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Research Article

Assessing The Capability of Disaster Risk Reduction and Management in Marikina City

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ABSTRACT

This study assesses the capability of disaster risk reduction and management (DRRM) in Marikina City, Philippines, aiming to enhance disaster resilience through effective implementation of Republic Act 10121 the Philippine Disaster Risk Reduction and Management (DRRM) Act of 2010. The research assesses Marikina City's implementation and challenges across disaster prevention and mitigation, disaster preparedness, disaster response, and disaster recovery and rehabilitation. Utilizing a quantitative methodology, data were collected from Marikina City Disaster Risk Reduction and Management Office (MCDRRMO) personnel, barangay officials, and residents to evaluate implementation levels and identify challenges. This research contributes significantly to understanding local government DRRM capabilities in urban disaster-prone areas. It provides valuable insights for policymakers and practitioners, highlighting effective practices and areas for further improvement. The study found that continuous capacity building, community engagement, and inter-agency collaboration are critical for strengthening Marikina City's resilience. It offers valuable recommendations for local policymakers and practitioners to address identified challenges and improve DRRM implementation."

Keywords: *Disaster Risk Reduction and Management, Marikina City, Philippines, Republic Act 10121*

Introduction

Natural disasters pose severe threats to human lives, infrastructure, and social stability worldwide, causing loss of life, displacement, and destruction of property. Effective disaster risk reduction and management (DRRM) strategies are essential to enhance resilience and minimize catastrophic impacts (Disaster Risk Management, 2007). Preparedness in DRRM not only saves lives but also aids in recovery and preserves financial resources (International Federation of Red Cross and Red Crescent Societies, 2022). This study focuses on Marikina City, Philippines—a flood-prone area—intending to evaluate its DRRM practices and improve its resilience.

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Globally, disaster risk reduction (DRR) efforts vary in success. The Sendai Framework for Disaster Risk Reduction 2015–2030, endorsed by the United Nations, emphasizes risk knowledge, governance, resilience investment, and preparedness (United Nations, 2015). Japan exemplifies successful DRR practices with its proactive disaster preparedness and response mechanisms, which mitigated the impact of Typhoon Hagibis in 2019 despite extensive damage (Roder, 2019; Shaw et al., 2020). Conversely, Jakarta faces significant challenges with flooding due to heavy rainfall, urbanization, and geographic factors, revealing limitations in its DRRM strategies (Octavianti & Charles, 2018; Jakarta Flooding Prompts Plan to Relocate Indonesia's Capital, 2022). These international examples underscore the importance of learning from both successes and failures to enhance DRRM strategies.

The Philippines, due to its geographic location and climate, is highly vulnerable to natural disasters, ranking as the second most disaster-prone country globally (Andriesse, 2018). It faces frequent cyclones, earthquakes, and volcanic eruptions (Lum & Margesson, 2014; Pe Symaco, 2013). Republic Act No. 10121, known as the Philippine Disaster Risk Reduction and Management Act, mandates a comprehensive, proactive approach to disaster management, involving all sectors and levels of society (Republic Act No. 10121, 2010). The National Disaster Risk Reduction and Management Plan (NDRRMP) outlines strategies for disaster prevention, readiness, response, and recovery (NDRRMC, 2011). The impact of Super Typhoon Haiyan (Yolanda) in 2013 highlighted deficiencies in early warning systems and infrastructure resilience, emphasizing the need for improved DRRM measures ("Typhoon Haiyan (Yolanda): U.S. and International Response to the Philippines Disaster," 2014).

Marikina City, situated in the Marikina Valley, is highly susceptible to flooding and other natural disasters. Its vulnerability is exacerbated by its proximity to the Marikina River and its tributaries (Iglesias, 2008). Typhoon Vamco (Ulysses) in 2020 caused severe flooding and damage, illustrating the need for better DRRM practices (Philippines: Typhoon Vamco (Ulysses) Snapshot (as of November 12, 2020)—the Philippines, 2020). The city's recurrent issues with floods, landslides, and earthquakes, particularly along the West Valley Fault System, highlight the necessity of strengthening its DRRM systems (About Marikina City, 2016). This study aims to assess Marikina City's DRRM effectiveness, providing insights for improving disaster preparedness, response, and recovery.

The study aimed to evaluate the implementation of RA 10121 in Marikina City by focusing on four key disaster management areas: prevention and mitigation, preparedness, response, and recovery. It highlights the roles of various stakeholders, including the Marikina City Disaster Risk Reduction and Management Office (MCDRRMO), barangay officials, and residents, in implementing these provisions.

The research compared implementation levels across these areas to identify strengths and weaknesses. It will also assess challenges faced in each area to find ways to overcome barriers and improve DRRM practices.

Based on the findings, the study proposed a program to enhance RA 10121 implementation, addressing identified challenges and stakeholder needs, with the goal of strengthening disaster risk reduction and management in Marikina City. The study is framed by the Philippine Disaster Risk Reduction and Management Act of 2010 (RA 10121).

Methods

The study utilized the descriptive research method to evaluate the capabilities regarding implementation and the challenges of RA 10121 of the Disaster Risk Reduction and Management Act in Marikina City.

Using a quantitative survey approach, data were collected from Marikina City Disaster Risk Reduction and Management Office (MCDRRMO) personnel, barangay officials, and residents.

A purposive sampling method was used to select participants with specific expertise and experience relevant to Marikina City disaster risk reduction and management (DRRM). This non-probability sampling technique targeted key stakeholders who could provide valuable insights into DRRM practices. The inclusion criteria for participants included:

- Marikina City DRRM Personnel: Individuals from the City Disaster Risk Reduction and Management Office (CDRRMO) and other relevant departments with direct experience in DRRM implementation.
- Barangay Officials: Elected or appointed officials from the barangays responsible for local governance and DRRM efforts.
- Community Members: Residents, community leaders, and local organization representatives actively involved in community-based DRRM initiatives.

Exclusion criteria ensured participants were directly involved in DRRM. Non-DRRM personnel, non-official barangay members, and individuals outside the selected barangay were not included.

The study utilized a structured questionnaire to gather quantitative data on the implementation and challenges of RA 10121 provisions in Barangay Tumana, Marikina City. The questionnaire was developed from relevant academic sources and DRRM literature to ensure validity and reliability.

Data were analyzed using statistical methods. Descriptive Statistics used as weighted means calculated to assess implementation levels and challenges in different DRRM areas. One-way ANOVA was used to determine significant differences in implementation levels and challenges among MCDRRMO personnel, barangay officials, and residents.

Informed consent forms were provided to participants, outlining the study's objectives, procedures, and confidentiality measures. Participants had the right to withdraw at any time without consequences. The study adhered to ethical standards, ensuring participants' privacy and voluntary participation throughout the research process.

Results and Discussion

Table 1. Level of Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Prevention and Mitigation

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
Regular assessments have been done by the local government to identify potential hazards and risks.	4.40	SA	4.64	SA	4.45	SA	4.49	SA
Effective measures and protocols in place to reduce the impact of potential disasters in Marikina City.	4.40	SA	4.43	SA	4.40	SA	4.41	SA
Active involvement of the community in disaster prevention and mitigation activities, such as awareness campaigns and drills.	4.20	SA	4.50	SA	4.50	SA	4.41	SA
Effective coordination among relevant agencies and stakeholders for disaster prevention and mitigation efforts.	4.60	SA	4.36	SA	4.65	SA	4.55	SA
Adequate resources are allocated for disaster prevention and mitigation activities such as training and capacity building.	4.47	SA	4.50	SA	4.55	SA	4.51	SA
Overall Mean	4.41	SA	4.49	SA	4.51	SA	4.47	SA

VI- Verbal Interpretation 4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

In terms of disaster prevention and mitigation, respondents strongly agreed, with a grand mean of 4.47, emphasizing effective coordination among relevant agencies and stakeholders, rated highest at 4.55 the effective measures and protocols in place to reduce the impact of potential disasters in Marikina City and the active involvement of the community in disaster prevention and mitigation activities, such as awareness campaigns and drills rated lowest of 4.41.

Table 2. Level of Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Preparedness

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
Clear and comprehensive disaster preparedness plans are in place in Marikina City.	4.47	SA	4.36	SA	4.60	SA	4.49	SA
Regular drills and simulations are conducted to test the readiness of the community in responding to disasters.	4.47	SA	4.36	SA	4.50	SA	4.45	SA
Information and education campaigns on disaster preparedness are accessible and practical.	4.20	SA	4.29	SA	4.50	SA	4.35	SA
The local government has established early warning systems to alert residents about potential disasters.	4.43	SA	4.54	SA	4.55	SA	4.51	SA
Adequate resources and facilities, such as evacuation centers and emergency supplies, are readily available during disasters.	4.53	SA	4.43	SA	4.60	SA	4.53	SA
The community is well-informed about the proper actions to take during a disaster.	4.27	SA	4.29	SA	4.53	SA	4.38	SA
Overall Mean	4.37	SA	4.35	SA	4.55	SA	4.44	SA

VI- Verbal Interpretation 4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

For disaster preparedness, the grand mean was 4.44, with the most notable aspect being the availability of adequate resources and facilities, rated at 4.53 while Information and education campaigns on disaster preparedness are accessible and practical rated lowest at 4.35.

Table 3. Level of Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Response

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
The response mechanisms and protocols during disasters are well-established and efficient.	4.20	SA	4.57	SA	4.50	SA	4.43	SA

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
There is effective coordination among response agencies and stakeholders during disaster events.	4.53	SA	4.50	SA	4.55	SA	4.53	SA
The communication channels for disseminating information during disasters are reliable and accessible.	4.13	A	4.29	SA	4.60	SA	4.37	SA
There is a timely and effective mobilization of resources and personnel during disaster response efforts.	4.07	A	4.43	SA	4.50	SA	4.35	SA
Overall Mean	4.23	SA	4.45	SA	4.54	SA	4.42	SA

VI- Verbal Interpretation 4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

Disaster Response also showed a very high implementation level, with a grand mean of 4.42 and the highest agreement on effective coordination among response agencies, rated at 4.53 while timely and effective mobilization of resources and personnel during disaster response efforts rated lowest at 4.35.

Table 4. Level of Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Recovery and Rehabilitation

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
Effective plans and programs are in place to aid in the recovery and rehabilitation of the community after a disaster.	4.33	SA	4.50	SA	4.55	SA	4.47	SA
Affected individuals and communities receive the necessary support and assistance during the recovery phase.	4.07	A	4.29	SA	4.45	SA	4.29	SA
Recovery and rehabilitation methods are implemented in a timely and effective manner.	4.27	SA	4.36	SA	4.45	SA	4.37	SA
Overall Mean	4.22	SA	4.38	SA	4.48	SA	4.38	SA

VI- Verbal Interpretation 4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

In terms of disaster recovery and rehabilitation, the grand mean was 4.38, with effective plans and programs for recovery and rehabilitation being most impressive, rated at 4.47 while the affected individuals and communities receive the necessary support and assistance during the recovery phase rated lowest at 4.29

Table 5. Significant Difference in the Level of Implementation of the Provisions of RA 10121 in Marikina City by the MCDRRMO Personnel, Barangay Officials, and Residents

Variables	Respondents	Mean	F-value	p-value	Decision on H_0	Interpretation
Disaster Prevention and Mitigation	MCDRRMO	4.41	0.101	.904	Accept	Not Significant
	Brgy. Officials	4.49				
	Residents	4.51				
Disaster Preparedness	MCDRRMO	4.37	0.543	.584	Accept	Not Significant
	Brgy. Officials	4.35				
	Residents	4.55				
Disaster Response	MCDRRMO	4.23	1.519	.230	Accept	Not Significant
	Brgy. Officials	4.45				
	Residents	4.54				
Disaster Recovery and Rehabilitation	MCDRRMO	4.22	0.832	.442	Accept	Not Significant
	Brgy. Officials	4.38				
	Residents	4.48				

H_0= Null Hypothesis
F-value= Computed F-value (ANOVA test result)
p-value= level of significance (if p<.05, significant; if p>.05, not significant)

The ANOVA test results indicated no significant differences in the assessments of MCDRRMO personnel, barangay officials, and residents regarding the implementation of RA 10121 across all dimensions: disaster prevention and mitigation (F = 0.101; p =.904), disaster preparedness (F = 0.543; p =.584), disaster response (F = 1.519; p = 0.230), and disaster recovery and rehabilitation (F = 0.832; p =.442).

Table 6. Degree of Challenges in the Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Prevention and Mitigation

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
The LGU and DRMM develop information, education, and communication (IEC) tools for risk assessment.	4.40	SA	4.50	SA	4.60	SA	4.51	SA
The LGU encourages residents and other stakeholders to increase the involvement of communities in disaster risk management programs.	4.73	SA	4.64	SA	4.53	SA	4.63	SA
The DRRM is always sure to make public service announcements.	4.13	A	4.43	SA	4.70	SA	4.45	SA
The LGU prioritizes the development and establishment of several early warning systems.	4.67	SA	4.64	SA	4.60	SA	4.63	SA
The DRRM, together with the barangay officials, always conducts several risk assessments.	4.60	SA	4.71	SA	4.70	SA	4.67	SA
Overall Mean	4.51	SA	4.59	SA	4.63	SA	4.58	SA

VI- Verbal Interpretation 4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

Regarding the degree of challenges in implementing RA 10121, findings showed a very low degree of challenges across all dimensions. For disaster prevention and mitigation, the grand mean was 4.58, with strong agreement on frequent risk assessments rated at 4.67 while the DRRM is always sure to make public service announcements rated lowest at 4.45.

Table 7. Degree of Challenges in the Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Preparedness

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
Take down the billboards and signage when necessary if there is an upcoming typhoon.	4.47	SA	4.36	SA	4.40	SA	4.41	SA
There is an immediate clearing of canals, creeks, and other small waterways to prevent flooding.	4.73	SA	4.71	SA	4.70	SA	4.71	SA
There is an early closure of streets and roads that are prone to floods and landslides.	4.60	SA	4.57	SA	4.35	SA	4.49	SA
The LGU, together with the residents, conducted a clean-up drive to prune and cut uprooted trees before the typhoon	4.60	SA	4.71	SA	4.40	SA	4.55	SA
The local government of Marikina coordinates with DPWH to implement disaster risk reduction programs.	4.67	SA	4.79	SA	4.65	SA	4.69	SA
Overall Mean	4.61	SA	4.63	SA	4.50	SA	4.57	SA

VI- Verbal Interpretation 4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

Disaster preparedness had a grand mean of 4.57, with an immediate clearing of waterways rated highest at 4.71 while the take down of the billboards and signage when necessary if there is an upcoming typhoon has the lowest rate of 4.41.

Table 8. Degree of Challenges in the Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Response

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
The DRRM personnel and volunteers attend seminars to improve their skills in search, rescue, and retrieval operations.	4.87	SA	4.71	SA	4.65	SA	4.73	SA
The LGU establishes an institutional mechanism for disaster response operations in every barangay.	4.73	SA	4.71	SA	4.70	SA	4.71	SA
The barangay officials create and improve the existing procedures for disaster communication.	4.67	SA	4.50	SA	4.65	SA	4.61	SA

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
The DRRM, together with the stakeholders, conducts disaster response and rescue training for residents.	4.67	SA	4.71	SA	4.70	SA	4.69	SA
The DRRM develops and regularly reviews disaster and rescue contingency plans.	4.80	SA	4.86	SA	4.65	SA	4.76	SA
Overall Mean	4.75	SA	4.70	SA	4.67	SA	4.70	SA

VI- Verbal Interpretation4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

Disaster response had a grand mean of 4.70, with regular review of contingency plans rated at 4.76 while the barangay officials create and improve the existing procedures for disaster communication lowest rated at 4.61.

Table 9. Degree of Challenges in the Implementation of the Provisions of RA 10121 in Marikina City in terms of Disaster Recovery and Rehabilitation

	MCDRRMO personnel		Barangay Officials		Residents		All Respondents	
	Mean	VI	Mean	VI	Mean	VI	Mean	VI
The LGU official coordinates with the proper authorities to provide designated centers during disasters.	4.67	SA	4.50	SA	4.60	SA	4.59	SA
The LGU makes sure to allocate food and medical requirements to affected areas.	4.73	SA	4.79	SA	4.65	SA	4.71	SA
The local government of Marikina makes sure that they provide evacuation centers for every barangay that can accommodate the affected residents	4.64	SA	4.57	SA	4.65	SA	4.63	SA
The barangay official always provides timely and accurate warning information to residents	4.47	SA	4.71	SA	4.60	SA	4.59	SA
The DRRM and LGU inform the residents of where to assemble pick-up points and staging areas in case of disasters and emergencies	4.27	SA	4.50	SA	4.55	SA	4.45	SA
Overall Mean	4.56	SA	4.61	SA	4.61	SA	4.59	SA

VI- Verbal Interpretation 4.20-5.00 Strongly Agree (SA); 3.40-4.19 Agree (A); 2.60-3.39 Neutral (N); 1.80-2.59 Disagree (D); 1.00-1.79 Strongly Disagree (SD)

Disaster Recovery and Rehabilitation had a grand mean of 4.59, with allocation of food and medical requirements rated highest at 4.71 while The DRRM and LGU inform the residents of where to assemble pick-up points and staging areas in case of disasters and emergencies rated lowest at 4.45

Table 10. Significant Difference in the Degree of Challenges in the Implementation of the Provisions of RA 10121 in Marikina City by the MCDRRMO Personnel, Barangay Officials, and Residents

Variables	Respondents	Mean	F-value	p-value	Decision on H_0	Interpretation
Disaster Prevention and Mitigation	MCDRRMO	4.51	0.247	.782	Accept	Not Significant
	Brgy. Officials	4.59				
	Residents	4.63				
Disaster Preparedness	MCDRRMO	4.61	0.266	.767	Accept	Not Significant
	Brgy. Officials	4.63				
	Residents	4.50				
Disaster Response	MCDRRMO	4.75	0.106	.900	Accept	Not Significant
	Brgy. Officials	4.70				
	Residents	4.67				
Disaster Recovery and Rehabilitation	MCDRRMO	4.56	0.068	.934	Accept	Not Significant
	Brgy. Officials	4.61				
	Residents	4.61				

H_0= Null Hypothesis
F-value= Computed F-value (ANOVA test result)
p-value= level of significance (if p<.05, significant; if p>.05, not significant)

The ANOVA test results revealed no significant differences among the groups regarding their perception of the degree of challenges in implementing RA 10121: disaster prevention and mitigation (F = 0.247; p =.782), disaster preparedness (F = 0.266; p =.767), disaster response (F = 0.106; p = 0.900), and disaster recovery and rehabilitation (F = 0.068; p =.934).

Conclusion

Marikina City exhibits a strong commitment to disaster risk reduction and management, with high implementation levels of Republic Act 10121 across key areas such as preparedness, response, and recovery. Stakeholders show consistent satisfaction with the effectiveness of these initiatives, and there are no significant differences in perceptions of RA 10121's implementation or challenges among different groups. The perceived low level of challenges indicates successful barrier management. Nonetheless, the study identifies areas for improvement, resulting in a comprehensive action plan to further enhance the city's disaster resilience.

Recommendations

1. Enhance community engagement by developing information campaigns, community-based training, and disaster preparedness committees to empower residents in disaster management efforts.
2. Focus on capacity-building with regular training for MCDRRMO personnel, barangay officials, and residents to maintain high standards in disaster management.
3. Upgrade early warning systems and communication channels by investing in new technology and improving protocols to ensure timely disaster response.
4. Develop tailored support mechanisms by strengthening coordination and collaboration among agencies and stakeholders to address challenges and improve disaster resilience.
5. Implement the proposed comprehensive action plan with clear timelines and responsibilities, led by the City Mayor, City Council, MCDRRMO Director, and barangay captains, to enhance disaster management efforts.

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