

Disaster Response Implementation and Effectiveness in Coastal BARMM, Philippines: A Study of Typhoon Survivors

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ABSTRACT

The Philippines experiences frequent typhoons that threaten lives and disrupt the livelihoods of coastal communities, particularly those who are dependent on fishing, small-scale enterprises, and agriculture. In the BARMM region, coastal communities are highly vulnerable to recurring typhoons due to their geographic location and various socio-economic challenges. These conditions greatly influence the effectiveness of disaster response mechanisms in the area, as communities often face difficulties in accessing resources, services, and timely assistance during and after disasters. This study examines the implementation and effectiveness of disaster response. It identifies key challenges faced by typhoon survivors and the strategies they proposed to strengthen resilience in 12 coastal barangays in Maguindanao del Norte and Lanao del Sur, Philippines. A convergent mixed-methods design was employed, using a structured survey of 240 typhoon survivors and qualitative responses analyzed through thematic analysis. Quantitative data were analyzed using descriptive statistics and Spearman's rank correlation and complemented with qualitative responses analyzed through thematic analysis. The relationship of the variables was measured by numerical data supported by real-life experiences. Results revealed a strong positive relationship between disaster response implementation and effectiveness ($p = 0.8997$, $p < 0.001$). Key determinants of effectiveness include communication systems, availability of flood-adapted rescue vehicles, and the provision of essential needs. Qualitative findings highlight operational constraints, including communication barriers and limited access in remote areas, as well as the need for improved coordination, community participation, and DRRM training. Drawing on the typhoon survivors' perspectives, the study provides experience-based insights into the gaps between institutional response capacity and local-level realities. The findings emphasize the importance of strengthening local government capacity, infrastructure, and community engagement to enhance disaster response systems and build resilience in vulnerable coastal communities.

Keywords: disaster response, community resilience, coastal vulnerability, disaster risk reduction, BARMM

INTRODUCTION

The Philippines is highly vulnerable to typhoons due to its geographic location in the western Pacific Ocean and its archipelagic structure. These hazards pose significant risks to coastal communities, particularly those dependent on fishing, agriculture, and small-scale enterprises. In recent years, changing climate patterns have contributed to the increasing intensity and unpredictability of tropical cyclones, further exacerbating community vulnerability, particularly in isolated and resource-constrained regions.

Despite ongoing efforts to strengthen disaster risk reduction and management (DRRM), many coastal communities, especially in resource-constrained and conflict-affected regions such as the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), continue to face challenges in disaster response implementation and effectiveness. These challenges are often reflected in inadequate infrastructure, limited accessibility to resources, and weak coordination among local government units (LGUs) and other stakeholders.

Existing studies have examined disaster preparedness, yet there remains a lack of empirical evidence on the implementation of disaster response and perceived effectiveness at the high-risk and conflict-affected settings, particularly from the perspectives of typhoon survivors in coastal communities. Addressing this gap is necessary to determine how operational capacities and institutional arrangements contribute to disaster outcomes.

This study examines the implementation of disaster response and the perceived effectiveness of typhoon survivors in coastal communities in BARMM.

METHODOLOGY

This study employed a convergent mixed-methods design to examine the implementation and effectiveness of disaster response in 12 coastal barangays in Maguindanao del Norte and Lanao del Sur, Philippines. A total of 240 typhoon survivors were selected through purposive sampling based on the following criteria: (1) Residency of the area for at least three years, (2), 18 years old and above, (3) A household head who has witnessed and personally experienced typhoons, and (4) Willing and able to participate voluntarily with informed consent. The selection of barangays was based on their vulnerability and high exposure to typhoons and coastal hazards. This ensured that respondents possessed firsthand knowledge of disaster response implementation and effectiveness in their respective communities.

Data were collected using a structured survey questionnaire consisting of four sections: socio-demographic profile, level of disaster response implementation, level of effectiveness, and open-ended questions on challenges and strategies. The instrument was validated by five experts in disaster risk reduction and management (DRRM) and pilot-tested before data collection. The questionnaire was translated into Filipino to ensure clarity and comprehension among respondents.

Quantitative data were analyzed using descriptive statistics and Spearman's rank correlation to determine the relationship between disaster response implementation and effectiveness. Qualitative responses were analyzed using thematic analysis to identify recurring patterns related to disaster response challenges and improvement strategies. Participation was voluntary, and informed consent was obtained from all respondents.

Furthermore, the study focuses on perceived implementation and effectiveness based on the lived experiences of typhoon survivors, which is essential in understanding community-level satisfaction and gaps in disaster response delivery.

Ethical Considerations

This study was reviewed and approved by the Mindanao State University-General Santos Institutional Ethics Review Committee (Approval No. 276-2025-MSUGSC-IERC). The researcher strictly followed the ethical standards in accordance with the university and social science research, providing all the necessary documents before conducting the study. Communication letters were provided to the municipal mayors, barangay officials, and participants, informing them of the purpose and objectives of the study. The researcher secured informed consent from all the respondents, ensuring that the participation is voluntary and they can withdraw anytime they feel uncomfortable without judgment. Participant anonymity and confidentiality were maintained by assigning codes to responses and securely storing all data.

RESULTS

Table 1. Perceived Implementation of Disaster Response

Indicator	Mean	SD
Rescuers are adequately trained	3.29	1.38

Indicator	Mean	SD
Rescuers respond promptly	2.74	1.28
Availability of flood-adapted rescue vehicles	2.25	1.14
Essential needs are adequately provided	3.54	1.25
Communication channels remain functional	2.93	1.47
Composite Mean	2.95	1.30

Table 1 presents the perceived constraints of disaster response implementation in the surveyed coastal communities. The composite mean score of 2.95 (SD = 1.30) indicates a moderate level of agreement among respondents regarding the disaster response mechanism.

Among the listed indicators, the provision of essential needs obtained the highest mean score of 3.54 (SD = 1.25), which implies that affected families received the aid distribution needed for survival during the disaster. The functionality of communication channels ranked as the second-highest indicator with a mean score of 2.93 (SD 1.47), indicating that communication systems were working during and after disasters, allowing responders and affected families to coordinate with each other. Rescuers are adequately trained and obtained a mean value of 3.29 (SD = 1.38). This indicates that respondents were satisfied with their operations but experienced limited manpower, equipment, or technical capability.

Meanwhile, the availability of flood-adapted rescue vehicles ranked the lowest with a mean score of 2.25 (SD = 1.14), highlighting the respondents' experiences on lack of rescue vehicles that can safely cross heavily flooded areas, which limits the ability of the responders to reach the affected families quickly.

Overall, the findings highlight how constraints such as specialized rescue equipment and mobility during floods affect the components of disaster response. The limited availability of flood-adapted vehicles may hinder and delay disaster rescue operations for the vulnerable households.

According to Wisner et al. (2012), insufficient resources are a major barrier to achieving resilient communities. Their study on At Risk: Natural Hazards, People's Vulnerability and Disasters highlights the importance of logistical capacity and emergency resources to ensure effective disaster risk reduction initiatives.

Similarly, limited resources can intensify disaster outcomes such as the number of casualties, damages, and displacements, as noted by Ewing et al. (2011). Moreover, sufficient and relevant rescue equipment and operational resources are essential to enhance and strengthen disaster response and maintain public trust in local authorities.

Table 2. Perceived Effectiveness of Disaster Response

Indicator	Mean	SD
Rescuers' ability to respond during calamities	2.83	1.20
Availability of flood-adapted rescue vehicles	2.05	1.06
Provision of essential needs during and after disasters	2.88	1.19
Communication channels during and after disasters	2.60	1.29
Composite Mean	2.59	1.19

Table 2 presents the perceived effectiveness and gaps in disaster response among the surveyed coastal communities. The composite mean of 2.59 (SD = 1.19) indicates that disaster response was generally perceived as slightly effective, suggesting the need to strengthen the operational performance.

Among the listed indicators, the provision of essential needs during and after disasters obtained the highest mean score of 2.88 (SD = 1.19), reflecting that relief operations are effective as perceived by the respondents.

The rescuers' ability to respond during calamities ranked the second-highest with a mean score of 2.83 (SD = 1.20). This indicates respondents' recognition of the rescuers' efforts and their competency in responding during calamities.

On the contrary, communication channels during and after disasters obtained a mean value of 2.60 (SD = 1.29), indicating that communication systems are unstable and require strengthening to ensure effective disaster response. However, the indicator on rescue vehicles specifically designed to safely navigate flooded areas has the lowest mean value of 2.05, highlighting a critical infrastructure gap that affects the safe operation during flooding.

Generally, the respondents in coastal communities have not experienced comprehensive and flexible disaster responses. Although the highest mean pertains to the provision of essential needs, respondents acknowledged existing gaps that require a more careful and equitable distribution of assistance to affected families. Meanwhile, the lowest mean for rescue vehicles suggests that this remains a significant issue affecting the overall responsiveness and efficiency of rescue operations during disasters.

According to Samson & Buot (2023), one way of reducing disaster impacts and strengthening DRRM is to address limited resources, limited trained officials, and work inefficiencies. Limited resources hamper disaster planning, such as the provision of rescue vehicles, the improvement of evacuation centers, and the construction of accessible roads. Limited training and work inefficiencies are also pressing challenges, as they affect the services needed to cater to all affected communities. Having these issues results in a selective and limited number of rescued families. Moreover, maximizing DRRM efforts strengthens the effectiveness of disaster management.

Despite these initiatives to enhance the effectiveness of DRRM, no country can be fully prepared to disasters. However, these help communities understand their vulnerabilities and be familiar with their rights and responsibilities when a disaster strikes. There will always be conflicts and challenges along the way of its implementation, which create opportunities for the LGUs to identify strategies to improve (Vicario-Merino et al., 2019).

Table 3. Correlation Between Disaster Response Implementation and Effectiveness

Variables	Mean	Spearman's ρ	p-value	Interpretation
Implementation	2.70	0.8997	< 0.001	Strong positive relationship
Effectiveness	2.31			

Table 3 presents the correlation analysis, which shows a strong positive relationship between disaster response implementation and effectiveness ($\rho = 0.8997$, $p < 0.001$). This indicates that higher levels of implementation—particularly in terms of trained responders, functional communication systems, and the provision of essential needs—are associated with greater perceived effectiveness of disaster response in coastal communities. These findings suggest that strengthening operational components of disaster response can significantly enhance overall system performance during disaster events.

Conceptual Framework

This study is anchored in community resilience theory, highlighting the crucial role of capacitating the community in disaster risk reduction and governance theory, emphasizing the critical role of institutional capacity, inter-agency coordination, and resource availability in shaping effective disaster rehabilitation and

recovery. The framework assumes that limitations in these institutional components constrain recovery outcomes, while strengthened governance, coordination, and community engagement enhance disaster resilience.

The conceptual framework assumes that institutional challenges directly affect the effectiveness of disaster rehabilitation and recovery. Institutional challenges include limitations in accessibility, insufficient equipment and technology, weak communication systems, and issues in the identification of beneficiaries. These constraints reduce the capacity of Disaster Risk Reduction and Management (DRRM) offices and local government units (LGUs) to deliver efficient and effective recovery services.

To address these constraints, institutional and community-based strategies are proposed to strengthen and improve recovery outcomes. These strategies include enhancing communication systems, strengthening training and capacity-building programs, improving relocation planning, and encouraging active participation of both local authorities and community members. These proposed strategies aim to mitigate institutional limitations and strengthen operational effectiveness.

Furthermore, the study integrates active community participation and involvement, and adaptive capacity, recognizing that sustainable recovery efforts depend not only on institutional efficiency and capacity but also on the active involvement of local communities. The interaction between institutional mechanisms and community engagement forms the basis for enhancing resilience in disaster-prone coastal areas.

Thus, the framework assumes that:

- Institutional challenges negatively affect the effectiveness of disaster rehabilitation and recovery;
- Implementation of proposed strategies is essential to improve recovery outcomes; and
- Community participation improves the effectiveness of institutional responses.

Figure 1 shows the relationship between institutional challenges, proposed strategies, and disaster recovery outcomes in coastal communities.

Fig. 1. Conceptual Illustration of Disaster Response and Effectiveness

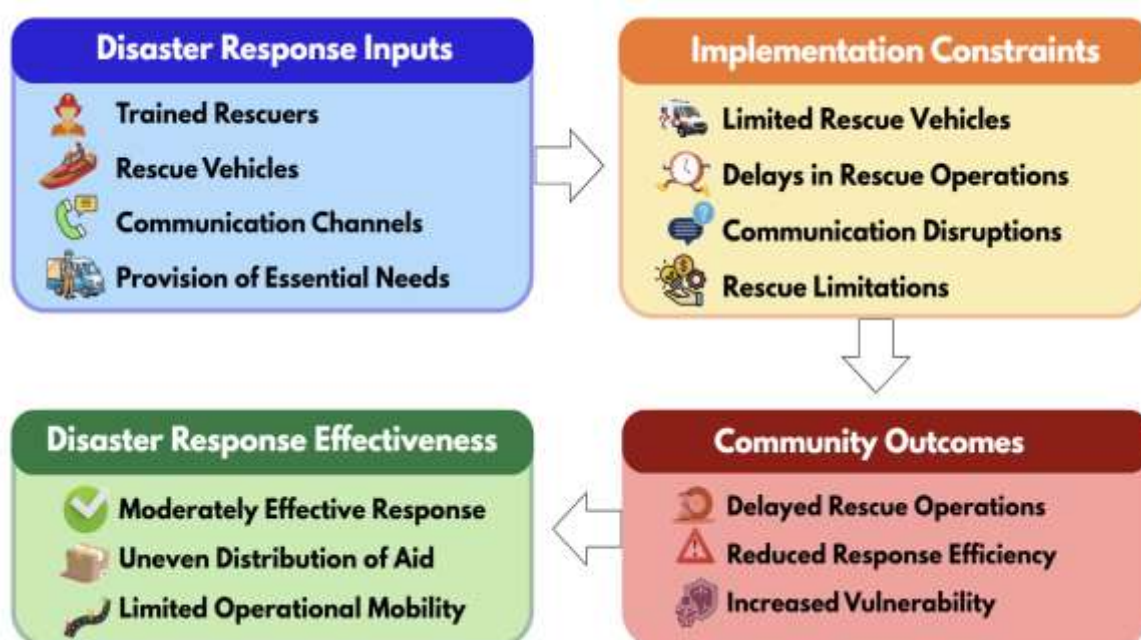


Figure 1 shows how disaster response inputs such as trained rescuers, rescue vehicles, communication channels, and the provision of essential needs affect the implementation of disaster response operations. Resource limitations, particularly the flood-adapted rescue vehicles and communication systems, limit rescue operations, thereby reducing the overall disaster response effectiveness in vulnerable coastal communities.

Figure 2. Key Themes on Disaster Response Challenges and Strategies Identified in Coastal Communities



Figure 2 presents the key themes derived from the perceived challenges and strategies in disaster response among typhoon survivors. The thematic analysis revealed three major dimensions affecting disaster response: operational challenges, institutional and community participation, and capacity building. Difficulties in communication and access to remote areas were identified as operational challenges, whereas coordination among agencies and incentive-based participation were perceived as important governance factors. Training and workshops were highlighted to strengthen disaster response operations. These themes contribute to long-term resilience among coastal communities in BARMM, particularly by improving site assessment for relocation planning in vulnerable and typhoon-prone areas.

Both the quantitative and qualitative findings converged on several key issues. The low ratings for communication systems and flood-adapted rescue vehicles were supported by the qualitative responses, which highlighted how communication challenges and limited transportation resources hinder disaster response efforts and restrict access to remote communities during emergencies. Similarly, the disaster responses, which had moderate ratings, were explained by the respondents' perspectives and experiences on limited resources, coordination issues, and delayed assistance. The integration of both quantitative and qualitative data strengthened the interpretation of the findings and provided a more comprehensive understanding of disaster response in coastal BARMM communities.

DISCUSSION

The findings indicate that disaster response in the coastal communities of BARMM was perceived to be moderately implemented. The provision of essential needs during the disaster was appreciated, and the efforts of trained responders are recognized. These results imply that LGUs and disaster responders were able to provide the basic services to the typhoon-affected families that help them cope with typhoon impacts.

However, the availability of rescue vehicles that can cross flooded areas was rated lowest in both implementation and effectiveness, highlighting how limited equipment is a major challenge to disaster response. Communication systems were also unstable, which delays rescue and relief distributions, highlighting the need to improve communication to ensure faster services.

The strong positive relationship between implementation and effectiveness ($\rho = 0.8997$) indicates that better implementation leads to more effective disaster response. This suggests that the availability of sufficient resources, reliable communication systems, and improved rescue operations can significantly enhance disaster response outcomes.

The qualitative findings supported these results by explaining the barriers experienced during disaster response operations, as respondents emphasized the importance of improving coordination, community involvement, and sustainable DRMM training and workshops. Strengthening these areas can help coastal communities in the BARMM region become more prepared and resilient for future disasters. The findings complemented the results on quantitative data by explaining the influencing factors behind the observed ratings. While the provision of essential needs and the trained responders' efforts were recognized, the respondents also described the challenges related to communication breakdowns, limited rescue equipment, and difficulties in accessing remote areas. These perspectives and challenges help explain why disaster responses were rated moderately in implementation and slightly effective despite the ongoing efforts of DRRM. The convergence of findings illustrates the value of a mixed-methods approach in understanding disaster response from both statistical trends and lived experiences.

Moreover, the study is limited to the typhoon survivors' perspectives and experiences from selected coastal communities in BARMM and therefore does not represent all disaster-prone areas in the region. Additionally, the use of descriptive statistics and correlation analysis identifies relationships between variables but does not establish causality. Future studies may utilize larger samples, include other disaster-prone areas, and employ advanced statistical techniques to further examine the factors influencing disaster response effectiveness.

CONCLUSION

This study demonstrates a strong positive relationship between disaster response implementation and perceived effectiveness in vulnerable coastal communities. While efforts in providing essential needs and deploying trained responders are evident, critical gaps remain in communication systems, mobility, and access to remote areas. Addressing these challenges requires targeted investments in infrastructure, enhanced coordination among stakeholders, and sustained capacity-building initiatives. Strengthening these components will improve disaster response systems and support the development of resilient coastal communities in hazard-prone regions.

These findings provide practical guidance for local government units and disaster management agencies in prioritizing investments and interventions to strengthen disaster response systems in high-risk coastal areas.

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Data Availability

The data of the study that further support the findings are available upon reasonable request to the authors.

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