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Disaster Risk Reduction and Management System Implementation in Flood Prone Barangays in Sta. Barbara, Pangasinan

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Abstract — This study assessed the implementation of the Disaster Risk Reduction Management in the Municipality of Santa Barbara, Pangasinan. Findings of the study revealed that the respondents rated the 5Ps of Disaster Risk Reduction Management System as "Evident|. These are philosophy, policies, programs, practices, and processes.

The level of implementation of the DRRM in Santa Barbara was perceived by the respondents as "Implemented" in terms of disaster prevention and mitigation, preparedness, response, and rehabilitation and recovery. There is no significant relationship between Philosophy and Policies and the four (4) components of DRRM. There is a significant relationship between "Programs" and "Disaster Prevention and Mitigation"; while no significant relationship between "Programs" and "Disaster Preparedness," "Response", and "Rehabilitation and Recovery; There is a significant relationship between "Practices" and "Disaster Preparedness", while no significant relationship between "Disaster Response," "Rehabilitation and Recovery;" and there is a significant relationship between "Processes" and "Disaster Prevention and Mitigation," "Preparedness," and "Response," while no significant relationship exist between "Processes" and "Disaster Rehabilitation and Recovery."

The three (3) top most challenges encountered by LGU in the implementation of DRRM of Santa Barbara are the following: 1) Blocked/Non-existent drainage system and poorly planned road widening; 2) Funding and resource constraints, and

3) lack of capacity and training for barangay officials and volunteers. On the other hand, the stakeholders also encountered the following challenges:1) minimal budget for DRRM projects, equipment, relief goods, and livelihood programs; 2) Insufficient or irrelevant trainings/seminars for personnel needing capability building; and 3) Shortage of essential gear for debris clearing, transport, and early warning systems. As to the level of community participation in the implementation of DRRM, the respondents were involved/or participated in the development of DRRN plans and ensure that their needs and perspectives are considered.

Based from the findings of this study, the following recommendations are hereby forwarded: LGU Santa Barbara may: 1) Include DRRM as one of its standing agenda, ensuring continuous focus on risk management. Discussions should involve around recent disaster events and lessons learned from previous disasters; 2) Conducts annual risks assessments Integrate lessons from post-disaster evaluations; 3) Procure and distributes essential equipment and resources to emergency response teams and volunteer units; 4) Disseminates warnings through various channels, including social media, local radio, mobile-based alerts, and community leaders to reach everyone; 5) Collaborates with DSWD to implement and strengthen Mental Health and Psychosocial support services in disaster response; 6) Builds the capacity of barangay officials and volunteers by equipping them

with essential skills such as standard first aid and basic life support; 7) Strengthens barangay participation in DRRM through continuous coordination and communication with BDRRMCs; and 8) Facilitates access to financial aid programs, which provides direct cash to affected individuals.

Keywords — disaster risk reduction. implementation, prevention and mitigation, preparedness, response, rehabilitation, and recovery

I. Introduction

The world today suffers from various natural and man-made disasters, such as typhoons, earthquakes, volcanic eruptions, flash floods, landslides, and tsunamis. The impact of these disasters is aggravated by global warming, climate change, environmental degradation, and population explosion. According to Setyawan et al. (2021), disasters, their causes, and their effect on human existence must be minimized and identified as early as possible to facilitate the development of a solution for disaster management.

"Disaster" according to Republic Act 10121, the Philippine Disaster Risk Reduction and Management Act of 2010, is defined as a serious disruption to a community of society's functioning that results in widespread human, material, economic, or environmental losses, exceeding the affected community's capacity to cope with its own resources.

Our country is one of the world's most disaster-prone countries in the world. Its susceptibility to various hazards/disasters can be attributed to its geographical location and geology. Located along the Western part of the "Pacific Ring of Fire" and along the boundary of major tectonic plates, and at the center of a typhoon belt, its islands are regularly impacted by floods, typhoons, landslides, earthquakes, volcanoes, and droughts. The Philippines also ranks among the top three countries in the world for population exposure and vulnerability to hazards. (Enriquez et al. 2019). As a result of this, the area surrounding the Philippines is visited by an average of 20 typhoons annually, with some intensifying into super typhoons, of which six to seven cause significant damage. (http://earthguideweb- meteorolog.layeredearth.com)

In line with the above, according to World Risk Index (WRI) 2024, which assessed the risk of natural disasters, the Philippines is consistently ranked as the most at-risk country to extreme natural events and negative climate change. The WRI report also mentioned that Asian countries are the "most at risk" to natural and climatic threats. Global Risk Report 2023 by the World Economic Forum revealed that in the next two years, the country's top risks would be natural disasters and extreme weather events, among others. The preceding statements were validated by Mina (2021) when he mentions that the World Risk Index states that 74% of the Filipinos are affected by the aforementioned calamities.

Since our country encounters an average of 20 typhoons every year, it is no wonder that the flooding crisis ranks third in the list of biggest problems in the Philippines. The Department of

Environment and Natural Resources, Mines and Geo- Science Bureau (DENR-MGB) provided a list of the top ten flood prone provinces and Pangasinan ranks Number 3. Pangasinan, together with Ilocos Norte are also identified as flood-prone provinces within Region I.

To address the disaster-prone setting of our country, in 2010, the Senate and the House of Representatives passed Republic Act 10121 or the Philippine DRRM Law. It is an act strengthening the Philippine disaster risk reduction and management system, providing for the national disaster risk reduction and management framework, and institutionalizing the national disaster risk reduction and management plan.

Under Republic Act 10121, local Government Units, through their Municipal Disaster Risk Reduction and Management Councils (MDRRMCs) and Municipal Disaster Risk Reduction and Management Offices (MDRRMOs) are primarily responsible for implementing disaster risk reduction and management (DRRM) activities within their jurisdiction.

Among the municipalities In Pangasinan, Santa Barbara is ranked among the most vulnerable areas to disasters, specifically typhoons and floods. This was stated by Estember et al. (2019), when he identified five (5) most vulnerable towns in the province alongside Dagupan City, Calasiao, Bolinao, and Sual. This vulnerability is assessed based on factors like reduction ability, resilience, and relief efforts related to typhoons, floods, and landslides. While the study did not assign a specific numerical rank, it places Santa Barbara within the top tier of disaster-prone areas in Pangasinan.

According to the list furnished by the MDRRMO of Santa Barbara, the flood- prone barangays are as follows: 1) Balingueo, 2) Banaoang, 3) Dalongue, 4)

Malanay, 5) Maningding, 6) Maticmatic, 7) Poblacion Norte, 8) Sapang, 9) Sonquil, and 10) Tuliao. In a municipality like Santa Barbara, which ranks among the vulnerable towns in Pangasinan susceptible to hazards like floods, the systematic management of disaster risks is paramount to safeguarding its population and infrastructure.

Conceptual Framework

Disaster is a serious disruption of the functioning of a community or a society involving widespread human material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources. Margallo (2019) mentioned, they are often described because of the combination of several things: the exposure to a hazard; the conditions of vulnerability that are present; and insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts may include loss of life, injury, disease and other negative effects on human, physical, mental and social well- being, together with damage to property, destruction of assets, loss of services, social and economic disruption, and environmental degradation.

DRRM cuts across various United Nations Sustainable Development Goals. Goal 11 of the United Nations Sustainable Development Goals is to make citizens inclusive, safe, resilient, and sustainable by 2030, significantly reduce the number of deaths and the number of people affected, and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus of protecting the poor and people in vulnerable situations. (United Nations Sustainable Development Goals)

Other Sustainable Development Goals that addressed DRRM are: SDG 1 – No Poverty. SDG 2 – Zero Hunger, SDG 3 – Good Health and Well-Being, SDG 4 – Quality Education, and SDG 6 – Clean Water and Sanitation.

In the Philippines, various plans and guidelines were formulated to support DRRM. Among others are the: National Disaster Risk Reduction and Management Plan (NDRRMP) 2020 – 2030; Guidelines for Mainstreaming Disaster Risk Reduction (DRR), and Climate Change Adaptation (CCA) in the Comprehensive Development Plan (CDP). There are also the Local Disaster Risk Reduction and Management Plans (LDRRMP) for Local Government Units. In addition, the acceleration of climate action, and strengthening of disaster resilience is set as one of the country's priorities in the Philippine Development Plan (PDP) 2023-2028.

Statement of the Problem

This study assessed the implementation of the Disaster Risk Reduction Management System in the Municipality of Santa Barbara, Pangasinan.

Specifically, it sought to answer the following sub-problems.

1) How may the 5Ps of Disaster Risk Reduction Management System of the Municipality of Santa Barbara be described in terms of:

   1.1 philosophy;

   1.2 policies;

   1.3 programs;

   1.4 practices; and

   1.5 processes?

2) What is the level of implementation of the Disaster Risk Reduction and Management System in the Municipality of Santa Barbara as perceived by the respondents in terms of the following thematic areas:

   2.1 prevention and mitigation;

2.2 preparedness;

2.3 response; and

2.4 rehabilitation and recovery?

3) Is there a significant relationship between the 5Ps of DRRM and the implementation of DRRM of the Municipality of Santa Barbara?

4) What are the challenges encountered by the LGU and stakeholders in the implementation of DRRM?

5) What is the level of community participation in the implementation of DRRM in Santa Barbara, Pangasinan?

6) What actionable recommendations may be proposed to improve implementation of DRRM in Santa Barbara, Pangasinan?

II. Methodology

This chapter presents the research design, population and sampling procedure, research instrument, and data collection

Research Design and Strategy

This study utilized the descriptive method of research. McCombes (2019) highlights that descriptive research accurately and systematically describes a population, situation, or phenomenon and can utilize a wide range of quantitative and qualitative methods. This definition was corroborated by Siedlecki (2020) when he states that descriptive research seeks to describe certain facts, situations, or conditions within their natural conditions, without any scientific manipulation.relevant training or seminars. Also, the extent level of badminton skill competencies will be determined in this study.

Population and Locale of the Study

The subjects of this study were residents from the selected barangays of the Municipality of Santa Barbara who are considered as “always affected” by natural calamities such as typhoons and floods. The respondents were selected based on the following inclusion criteria: 1) they must be 18 years old and above, 2) have lived in the barangay for at least two (2) years, 3) possess basic knowledge of Disaster Risk Reduction and Management (DRRM), and 4) voluntarily agreed to participate in the study. A stratified random sampling technique was employed to ensure that all ten identified high-risk barangays were proportionally represented in the study. The total sample size of 397 respondents was determined using Cochran’s formula with a 95% confidence level, a 5% margin of error, and maximum variability ($p = 0.5$). The sample for each barangay was then

allocated proportionally according to its population. This approach ensures that larger barangays contribute more respondents while smaller barangays are still represented, maintaining both representativeness and relevance.

In particular, the Municipality of Santa Barbara has the following list of affected barangays as shown in Table 1 below.

Table 1
Distribution of Respondents

Barangays	Total Population (N)	Sample Size (n)
Balingueo	1,895	13
Banaoang	9,755	69
Dalongue	3,130	22
Malanay	4,730	33
Maningding	12,790	91
Maticmatic	6,485	46
Poblacion Norte	400	3
Sapang	2,895	21
Sonquil	4,270	30
Tuliao	9,740	69
Total	56,090	397

Data Gathering Tool

The researcher used a survey questionnaire as the main instrument in data gathering. This tool helped the researcher in assess the implementation of the Disaster Risk Reduction Management System in the Municipality of Santa Barbara, Pangasinan.

The questionnaire was prepared by the researcher after intensive readings of related materials from professional journals, magazines, books, and articles from the world-wide web related to disaster management. It also contains items patterned from 2011-2018 Philippine National Disaster Risk Reduction and Management Plan and from Republic Act No. 10121, otherwise known as the "Philippine Disaster Risk Reduction and Management Act of 2010," which highlighted the key activities under the NDRRMC priority areas: prevention and mitigation, preparedness, response, and rehabilitation and recovery.

The questionnaire consisted of two parts. Part I focused on the description of the Disaster Risk Reduction Management System of the Municipality of Santa Barbara, while Part II assessed the level of implementation of the DRRM system.

The researcher secured permission to conduct the study from the Municipal Mayor and the Punong Barangays of the barangays of the municipality, through a Letter of Request. The target

respondents were identified prior to the administration of the instrument to facilitate a more efficient conduct of the survey. The respondents were assured that whatever information they will gave, would be treated with utmost confidentiality.

Data Gathering Procedure

For better and reliable results of the study, statistical tools were utilized.

As to Problem No. 1, which described the Disaster Risk Reduction Management System of the Municipality of Santa Barbara in terms of 5 Ps, (philosophy, policies, programs, practices, and processes, Average Weighted Mean (AWM) was used.

In describing the DRRM System, the scale below was utilized.

Point Value	Scale Range	Descriptive Equivalent
4	3.50 – 4.0	Highly Evident (HE)
3	2.50 - 3.49	Evident (E)
2	1.50 - 2.49	Moderately Evident (ME)
1	1.00 - 1.49	Not Evident (NE)

For Problem No. 2 which assessed the level of implementation of the Disaster Risk Reduction and Management System in the Municipality of Santa Barbara, Average Weighted Mean (AWM), was likewise used.

The scale on the below was used to measure the level of implementation.

Point Value	Scale Range	Descriptive Equivalent
4	3.50 – 4.0	Highly Implemented (HI)
3	2.50 - 3.49	Implemented (I)
2	1.50 - 2.49	Moderately Implemented (MI)
1	1.00 - 1.49	Not Implemented (NI)

For Problem No. 3, which determined if there exists a significant relationship between the 5Ps of DRRM and the implementation of DRRM in the Municipality of Santa Barbara, Pearson-r was used.

As to the challenges encountered by LGU and stakeholders, frequency counts, percentages, and ranking were used.

About the level of community participation in the implementation of DRRM in Santa Barbara, Average Weighted Mean (AWM) was used. To measure the level of community participation, a-Four Point Likert Scale was utilized, with the corresponding scale shown below:

Point Value	Scale Range	Descriptive Equivalent
4	3.50 – 4.0	Highly Participated HPI)
3	2.50 - 3.49	Participated (P)
2	1.50 - 2.49	Moderately Participated (MP)
1	1.00 - 1.49	Not Participated (NP)

III. Results and Discussion

This chapter presents the data gathered, the results of the statistical analysis done, and the interpretation of the findings. These are presented in tables following the specific research problem stated in Chapter 1.

I. Description of the Disaster Risk Reduction and Management System of Santa Barbara

Table 1
Disaster Risk Reduction and Management System in Terms of Philosophy
n = 397

A. Philosophy ***The municipality of Santa Barbara:***	**Mean**	**Descriptive Rating**
1) communicates its commitment to DRRM to officials, employees, and barangay officials	2.78	Evident
2) incorporates DRRM policies during its regular sessions	2.48	Moderately Evident
3) promotes a culture of safety and preparedness	2.76	Evident
4) aligns the principle of DRRM with its core values	2.84	Evident
5) integrates DRRM into its vision, mission, goals, and objectives	2.67	Evident
Weighted Mean	2.71	Evident

Legend: 4 - 3.50 – Highly Evident (HE), 3 – 2.50 – 3.49. Evident (E), 2 – 1.50 – 2.49, Moderately Evident (ME), 1 – 1.00 – 1.49, Not Evident (NE)

As reflected in Table 1 above, in terms of "Philosophy" it garnered a weighted mean of 2.71, with a descriptive rating of "Evident." This means that the Local Government of Santa Barbara recognize the importance of Disaster Risk Reduction Management (DRRM) in the philosophy of their LGU.

The table also shows that there are five (5) indicators in the category of Philosophy, four (4) of which were rated as "Evident." with means ranging from 2.67 to 2.84. Out of the four (4), the indicator which obtained the highest mean of 2.84, rated as Evident, is "The Municipality aligns the principles of DRRM with its core values."

II. Disaster Risk Reduction and Management System Implementation of the Municipality of Santa Barbara

Table 2 below presents the Disaster Risk Reduction and Management System Implementation along Prevention and Mitigation.

Local government units and individuals must undertake disaster prevention and mitigation activities and strategies. Prevention measures seek to eliminate the impact of hazards and/or reduce susceptibility to them. Mitigation measures, on the other

Table 2
Disaster Risk Reduction and Management System Implementation Along Prevention and Mitigation
n = 397

A. Prevention and Mitigation ***The Municipality of Santa Barbara:***	**Mean**	**Descriptive Rating**
1) disseminates information about disaster risks, early warning systems and safety measures	3.04	Implemented
2) organizes regular drills to prepare barangays for different disasters	2.99	Implemented
3) conducts training programs for barangays on disaster preparedness, response and recovery	2.92	Implemented
4) ensures that children, elderly, and people with disabilities are included in DRRM initiatives	2.77	Implemented
5) establishes and strengthens Local Disaster Risk Reduction and Management Councils (LDRRMCs)	3.05	Implemented
Weighted Mean	2.95	Implemented

Legend: 4 - 3.50 – Highly Implemented (HI), 3 – 2.50 – 3.49. Implemented (I), 2 –1.50 – 2.49, Moderately Implemented (MI), 1 – 1.00 – 1.49, Not Implemented (NI)

organizes regular drills, conduct training programs for disaster preparedness response and recovery, and ensures that children, the elderly, and persons-with- disabilities are included in DRRM initiatives.

Of the five (5) indicators, "Establishes and strengthens Local Disaster Risk Reduction and Management Councils (LDRRMCs), obtained the highest mean of 3.05.

Municipalities are required to establish and strengthen Local Disaster Risk Reduction and Management Councils (LDRRMCs). This requirement is mandated By the Philippine Disaster Risk Reduction and Management Act of 2010 (Republic Act No. 10121). In addition, municipalities are encouraged to enhance the capacity and functionality of these councils through training, resources, and community involvement.

IV. Challenges Encountered by the LGU and Stakeholders in the Implementation of DRRM

Table 3, next page, identified the challenges encountered by the Local Government Unit (LGU) of Santa Barbara in the implementation of DRRM.

It could be gleaned from the table that the three (3) top-most challenges encountered by LGU Santa Barbara in the implementation of the DRRM are the following: 1) Blocked/non-existent drainage system and poorly planned road widening (Rank 1); 2) Funding and resource constraints (Rank 2); and 3) Lack of capacity and training for barangay officials and volunteers (Rank 3). Blocked drainage systems refer to existing infrastructure (pipes, catch basins, culverts, channels) that cannot function at full capacity due to obstructions. Common causes, according to Al Overview, include improper disposal of solid waste and debris, siltation, or damage from construction projects.

Table 3
Challenges Encountered by the Local Government Unit (LGU) in the Implementation of DRRM
n=397

Challenges	f	%	Rank
1) Blocked/non-existent drainage system and poorly planned road widening.	372	93.70	1
2) Funding and resource constraints.	361	90.93	2
3) Lack of capacity and training for barangay officials and volunteers.	354	89.17	3
4) Poor database management and fragmented coordination among stakeholders.	343	86.40	4
5) Insufficient full-time disaster managers, and lack of specialized skills.	331	83.37	5
6) Minimal funds for DRRM projects, training, equipment, and relief goods forcing barangays to rely heavily on LGUs	319	80.35	6
7) Shortages of essential gear like debris clearing tools, multi-purpose vehicles and communication systems.	308	77.58	7
8) Difficulty in getting adequate, well-trained personnel and conducting congruent training programs.	296	74.56	8
9) Fragmentation, poor data systems, and coordination gaps.	283	71.28	9
10) Inconsistent policies and regulations create confusion and hinder effective DRRM implementation	268	67.51	10

Funding and resource constraints poses significant challenges to effective DRRM, primarily be limiting proactive measures and forcing a reliance on less efficient post-disaster response and recovery efforts. Evidences show that despite evidences that investing in DRR can be highly cost-effective, it is difficult to quantify the benefits of avoided disasters, making it a lower priority for pre-event budget allocation compared to other pressing problems.

Many barangays, particularly in rural areas, operate on constrained budgets and often struggle to allocate sufficient funds for comprehensive training programs. The lack of capacity training for barangay officials and volunteers is primarily due to limited financial resources, inadequate training opportunities, political dynamics in appointments, and a mismatch between actual needs and available programs. (https://dilg.gov.ph)

IV. Conclusions and Recommendations

Based from the findings of the study, the following conclusions were arrived at: The 5Ps of Disaster Risk Reduction Management System of the Municipality of Santa Barbara described in terms of: “Philosophy,” “Policies,” “Programs,” “Practices”, and “Processes”, were all rated as “Evident. The four (4) components of Disaster Risk Reduction Management along: “Prevention and Mitigation,” “Preparedness”, “Response”, and “Rehabilitation and Recovery”, were all rated as “Implemented.” There is no significant relationship between “Philosophy” and” Policies” and the four (4) components of DRRM (“Prevention and Mitigation,” “Preparedness”, “Response”, and “Rehabilitation and Recovery”) in the Municipality of Santa Barbara,

There is a significant relationship between "Programs" and "Disaster Prevention and Mitigation," while no significant relationship exists between "Programs" and "Disaster Preparedness," "Response," and "Rehabilitation and Recovery." There is a significant relationship between "Practice" and "Disaster Preparedness," while no significant relationship between "Practice" and "Disaster Prevention and Mitigation," "Response," and "Rehabilitation and Recovery." There is a significant relationship between "Processes" and "Disaster Prevention and Mitigation," "Preparedness and Response," while there is a significant relationship between "Processes" and "Rehabilitation and Recovery." In view of the findings and the conclusions derived from this study, the following recommendations are hereby forwarded:

LGU Santa Barbara may: Include DRRM as one of its standing agenda, ensuring continuous focus on risk management. Discussions should involve around recent disaster events and lessons learned from previous disasters; Conducts annual risks assessments Integrate lessons from post-disaster evaluations; Procure sand distributes essential equipment and resources to emergency response teams and volunteer units; Disseminates warnings through various channels, including social media, local radio, mobile-based alerts, and community leaders to reach everyone, Collaborates with DSWD to implement and strengthen Mental Health and Psychosocial support services in disaster response ,Builds the capacity of barangay officials and volunteers by equipping them with essential skills such as standard first aid and basic life support; Strengthens barangay participation in DRRM through continuous coordination and communication with BDRRMCs; and Facilitates access to financial aid programs, which provides direct cash to affected individuals.

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