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Disaster risk reduction management readiness level in flood-prone municipalities of Camarines Sur

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Abstract

This study aimed to assess DRRM readiness levels among staff in the flood-prone municipalities of Milaor, San Fernando, and Pasacao, Camarines Sur. Random sampling selected participants from each municipality's DRRM workforce to ensure representative data on key components: hazard assessment, early warning systems, emergency response planning, infrastructure preparedness, and community capacity building. Data collection involved survey questionnaires distributed to randomly sampled DRRM staff, supplemented by survey. Analysis followed the NDRRMC Readiness Assessment Framework, with results interpreted using standards from the Philippine DRRM Act of 2010 (RA 10121) and its implementing rules. Survey findings showed staff reported compliance with minimum standards for hazard mapping and early warning systems in most areas. However, emergency shelter capacity and evacuation route signage consistently failed to meet requirements across all three municipalities. Responses also revealed that community awareness and training programs were below recommended levels, indicating weak grassroots preparedness. Logistics coordination for relief operations was inadequate in inland areas. Based on NDRRMC guidelines, Milaor, San Fernando, and Pasacao were classified as having "high level readiness" suitable for common flood events. Yet, improvements are needed to handle severe or complex disasters. These results emphasize the need for greater investment in infrastructure, regular readiness audits, and targeted capacity-building programs for DRRM staff. Strengthening these areas will improve flood resilience in the surveyed municipalities. The study provides baseline data for local government units and policymakers to prioritize resource allocation and address gaps in emergency shelter, signage, training, and logistics coordination.

Keywords: readiness, demographic profile, correlation, training facilities, equipment and human resources

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1. Introduction

The Philippines is highly vulnerable to floods, ranking among the top disaster-prone countries globally (World Risk Report, 2023). The country experiences frequent flooding, especially in low-lying areas like Camarines Sur, due to its geographical location and climate. The Philippine government has institutionalized the Disaster Risk Reduction and Management Act of 2010 (RA 10121) to enhance community resilience.Camarines Sur, particularly municipalities like Milaor, San Fernando, and Pasacao, face recurring flood events that disrupt socio-economic activities and endanger lives. Effective DRRM is crucial, but readiness varies across Local Government Units (LGUs) due to limited resources and inadequate infrastructure.This study assesses DRRM readiness in these flood-prone municipalities, focusing on operational readiness, resource capacity, and community engagement. It aligns with Sustainable Development Goals (SDGs) 1, 3, 9, 11, and 13, contributing to poverty reduction, health outcomes, and climate action.Previous studies highlight the importance of localized DRRM planning, community-based knowledge, and early warning systems in reducing flood impacts (Ignacio and Mercado, 2014; Lagmay et al., 2015). This research aims to identify gaps and provide recommendations to enhance flood risk management and inform policies for disaster risk reduction.

Objectives - The primary objective of this study is to assess the Disaster Risk Reduction and Management (DRRM) readiness of Milaor, San Fernando, and Pasacao in Camarines Sur, focusing on flood-prone areas. It seeks to profile respondents by age, civil status, education, and years of stay, and evaluate DRRM readiness in terms of training, equipment, and human resources. The study also examines the relationship between respondent profiles and DRRM readiness, aiming to propose interventions and enhance disaster resilience in these municipalities.

Significance of the study - This study evaluates the Disaster Risk Reduction and Management (DRRM) readiness of flood-prone municipalities in Camarines Sur, Philippines, with the aim of enhancing local disaster preparedness and resilience. Specifically, it assesses the preparedness of Milaor, San Fernando, and Pasacao in terms of training, equipment, and human resources, and proposes evidence-based interventions to strengthen DRRM systems and improve community resilience to flood-related disasters.

Scope and delimitation - This study assesses the Disaster Risk Reduction and Management (DRRM) readiness of Pasacao, San Fernando, and Milaor municipalities in Camarines Sur, Philippines, which are highly vulnerable to flooding. It evaluates the preparedness of local government units and communities in managing flood-related disasters, focusing on DRRM council functionality, early warning systems, evacuation plans, and community awareness. Data was collected through surveys, interviews, and document analysis involving DRRM officers and barangay officials. The findings are limited to the research period and rely on self-reported data, providing a snapshot of DRRM readiness in these municipalities.

Theoretical Framework - This study is based on three theoretical frameworks that provide a comprehensive understanding of disaster risk reduction and management in the Philippines' flood-prone municipalities. These frameworks consider disasters as a result of natural hazards and social, economic, and institutional factors. They help examine local governments' and communities' preparedness, response, and recovery from flooding, and their resilience and adaptability. The Social Cognitive Theory (SCT) suggests DRRM readiness is influenced by learned behaviors, such as self-efficacy and observational learning. Communities observing effective disaster responses adopt similar behaviors, enhancing readiness. The Protection Motivation Theory (PMT) explains motivation to prepare for floods depends on perceived risk severity, vulnerability, and belief in effective measures. The Theory of Planned Behavior (TPB) states disaster preparedness is influenced by attitudes, social norms, and perceived control. These frameworks are supported by studies on flood risk forecasting and DRRM implementation in the

Bicol Region. This study assesses DRRM readiness in Camarines Sur, identifying gaps and areas for improvement.

2. Methodology

This study aims to assess DRRM readiness in Camarines Sur, identifying gaps and areas for This chapter presents the methodology used in collecting the data for the study. It includes Research Design, Research Method, Population and Sampling design, Data Gathering procedure, and the statistical Treatment and data employed in data analysis to interpret the pertinent information gathered.

Research design - This study employed a mixed-method research design, combining quantitative and qualitative approaches to assess the Disaster Risk Reduction and Management (DRRM) readiness of flood-prone municipalities in Camarines Sur. A structured survey questionnaire was used to collect numerical data, which was analyzed using statistical tools to determine the level of readiness. Additionally, qualitative data was gathered through open-ended questions and interviews to provide insights into DRRM implementation, challenges, and best practices, offering a comprehensive understanding of the municipalities' preparedness.

Research method - The study used a survey questionnaire and in-depth interviews to gather data on DRRM preparedness in flood-prone municipalities. The questionnaire included Likert-scale and open-ended questions on early warning systems, emergency response plans, and community participation. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to analyze the data, with results presented in tables and graphs to highlight strengths and weaknesses in local DRRM efforts.

Population and sampling - The study targeted Municipal DRRM Office staff and DRRM focal persons in Pasacao, San Fernando, and Milaor, Camarines Sur, due to their key roles in disaster management. Using Slovin's formula, a sample size of 46 was determined from a total population of 54 DRRM personnel, ensuring a high representation. The breakdown includes 15 respondents from Milaor, 17 from San Fernando, and 14 from Pasacao. This sample size provides reliable data on DRRM readiness, with mean scores interpreted as Very High (4.21-5.00), High (3.41-4.20), Moderate (2.61-3.40), Low (1.81-2.60), or Very Low (1.00-1.80) readiness, allowing for a balanced assessment in these flood-prone municipalities.

Data gathering - To gather accurate data on DRRM readiness in a flood-prone Camarines Sur municipality, researchers secured approval from their academic institution, local government, and MDRRMO, and sent formal requests to municipal authorities. They administered surveys to DRRM officers through assisted interviews, explaining the study purpose and ensuring voluntary participation and confidentiality. Key informant interviews were conducted in the local language with consent and note-taking. Participants were informed about the study and signed consent forms, with data kept confidential and anonymous. After collection, data was sorted, transcribed, and analyzed using descriptive statistics and thematic coding, ensuring a comprehensive and reliable assessment of DRRM readiness.

Statistical treatment of data - The data was analyzed using percentage to show the proportion of responses, mean to measure the average readiness level, and Slovin's Formula to determine the sample size from the known population of DRRM personnel in Camarines Sur.

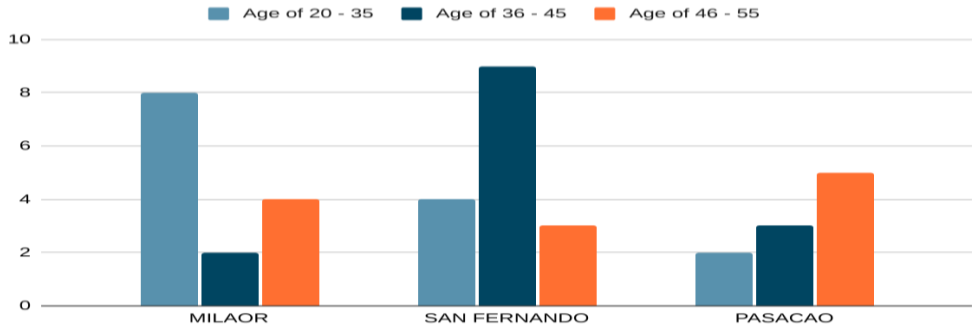
3. Result and discussion

This section presents the demographic profile of respondents and statistical data related to the study's objectives, focusing on key variables and patterns. Data was collected through survey questionnaires and in-depth interviews, providing both structured and detailed insights. The age distribution is fairly balanced, with the largest group being 21-27 years (24%), followed by 28-34 years (20%) and 35-41 years (20%). The 42-48 years and 49-55 years groups each contribute 18%, indicating participation from working-age individuals across various age ranges.

3.1 *Demographic profile*

Figure 1

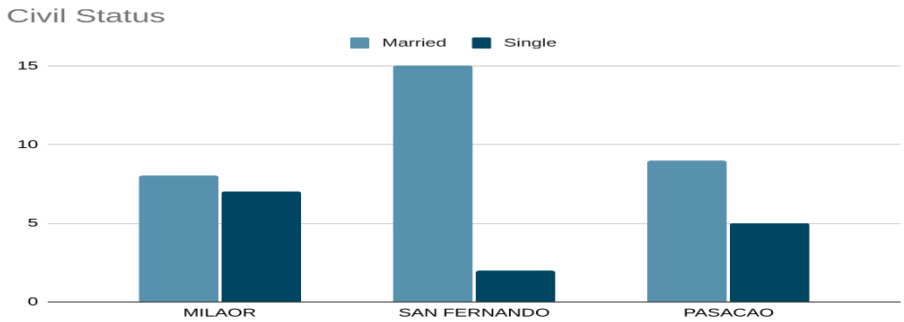
Respondent's Age



The age distribution of DRRM personnel in Milaor, San Fernando, and Pasacao, Camarines Sur, shows varying profiles. In Milaor, most personnel are 20-35 years old, indicating a younger workforce with potential adaptability to emergency response. San Fernando's workforce is dominated by 36-45-year-olds, combining experience and capability. In Pasacao, most personnel are 46-55 years old, suggesting reliance on experience and leadership. This diversity aligns with NDRRMC's value on age diversity in DRRM roles, impacting disaster preparedness and response approaches.

Figure 2

Civil Status of the Respondents



The civil status of DRRM personnel in Milaor, San Fernando, and Pasacao, Camarines Sur, shows a predominance of married individuals. In Milaor, married respondents slightly outnumber single ones, suggesting family responsibilities influence their disaster preparedness commitment. San Fernando has a significant majority of married respondents, indicating stable, long-term service in DRRM roles. Pasacao's distribution is relatively balanced, but still dominated by married personnel. Overall, married individuals comprise the majority, potentially contributing to effective planning and decision-making in flood-prone areas, aligning with UNDRR's findings on demographic diversity in DRRM teams.

The educational attainment of respondents in Milaor, San Fernando, and Pasacao, Camarines Sur, shows college graduates constitute the largest proportion, with San Fernando having the highest number, followed by Milaor and Pasacao. Undergraduates are present in all areas, with Pasacao having slightly higher numbers. Vocational graduates represent the smallest group, with San Fernando having the lowest. San Fernando's high number of college graduates may indicate higher preparedness and organizational readiness in DRRM activities. The presence of undergraduates and vocational graduates highlights the need for inclusive DRRM communication strategies. Overall, the educational profile is favorable, but continuous capacity-building programs are needed, particularly for those with lower educational attainment, to ensure equitable preparedness and resilience, as

supported by Lavell et al. (2019).

Figure 3

Educational Attainment

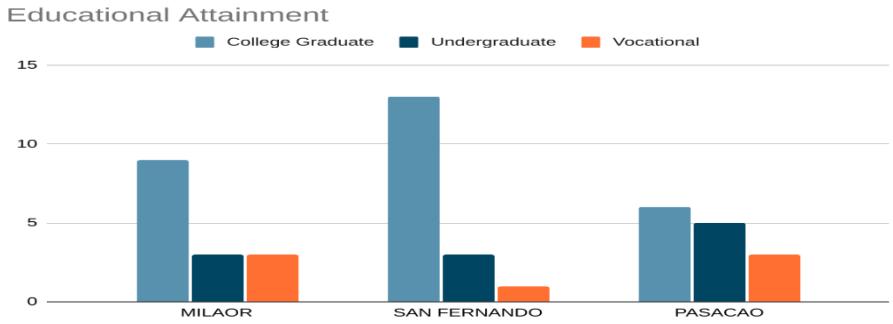
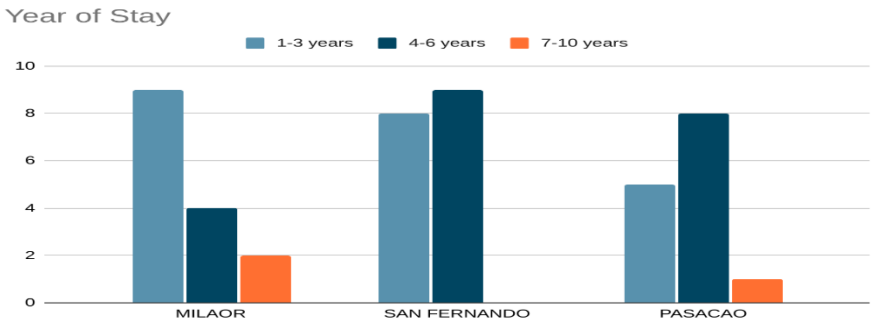


Figure 4

Year of Stay of the Respondents



The length of residency in Milaor, San Fernando, and Pasacao shows most respondents have lived in their communities for 1-6 years. In Milaor, majority have stayed 1-3 years, followed by 4-6 years. San Fernando has an even distribution between 1-3 and 4-6 years, with no respondents in the 7-10 years category, suggesting a mobile population. Pasacao's respondents are mostly 4-6 years, followed by 1-3 years. The findings highlight the need for continuous DRRM orientation and training, especially for newer residents, aligning with the Philippine DRRM Act of 2010 and national mandates for local government units to implement targeted orientation.

3.2 Level of Disaster Risk Reduction Management Readiness of the Flood Prone Municipalities

Table 1

Training and Capacity Building

Municipality	Weighted Mean	Verbal Interpretation	Rank
Milaor	4.77	Very High Readiness	2
San Fernando	4.60	High Readiness	1
Pasacao	4.98	Very High Readiness	3

Pasacao shows the highest DRRM training readiness with a Weighted Mean of 4.98 ("Very High Readiness"), indicating significant investment in training and capacity building. Milaor follows with a Weighted Mean of 4.77 ("Very High Readiness"), showing strong DRRM commitment. San Fernando ranks 3rd with a Weighted Mean of 4.60 ("High Readiness"), suggesting room for enhancing training programs. The findings align with literature on LGUs' role in disaster preparedness (Lorenzo, 2024) and RA 10121's mandate for LGUs to strengthen disaster preparedness.

Table 2
Equipment and Facilities

Municipality	Weighted Mean	Verbal Interpretation	Rank
Milaor	4.52	Very High Readiness	1
San Fernando	4.73	Very High Readiness	3
Pasacao	4.62	Very High Readiness	2

Milaor leads in DRRM equipment and facilities with a weighted mean of 4.52 ("Very High Readiness"), indicating comprehensive resources and proactive preparedness. Pasacao ranks 2nd with 4.62 ("Very High Readiness"), showing strong foundational preparedness. San Fernando ranks 3rd with 4.73 ("Very High Readiness"), suggesting scope for optimizing equipment and facilities. The municipalities' high readiness aligns with RA 10121's mandate for LGUs to allocate funds for disaster response resources and infrastructure, and studies highlighting access to equipment as critical for effective emergency response (Coppola, 2015).

Table 3
Human Resource and Institutional Readiness

Municipality	Weighted Mean	Verbal Interpretation	Rank
Milaor	4.76	Very High Readiness	3
San Fernando	4.69	Very High Readiness	2
Pasacao	4.97	Very High Readiness	1

Pasacao leads in human resource and institutional readiness with a Weighted Mean of 4.97, indicating optimized DRRM preparedness. San Fernando follows with 4.69, showing strong readiness with room for improvement. Milaor ranks 3rd with 4.76, still "Very High Readiness", but with opportunities for enhancement. The municipalities' high readiness aligns with RA 10121's mandate for LGUs to strengthen institutional capacity and Coppola's (2015) emphasis on human resources and institutional systems as core to disaster preparedness.

4. Summary of findings, Conclusions, and Recommendations

This section presents the summary and conclusion derived from the study that identifies the level of readiness of Disaster Risk Reduction Management in the flood-prone municipality in Camarines Sur. This section also provides recommendations that can be used by the local government.

Summary of findings - The respondents from Milaor, Pasacao, and San Fernando are mostly young to middle-aged, with males dominating the sample, and most having college degrees. Many have lived in their municipalities for 2-5 years, indicating varying levels of local knowledge and disaster risk awareness, which may impact their participation in disaster risk reduction initiatives. The municipalities show high to very high DRRM readiness in training, equipment, and institutional capacity, with Pasacao leading in training and human resource readiness, and Milaor topping in equipment and facilities. Respondents aged 35-41 are more involved in disaster preparedness. Despite high readiness, challenges persist, including limited DRRM training access, equipment shortages, human resource gaps, environmental vulnerability, and financial constraints.

The municipalities' low-lying terrain and proximity to rivers make them flood-prone, straining disaster response capacities. ANOVA results show Milaor has a higher readiness level than San Fernando, but Pasacao's readiness is comparable to both. All municipalities fall under "Very High Readiness", with Milaor scoring highest. San Fernando faces high risks from typhoons and floods, with gaps in community preparedness, highlighting the need for regular drills and training. Efficient early warning systems and communication networks are lacking, and infrastructure like evacuation centers and drainage systems aren't fully disaster-resilient. Environmental degradation worsens flooding, so reforestation and river clean-up are needed. Coordination among local units, schools, and communities is insufficient, and public awareness on disaster management needs boosting.

Conclusion - The respondents are mostly male, educated, and of working age, indicating potential for active participation in community and disaster activities, with their high educational level able to boost DRRM awareness and response. However, limited female representation and varying educational backgrounds suggest a need for more inclusive participation, and differences in residency duration imply varying levels of familiarity with local

risks and response systems. The municipalities of Milaor, San Fernando, and Pasacao in Camarines Sur have achieved a high level of DRRM readiness, with trained personnel, adequate equipment, and strong institutional frameworks, but challenges like limited specialized training, resource shortages, and environmental vulnerabilities persist. Community participation, particularly from mid-age groups, plays a key role in DRRM initiatives. To sustain and improve disaster preparedness, strengthening training, resource management, institutional coordination, and environmental strategies is crucial.

The DRRM readiness levels of Milaor, San Fernando, and Pasacao aren't uniform, with Milaor showing significantly higher readiness than San Fernando, but all three are classified as "Very High Readiness", indicating they have necessary structures and strategies to manage disasters like flooding. Continuous improvement of DRRM programs is needed, addressing gaps in municipalities like San Fernando, to achieve balanced readiness and enhance community resilience. San Fernando's vulnerability to natural hazards makes strengthening Disaster Risk Reduction and Management readiness a critical priority. Without improved community preparedness, modern warning systems, resilient infrastructure, environmental protection, and strong institutional coordination, the municipality will continue to face significant risks to life, property, and livelihood during disasters.

Recommendations - To enhance DRRM readiness, it's essential to aim for gender balance by encouraging women to participate more in programs and decision-making. Providing targeted training for those with lower educational backgrounds using simple, practical approaches can also help. Regular seminars and drills for all residents can improve disaster preparedness knowledge, while leveraging college graduates as DRRM leaders or volunteers can spread awareness. Integrating new residents into local systems and tapping long-term residents' experience can also be beneficial. Continuously monitoring demographic profiles can keep DRRM programs inclusive and relevant.

Enhancing training programs with regular drills and specialized sessions for personnel and barangay responders is also crucial. Investing in more disaster response equipment like rescue boats and communication devices, and ensuring they're well-maintained, can improve response capabilities. Appointing permanent, trained staff to DRRM offices can also enhance coordination. Improving early warning systems and communication networks can provide timely information dissemination. Implementing flood mitigation programs, like drainage improvements and reforestation, can reduce risks. Utilizing the Local Disaster Risk Reduction and Management Fund effectively and encouraging community participation in DRRM activities can strengthen resilience. Future research can explore community resilience, disaster recovery, and early warning system effectiveness.

Enhancing capacity-building with regular training, workshops, and simulations for personnel, and allocating sufficient resources for equipment, early warning systems, and evacuation facilities are also necessary. Fostering inter-municipal collaboration among Milaor, San Fernando, and Pasacao, and strengthening community-based DRRM programs through awareness campaigns and training at the barangay level, can also improve readiness. Continuously monitoring and updating DRRM policies can keep them adaptive and responsive to emerging challenges. For San Fernando, implementing targeted training programs and drills, allocating more funds for early warning systems and equipment, and encouraging inter-municipal collaboration can help. Intensifying information campaigns at the barangay level can empower residents, and regularly reviewing and updating DRRM policies can keep them adaptive and inclusive.

Practical educational implications - it involves integrating DRRM concepts into school curricula with hands-on training and simulations, organizing regular drills for students and staff, and encouraging community engagement. Students can develop skills like first aid and emergency response while promoting environmental conservation. Schools can partner with local governments and NGOs to support these initiatives, using local contexts to make learning more relevant. This approach can foster a culture of disaster resilience and preparedness among students, teachers, and the community, ultimately contributing to more effective disaster management in municipalities like Milaor, Pasacao, and San Fernando.

Implication for practitioners - for DRRM officials and local government units, it's crucial to focus on

inclusive and targeted training programs that address gaps in equipment and human resources. Strengthening community participation, especially among females and new residents, is also key. Enhancing early warning systems, communication networks, and infrastructure resilience should be prioritized, alongside environmental protection and reforestation efforts.

Implication for teacher - teacher play a crucial role in shaping the next generation's disaster resilience. Integrate DRRM concepts into your school curricula, emphasizing practical skills and awareness. Organizing regular drills and training sessions for students and staff, making sure everyone knows what to do in case of an emergency. This hands-on approach will not only prepare them for disasters but also help them develop valuable life skills. Collaborate with other teachers to incorporate DRRM into various subjects, like science, social studies, or even physical education. By doing so, they will be helping create a culture of disaster preparedness in school and community.

Implication for students - students have a vital role in promoting disaster resilience in school and community. Participating in DRRM initiatives and sharing what they learned with their families and neighbors, it is a great opportunity to develop skills in disaster preparedness, response, and mitigation, which will benefit all. Joining school clubs or groups focused on DRRM, and get involved in activities like emergency drills, first aid training, or environmental clean-up drives. By taking an active role, students will not only be prepared for disasters but also contribute to making your community safer and more resilient. Plus, they will gain valuable experience and skills that will serve them well throughout their life.

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