also room for improvement where the implementation of DRRM activities on flooding can be improved up to a very great extent as a whole and the thematic area of rehabilitation and recovery can be upgraded to a great extent. The implementers and the community leaders focused more on the thematic areas of prevention and mitigation, preparedness, and response compared to the thematic area of recovery. The implication of the result reflects the actual implementation by our implementers and community leaders and can be a basis for future studies.

#### **Limitation of Findings**

The study's findings are limited since the study was conducted in a highly urbanized city in the Visayas. They do not reflect the opinion of the office where the respondents are

employed or served. This study also identified the challenges in implementing disaster risk reduction management activities on flooding. Another limitation includes the samples since only incidental sampling is used and not stratified random sampling. The study is limited to only 102 respondents which is only a small number compared to the implementers and community leaders in the whole city. The interpretation of the results in the study is not approximate to the result of the actual implementation of the activities. There are also limited studies relating to the extent of implementation of DRRM activities in flood-prone areas.

### **Practical Application**

The researcher proposed a Strategic Plan to strengthen the implementation of the DRRM activities on flooding in their local communities. Furthermore, observing these proposed programs, projects, and activities would create a positive outlook for the community.

Based on the findings and conclusion, the following suggestions are directed to the LCEs, legislative council, community leaders, and future researchers. The Local Chief Executives may look more closely at the results of the study and the proposed enhancement of the BDRRM and CDRRM activities as provided. They may also consider the enhancements proposed and ratify the current mandate on DRRM activities on flooding. Likewise, the Legislative Council may consider strengthening the current policies and programs of DRRM, especially in disaster preparedness, prevention and mitigation, response, and recovery. Lastly, the Community leaders may look at the result of the study for the proposed enhancement of the activities in their respective communities.

### **Direction for Future Research**

Future research may explore other variables that affect the implementation of disaster risk reduction management activities in flooding. Moreover, another study may be conducted exploring the DRRM measures and fund utilization of the community leaders in addressing disaster-related concerns. Furthermore, future researchers may address the limitations mentioned in this study.

## **Proposed strategic plan to enhance implementation of disaster risk management activities on flooding**

### **Context**

This study determined the extent of **implementation of disaster risk reduction management activities in flooding in a highly urbanized city in Central Visayas of the Philippines**. The respondents were grouped according to their income, land area, and population. **The** extent of implementation of the disaster risk reduction management activities on flooding, when grouped according to income, population, and land area classification of the respondent, is great except for the thematic area of recovery. It implies that the implementers had implemented the DRRM activities on flooding most of the time. The same goes with its areas; all of them were of great extent except for recovery, which is to a moderate extent. The findings were utilized to enhance the BDRRM Plan for a highly urbanized city in the Philippines and enhance its implementation of DRRM activities on flooding.

### **Rationale**

A Disaster Risk Reduction and Management Plan serves as the blueprint of the Local Government Unit in implementing disaster preparedness, prevention and mitigation, response, and rehabilitation measures to address the risks and vulnerability of the people and further strengthen the resiliency of the community. Some barangays in Bacolod are considered more vulnerable to disaster, particularly flooding. Hence a study was conducted in the city, barangays, and communities of a highly urbanized city in Central Visayas to determine the extent of the level of implementation of disaster risk reduction management activities on flooding.

**Objectives:**

1. To mitigate the flooding in the areas of a highly urbanized city by improving the extent of implementation of disaster risk reduction management activities on flooding.
2. To ensure that disaster risk management activities are implemented on time without delay.
3. To increase the participatory engagement of the people toward disaster risk reduction management activities on flooding.
4. To reduce the risk and vulnerability of the people to flooding.

**Budgetary Allocation**

The proposed budget can be sourced from the regular annual DRRM funds of the barangays and can be augmented by the DRRM funds of the higher LGUs. Infrastructure projects requiring substantial funding can be sourced from the 20% development fund of the LGUs. Resolutions requesting funding for DRRM projects may also be submitted to the Province or the Office of the Congressman for possible financing. Moreover, it can also be lobbied through different partner agencies and private companies for some donation drives.

**Monitoring and Evaluation**

The BDRRM committee shall monitor regularly, and evaluation can be discussed during its quarterly meeting. Purok officials may also be involved in tracking projects, and regular feedback can be done during purok meetings and barangay assemblies. Barangay officials shall encourage their constituents to participate in DRRM activities.

### Matrix of the proposed strategic plan

#### A. Prevention and Mitigation

Objectives	Strategies	Person Responsible	Financial Resource	Time frame
To implement disaster risk reduction management activities on prevention and mitigation by high and low-income implementers to a very great extent to	1. Proper and strategic disposal of waste by the local people.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementer	1. Government funding 2. Other organizations support	1 year
	2. By allocating enough compensation and funds to the implementers.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	1 year
To implement disaster risk reduction management activities on prevention and mitigation by implementers in smaller and bigger population groups to a very great extent	1, Proper and strategic disposal of waste by the local people.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	1 year
	2.By allocating enough compensation and funds to the implementers.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	
To implement disaster risk reduction management activities on prevention and mitigation by implementers in smaller and bigger land area groups to a very great extent	. 1.Proper and strategic disposal of waste by the local people.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementers	1. Government funding 2. Other organizations support	1 year
	2. By allocating enough compensation and funds to the implementers.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementers	1. Government funding 2. Other organizations support	

B. Preparedness

Objectives	Strategies	Person Responsible	Financial Resource	Time frame
Disaster risk reduction management activities on prevention and mitigation of high and low-income implementers to a very great extent	1.To fast-track the implementation of city/barangay projects for disaster risk reduction	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementers	1. Government funding 2. Other organizations support	2 years
	2.Sufficiency of equipment used	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	2 years
	3.By conducting seminars and orientations on all persons involved in the implementation of DRRM activities.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementers	1. Government funding 2. Other organizations support	2 years
To implement disaster risk reduction management activities on prevention and mitigation by implementers in smaller and bigger population groups to a very great extent.	1.To fast-track the implementation of city/barangay projects for disaster risk reduction	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementers	1. Government funding 2. Other organizations support	1 year
	2.Sufficiency of equipment used	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementers	1. Government funding 2. Other organizations support	1 year
	3.By conducting seminars and orientations on all persons involved in the implementation of DRRM activities.1	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementers	1. Government funding 2. Other organizations support	1 year
To implement disaster risk reduction management activities on prevention and mitigation by implementers in	1.To fast-track the implementation of	1. Local Chief Executives	1. Government funding	1 year

smaller and bigger land area groups to a very great extent.	city/barangay projects for disaster risk reduction	2. Legislative Council 3. Community Leaders 4. Implementers	2. Other organizations support	
	2. Sufficiency of equipment used	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	1 year
	3. By conducting seminars and orientations on all persons involved in the implementation of DRRM activities.1	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	1 year

C. Response

Objectives	Strategies	Person Responsible	Financial Resource	Time frame
To implement disaster risk reduction management activities on prevention and mitigation by high and low-income implementers to a very great extent.	1.Well managed local action	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementer	1. Government funding 2. Other organizations support	1 year
.	2.By allocating enough compensation and funds to the implementers.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementer	1. Government funding 2. Other organizations support	1 year
To implement disaster risk reduction management activities on prevention and mitigation by implementers in smaller and bigger population groups to a very great extent	1.Well managed local action	1. Local Chief Executives  2. Legislative Council 3. Community Leaders 4.Implementer	1. Government funding 2. Other organizations support	1 year
	2.By allocating enough compensation and funds to the implementers.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementer	1. Government funding 2. Other organizations support	1 year
	3.Timely response to the need of the affected individuals by improving communication and personel.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4.Implementer	1. Government funding 2. Other organizations support	1 year
To implement disaster risk reduction management activities on prevention and	1.Well managed local action	1. Local Chief Executives	1. Government funding	1 year

mitigation by implementers in smaller and bigger land area groups to a very great extent.		2. Legislative Council 3. Community Leaders 4. Implementer	2. Other organizations support	
	2. By allocating enough compensation and funds to the implementers.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementer	1. Government funding 2. Other organizations support	1 year
	3. Timely response to the need of the affected individuals by improving communication and personnel.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementer	1. Government funding 2. Other organizations support	1 year

D. Recovery and Rehabilitation

Objectives	Strategies	Person Responsible	Financial Resource	Time frame
To implement disaster risk reduction management activities on prevention and mitigation by high and low-income implementers to a great extent.	1. Timeliness on the implementation of the project for recovery	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	2 years
	2.To give enough compensation and funds to the projects for rehabilitation.	1. Local Chief Executives 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	1 year
.To implement disaster risk reduction management activities on prevention and mitigation by implementers in smaller and bigger population groups to a great extent.	1.Timeliness on the implementation of the project for recovery	1. Local Chief Executives. 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	2 years
	2.To give enough compensation and funds to the projects for rehabilitation.	1. Local Chief Executives. 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	2 years
	3.Government, communities, and other organizations continually support and fund for recovery and rehabilitation activities of DRRM.	1. Local Chief Executives. 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	1 year
To implement disaster risk reduction management activities on prevention and mitigation by implementers in smaller and bigger land area groups to a great extent	1.To give enough compensation and funds to the projects for rehabilitation.	1. Local Chief Executives. 2. Legislative Council 3. Community Leaders 4. Implementers	1. Government funding 2. Other organizations support	1 year

	2. Timeliness on the implementation of the project for recovery	<ol style="list-style-type: none"> <li>1. Local Chief Executives.</li> <li>2. Legislative Council</li> <li>3. Community Leaders</li> <li>4. Implementers</li> </ol>	<ol style="list-style-type: none"> <li>1. Government funding</li> <li>2. Other organizations support</li> </ol>	1 year
	3. Government, communities, and other organizations continually support and fund for recovery and rehabilitation activities of DRRM	<ol style="list-style-type: none"> <li>1. Local Chief Executives.</li> <li>2. Legislative Council</li> <li>3. Community Leaders</li> <li>4. Implementers</li> </ol>	<ol style="list-style-type: none"> <li>1. Government funding</li> <li>2. Other organizations support</li> </ol>	2 years

## References

- [1] Adedeji, O. H., Odufuwa, B. O., & Adebayo, O. H. (2012). Building capabilities for flood disaster and hazard preparedness and risk reduction in Nigeria: need for spatial planning and land management. *Journal of Sustainable Development in Africa*, 14(1), 45-58.
- [2] Ajzen, I. (2015). The theory of planned behaviour is alive and well, and not ready to retire: A commentary on Sniehotta, Pesseau, and Araújo-Soares. *Health Psychology Review*, 9(2), 131-137. <https://doi.org/10.1080/17437199.2014.883474>
- [3] Al-Dahash, H., Thayaparan, M., & Kulatunga, U. (2016). Challenges during disaster response planning resulting from war operations and terrorism in Iraq. In *12th International conference of the International Institute for Infrastructure Resilience and Reconstruction*.
- [4] Alfieri, L., Cohen, S., Galantowicz, J., Schumann, G. J., Trigg, M. A., Zsoter, E., ... & Salamon, P. (2018). A global network for operational flood risk reduction. *Environmental Science & Policy*, 84, 149-158. <https://doi.org/10.1016/j.envsci.2018.03.014>
- [5] Andrew, O. (2018). Determinants of access and utilization of climate services among vulnerable communities: A case study of Isoko communities in Delta State, Nigeria. *Climate Change*, 4(16), 734-742. [http://www.discoveryjournals.org/climate\\_change/current\\_issue/v4/n16/A9.pdf](http://www.discoveryjournals.org/climate_change/current_issue/v4/n16/A9.pdf)
- [6] Asare, M. (2015). Using the theory of planned behavior to determine the condom use behavior among college students. *American Journal of Health Studies*, 30(1), 43. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4621079/>
- [7] Atanga, R. A. (2020). The role of local community leaders in flood disaster risk management strategy making in Accra. *International Journal of Disaster Risk Reduction*, 43, 101358. <https://doi.org/10.1016/j.ijdr.2019.101358>
- [8] Becodo, R. P. (2015). Governance communication for DRRM and preparedness level of the disaster-prone communities in Iloilo, Philippines. *Journal of Society & Technology*, 5, 103-113.
- [9] Bronfman, N. C., Cisternas, P. C., Repetto, P. B., & Castañeda, J. V. (2019). Natural disaster preparedness in a multi-hazard environment: Characterizing the sociodemographic profile of those better (worse) prepared. *PloS One*, 14(4). <https://doi.org/10.1371/journal.pone.0214249>
- [10] Carcellar, N., Co, J. C. R., & Hipolito, Z. O. (2011). Addressing disaster risk reduction through community-rooted interventions in the Philippines: Experience of the Homeless People's Federation of the Philippines. *Environment and Urbanization*, 23(2), 365-381. <https://doi.org/10.1177/0956247811415581>
- [11] Cirella, G. T., & Iyalomhe, F. O. (2018). Flooding conceptual review: Sustainability-focalized best practices in Nigeria. *Applied Sciences*, 8(9), 1558. <https://doi.org/10.3390/app8091558>
- [12] Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- [13] Dash, P., & Punia, M. (2019). Governance and disaster: Analysis of land use policy with reference to Uttarakhand flood 2013, India. *International Journal of Disaster Risk Reduction*, 36. <https://doi.org/10.1016/j.ijdr.2019.101090>
- [14] De Silva, K., & Jayathilaka, R. (2014). Gender in the context of disaster risk reduction: A case study of a flood risk reduction project in the Gampaha District in Sri Lanka.

- Procedia Economics and Finance*, 18, 873-881. [https://doi.org/10.1016/S2212-5671\(14\)01013-2](https://doi.org/10.1016/S2212-5671(14)01013-2)
- [15] Gaire, S., Castro Delgado, R., & Arcos González, P. (2015). Disaster risk profile and existing legal framework of Nepal: Floods and landslides. *Risk Management and Healthcare Policy*, 139-149. <https://doi.org/10.2147/RMHP.S90238>
- [16] Gilbuena Jr, R., Kawamura, A., Medina, R., & Amaguchi, H. (2019). Fuzzy-based gaps assessment of flood disaster risk reduction management systems in Metro Manila, Philippines. *Water and Environment Journal*, 33(3), 443-458. <https://doi.org/10.1111/wej.12416>
- [17] Hashimoto, S., Nagai, M., Fukuma, S., Ohira, T., Hosoya, M., Yasumura, S., ... & Fukushima Health Management Survey Group. (2017). Influence of post-disaster evacuation on incidence of metabolic syndrome. *Journal of Atherosclerosis and Thrombosis*, 24(3), 327-337. <https://doi.org/10.5551/jat.35824>
- [18] Herrera Jr, S. H. (2021). Implementation of the disaster risk reduction and management in flood-prone barangays in Talisay City. *International Social Science Review*, 4(1), 1-1. <https://uz.edu.ph/wp-content/uploads/2022/08/ISSR-VOL4.pdf#page=9>
- [19] Hoffarth, V. (2022). *Song of Negros: Myths and culture in the Philippines*. Troubador Publishing Ltd.
- [20] Ignacio, J. A. F., & Henry, S. (2013). Assessing the vulnerability of populations at high risk to coastal river flooding in the Philippines. *Publication Series of UNU-EHS No. 17/2012*, 78. <https://d-nb.info/1036332659/34#page=79>
- [21] Ishiwatari, M., Koike, T., Hiroki, K., Toda, T., & Katsube, T. (2020). Managing disasters amid COVID-19 pandemic: Approaches of response to flood disasters. *Progress in Disaster Science*, 6. <https://doi.org/10.1016/j.pdisas.2020.100096>
- [22] Jamshed, A., Birkmann, J., Rana, I. A., & Feldmeyer, D. (2020). The effect of spatial proximity to cities on rural vulnerability against flooding: An indicator based approach. *Ecological Indicators*, 118. <https://doi.org/10.1016/j.ecolind.2020.106704>
- [23] Jongsuksomsakul, P. (2013). Disaster risk management communication in ASEAN case study in flood. *GSTF International Journal on Media & Communications*, 1(1), 120-131.
- [24] Karlan, D., Kendall, J., Mann, R., Pande, R., Suri, T., & Zinman, J. (2016). Research and impacts of digital financial services. *National Bureau of Economic Research*. [https://www.nber.org/system/files/working\\_papers/w22633/w22633.pdf](https://www.nber.org/system/files/working_papers/w22633/w22633.pdf)
- [25] Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel Psychology*, 28(4), 563-575.
- [26] Lopez Jr, G. P., Mejica, M. N. A., & Madrigal, D. V. (2022). Disaster preparedness practices of low and middle-income households in the coastal communities in Negros Occidental, Philippines. *Philippine Social Science Journal*, 5(2), 40-50.
- [27] Luu, C., Von Meding, J., & Kanjanabootra, S. (2018). Flood risk management activities in Vietnam: A study of local practice in Quang Nam province. *International Journal of Disaster Risk Reduction*, 28, 776-787. <https://doi.org/10.1016/j.ijdr.2018.02.006>
- [28] Malalgoda, C., Amaratunga, D., Haigh, R., & Albert, O. (2018, September). Symposium on Making cities resilient: how local governments can reduce disaster risks realigning with Sendai Framework for Disaster Risk Reduction: Book of abstracts. In *International Symposium on Making Cities Resilient: How Local Governments Can Reduce Disaster Risks Realigning with Sendai Framework for Disaster Risk Reduction*.

- [29] McVittie, A., Cole, L., Wreford, A., Sgobbi, A., & Yordi, B. (2018). Ecosystem-based solutions for disaster risk reduction: Lessons from European applications of ecosystem-based adaptation measures. *International Journal of Disaster Risk Reduction*, 32, 42-54. <https://doi.org/10.1016/j.ijdr.2017.12.014>
- [30] Mohanty, M. P., Mudgil, S., & Karmakar, S. (2020). Flood management in India: A focussed review on the current status and future challenges. *International Journal of Disaster Risk Reduction*, 49. <https://doi.org/10.1016/j.ijdr.2020.101660>
- [31] Octastefani, T., & Rum, M. (2019). Millennials' contribution in disaster risk reduction: Case study of tidal flooding in Semarang. *Jurnal Ilmu Sosial dan Ilmu Politik*, 23(1), 14-29. <https://core.ac.uk/download/pdf/294858838.pdf>
- [32] Okoroji, U. U. (2018). Disaster risk reduction and local knowledge in flood-prone communities: A Nigerian case study. <http://hdl.handle.net/10012/13023>
- [33] Pardillo, R. S., & Perigua, I. (2020). Disaster preparedness in Sagay City. *Globus Journal of Progressive Education*, 10(1), 1-9. <https://www.globusedujournal.in/wp-content/uploads/2020/06/GPE-JJ20-Robert-S.-Pardillo-Final.pdf>
- [34] Pascapurnama, D. N., Murakami, A., Chagan-Yasutan, H., Hattori, T., Sasaki, H., & Egawa, S. (2018). Integrated health education in disaster risk reduction: Lesson learned from disease outbreak following natural disasters in Indonesia. *International Journal of Disaster Risk Reduction*, 29, 94-102. <https://doi.org/10.1016/j.ijdr.2017.07.013>
- [35] Pati, R., Franco, D., Alcantara, A., Pacardo, E., & Resurreccion, A. (2014). Vulnerability to flooding of the towns of Mabitac and Santa Maria, Laguna, Philippines. *Journal of Environmental Science and Management*, 17(2). [https://doi.org/10.47125/jesam/2014\\_2/02](https://doi.org/10.47125/jesam/2014_2/02)
- [36] Rana, I. A., Asim, M., Aslam, A. B., & Jamshed, A. (2021). Disaster management cycle and its application for flood risk reduction in urban areas of Pakistan. *Urban Climate*, 38. <https://doi.org/10.1016/j.uclim.2021.100893>
- [37] Raungratanaamporn, I. S., Pakdeeburee, P., Kamiko, A., & Denpaiboon, C. (2014). Government-communities collaboration in disaster management activity: Investigation in the current flood disaster management policy in Thailand. *Procedia Environmental Sciences*, 20, 658-667. <https://doi.org/10.1016/j.proenv.2014.03.079>
- [38] Samaddar, S., Yokomatsu, M., Dayour, F., Oteng-Ababio, M., Dzivenu, T., Adams, M., & Ishikawa, H. (2015). Evaluating effective public participation in disaster management and climate change adaptation: insights from northern ghana through a user-based approach. *Risk, Hazards & Crisis in Public Policy*, 6(1), 117-143. <https://doi.org/10.1002/rhc3.12075>
- [39] Satterthwaite, D. (2011). What role for low-income communities in urban areas in disaster risk reduction. [https://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/Satterthwaite\\_2011.pdf](https://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/Satterthwaite_2011.pdf)
- [40] Setiadi, R., & Frederika, R. (2022). Family financial planning for disaster preparedness: A case study of north Semarang, Indonesia. *International Journal of Disaster Risk Reduction*, 82. <https://doi.org/10.1016/j.ijdr.2022.103332>
- [41] Simkus, A., Coolen, F. P., Coolen-Maturi, T., Karp, N. A., & Bendtsen, C. (2022). Statistical reproducibility for pairwise t-tests in pharmaceutical research. *Statistical Methods in Medical Research*, 31(4), 673-688. <https://journals.sagepub.com/doi/pdf/10.1177/09622802211041765>

- [42] Sumbillo Jr, L. Z., & Madrigal, D. V. (2020). Disaster risk reduction management practices of Augustinian Recollect schools in Negros Island. *Philippine Social Science Journal*, 3(2), 135-136.
- [43] Suzuki, S. (2021). Interfering via ASEAN? In the case of disaster management. *Journal of Current Southeast Asian Affairs*, 40(3), 400-417. [10.1177/18681034211016865](https://doi.org/10.1177/18681034211016865)
- [44] Tabilon-Tizon, R., & Comighud, S. M. T. (2020). Implementation of the public schools' disaster risk reduction management program and level of capabilities to respond. *UBT Knowledge Center*, 48. <https://knowledgecenter.ubt-uni.net/cgi/viewcontent.cgi?article=3144&context=conference#page=50>
- [45] Tselios, V., & Tompkins, E. L. (2019). What causes nations to recover from disasters? An inquiry into the role of wealth, income inequality, and social welfare provisioning. *International Journal of Disaster Risk Reduction*, 33, 162-180. <https://doi.org/10.1016/j.ijdr.2018.10.003>
- [46] Villanueva, M. M., Sigaya, S. S., Arca, E. M. A., & Pedrosa, E. A. (2021). Sustainable livelihood program for Purok Arao, Barangay Vista Alegre, Bacolod City, Negros Occidental, Philippines. *Kalamboan*, 1, 43-57.
- [47] Yodmani, S. (2001). Disaster risk management and vulnerability reduction. <http://lib.riskreductionafrica.org/bitstream/handle/123456789/495/2023.Disaster%20Risk%20Management%20and%20Vulnerability%20Reduction.pdf?sequence=1>