Extent of Implementation of Community-Based Disaster Risk Reduction and Management in Flood-Prone Municipalities of Pangasinan

Engr. Mark Harvey T. Tayag, RCE, RMP, S02, MSME

University of Luzon

DOI: https://doi.org/10.47772/IJRISS.2026.100700091

Received: 10 July 2026; Accepted: 15 July 2026; Published: 25 July 2026

ABSTRACT

This article reports the quantitative implementation-extent component of a completed sequential-explanatory mixed-methods dissertation on Community-Based Disaster Risk Reduction and Management (CBDRRM) in Pangasinan. The follow-up qualitative phase was completed in the parent dissertation and is reported separately; it is not used here to calculate implementation levels. A researcher-developed and validated questionnaire was administered to 20 purposively selected implementation actors from Lingayen and Calasiao, composed of Municipal Disaster Risk Reduction and Management Office personnel, barangay officials, and community volunteers. Participants had direct roles in CBDRRM and at least one year of relevant involvement. Purposive sampling was appropriate because the study required informed assessments from a bounded group of implementers rather than population estimates from residents. Weighted means showed high implementation overall (grand mean = 4.45). Disaster Prevention and Mitigation ranked first (4.53), followed by Disaster Response and Early Recovery (4.45) and Disaster Preparedness (4.39). The pattern indicates stronger institutional planning, leadership, warning, and coordination mechanisms than household-level, experiential, and logistical capacities. Lower ratings for hazard-map explanation, household preparedness, simulation drills, community and school participation, information-material distribution, and rescue equipment may reflect uneven risk communication, participation barriers, coordination demands, and resource constraints. Findings are limited by the small purposive sample, self-reported ratings, two-municipality scope, and incomplete triangulation within this article. Priority actions are to convert risk information into household practice, institutionalize inclusive drills with schools and volunteers, and improve the inventory, maintenance, and pre-positioning of emergency equipment.

Keywords: Community-based Learning; CBDRRM; Flood Preparedness; Disaster prevention; Pangasinan; Disaster response

INTRODUCTION

Flooding remains a recurring development and public-safety concern in Pangasinan. Low-lying settlements, river systems, coastal exposure, drainage limitations, and monsoon and typhoon events repeatedly affect households, schools, livelihoods, mobility, health, and local government operations. These conditions require more than structural flood-control measures. They also require locally understood risk information, practical preparedness, community participation, functional warning systems, and coordinated response. The Sendai Framework for Disaster Risk Reduction emphasizes risk understanding, governance, investment in resilience, and preparedness for effective response and recovery, while Republic Act No. 10121 assigns local governments important responsibilities for disaster education, training, early warning, preparedness, and community participation (Republic Act No. 10121, 2010; United Nations Office for Disaster Risk Reduction, 2015).

Community-Based Learning provides an educational route for translating disaster information into collective action. Freire's empowerment perspective views community members as active participants who can examine local risks and act on them, rather than as passive recipients of instructions (Freire, 2000). Norris et al. (2008) likewise describe community resilience as a set of adaptive capacities that includes social capital, information

and communication, and community competence. In CBDRRM, these principles are reflected in participatory planning, local knowledge-sharing, drills, household preparedness, volunteer mobilization, and coordination among residents, schools, barangays, and municipal offices. Evidence from community-based disaster management and learning studies indicates that preparedness improves when education is localized, participatory, repeated, and connected to actual community conditions (Rozi et al., 2021; Saifi et al., 2024; Yodsuban & Nuntaboot, 2021).

However, high overall implementation ratings can conceal weaker components. Formal plans, digital campaigns, and municipal coordination may be visible and routinely documented, while household action, inclusive participation, practical drills, school-community linkages, and equipment readiness may be less consistent. Philippine and international studies have similarly identified gaps between policy strength and local operational capacity, especially in resources, risk communication, household preparedness, and sustained participation (Alcayna-Stewart et al., 2016; Elum & Lawal, 2022; Kurata et al., 2023). A more useful analysis therefore requires attention not only to the overall mean but also to the relative position of individual indicators and the institutional, logistical, and social conditions that may explain them.

This article addresses the first statement of the problem in the parent dissertation: to determine the extent of CBDRRM implementation in the flood-prone municipalities of Lingayen and Calasiao in terms of Disaster Prevention and Mitigation, Disaster Preparedness, and Disaster Response and Early Recovery. It focuses on the quantitative strand and critically interprets the indicator pattern in relation to community-based learning, resilience, and local implementation capacity. The qualitative strand of the completed parent study examined implementers' lived experiences, best practices, and challenges, but those findings are reported separately and are not presented as a second results dataset in this article.

METHODS

Research Design and Scope

The parent study employed a sequential-explanatory mixed-methods design in which the quantitative phase was conducted first and the qualitative phase followed to explain implementation patterns (Creswell & Plano Clark, 2018). The present article deliberately reports only the quantitative phase corresponding to the assessment of implementation extent. The completed qualitative phase, based on key informant interviews, is contained in the full dissertation and is outside the primary analytic scope of this manuscript. Accordingly, the results reported here are weighted-mean assessments from the survey; qualitative observations are mentioned only when discussing convergence and limitations, not as data used to compute the reported means.

Study Sites, Sampling, and Participants

Lingayen and Calasiao were purposively selected because both municipalities have documented recurring flood exposure and active local DRRM engagement, while representing different local conditions: Lingayen is coastal and low-lying, whereas Calasiao is inland and affected by river overflow, drainage constraints, and urban expansion. This bounded two-site design allowed the study to examine implementation in municipalities where CBDRRM responsibilities are regularly exercised.

The quantitative participants were 20 purposively selected implementation actors, with 10 from Lingayen and 10 from Calasiao. They consisted of MDRRMO personnel, barangay officials, and community volunteers. Inclusion required at least one year of involvement in CBDRRM, flood preparedness, response, disaster education, or community mobilization; an official, recognized, or active role in the local DRRM structure; service or assignment in either study municipality; and voluntary informed consent. Individuals without direct knowledge or involvement were excluded.

Purposive sampling was used because the questionnaire required informed judgments about planning, training, warnings, coordination, monitoring, and equipment that general residents might not be positioned to assess. The 20 participants were considered adequate for this bounded descriptive purpose because they represented a small, specialized pool of information-rich implementers, were balanced equally across the two municipalities, and

covered municipal, barangay, and volunteer perspectives. The sample was not intended to estimate population prevalence or represent all residents of Pangasinan; therefore, the findings are interpreted as the assessments of selected implementers and not as statistically generalizable municipal population estimates.

Instrument and Data Collection

The researcher-developed questionnaire, Community-Based Learning on Disaster Risk Reduction and Management in the Province of Pangasinan, was anchored on the Operation Listo framework and contained 25 indicators organized into Disaster Prevention and Mitigation (8 indicators), Disaster Preparedness (13 indicators), and Disaster Response and Early Recovery (4 indicators). Responses used a five-point Likert scale from 5 = Strongly Agree to 1 = Strongly Disagree. The instrument obtained an overall validation mean of 3.89, interpreted as Highly Valid, and a Cronbach alpha of 0.959, indicating excellent internal consistency.

Formal permission was obtained from the concerned institutions and local authorities before data collection. Participants were informed of the purpose and scope of the study, participation was voluntary, informed consent was secured, and responses were coded to protect confidentiality. The questionnaire did not require personally identifying information unless voluntarily provided.

Data Analysis

Weighted means and ranks were used to describe the extent of implementation. The interpretation ranges were 4.21-5.00 = Strongly Agree, 3.41-4.20 = Agree, 2.61-3.40 = Neutral, 1.81-2.60 = Disagree, and 1.00-1.80 = Strongly Disagree. Under the study's operational definition, stronger agreement indicated a higher perceived extent of implementation. No inferential comparison is reported in this article because it addresses only the first research problem. The analysis emphasizes both domain means and lower-ranked indicators so that a high grand mean does not obscure implementation gaps.

RESULTS AND DISCUSSION

Disaster Prevention and Mitigation

Table 1 presents the implementation ratings for Disaster Prevention and Mitigation. The overall mean was 4.53, interpreted as Strongly Agree and operationally classified as high implementation.

Indicator	Mean	DE	Rank
DRRM community-based learning activities are systematically planned by the LGU.	4.75	SA	4
Stakeholders are actively involved in DRRM activity planning.	3.95	A	7
Community needs are considered in activity design.	5.00	SA	1.5
Adequate budget is allocated for DRRM learning activities.	4.45	SA	6
Vulnerable sectors such as children, elderly, and PWDs are included in DRRM planning.	5.00	SA	1.5
Hazard maps are available and explained to community residents.	3.65	A	8
Barangay officials regularly conduct risk assessment activities.	4.60	SA	5
Monitoring and evaluation of DRRM learning activities are regularly conducted.	4.85	SA	3
Overall Mean	**4.53**	**SA**	

The highest ratings were given to considering community needs in activity design and including vulnerable sectors in DRRM planning (both 5.00), followed by regular monitoring and evaluation (4.85), systematic LGU planning (4.75), and barangay risk assessment (4.60). These results suggest that the selected implementers perceive prevention and mitigation as strongly institutionalized through formal planning, inclusion, and monitoring. This is consistent with Republic Act No. 10121 and the Sendai Framework, which emphasize proactive risk reduction, inclusive governance, and local capacity. It also reflects Norris et al.'s (2008) view that resilience depends on organized community competence and information systems.

The lower ratings are analytically important. Stakeholder involvement in planning obtained 3.95, while the availability and explanation of hazard maps obtained 3.65. The first result suggests that planning may be organized by local institutions but not always broadly co-produced with residents and sectoral groups. This matters because community-based approaches depend on trust, networks, and shared responsibility; Nguyen et al. (2023) found that community and individual resources influence disaster preparedness. The hazard-map result indicates a possible gap between technical availability and practical understanding. Maps may be posted or maintained by offices without being consistently translated into familiar landmarks, evacuation decisions, and household actions. Smith and Diedrich (2024) similarly emphasize participatory vulnerability assessment and community ownership of risk information. The survey did not directly test the causes of these lower ratings, but limited orientation time, technical language, uneven access, and reliance on official rather than participatory mapping are plausible local constraints that warrant further examination.

Disaster Preparedness

Table 2 shows the ratings for Disaster Preparedness. The overall mean was 4.39, interpreted as Strongly Agree, although it ranked lowest among the three domains.

Indicator	Mean	DE	Rank
Regular flood preparedness training is conducted.	4.80	SA	5
Simulation drills are conducted in flood-prone areas.	3.80	A	10.5
Residents are trained in early warning response.	4.30	SA	8
DRRM education programs are consistently implemented.	5.00	SA	2.5
Community members are oriented on evacuation procedures.	4.65	SA	6
Household preparedness practices are promoted in the community.	3.70	A	13
DRRM information materials are widely distributed.	3.80	A	10.5
Digital platforms are used for DRRM awareness campaigns.	5.00	SA	2.5
Community members actively participate in DRRM activities.	3.75	A	12
Barangay leaders encourage participation in DRRM programs.	5.00	SA	2.5
Volunteer groups are active in disaster preparedness.	5.00	SA	2.5
Schools participate in community-based DRRM learning programs.	3.85	A	9
Evacuation centers are properly identified and prepared before disasters.	4.45	SA	7
Overall Mean	**4.39**	**SA**	

Preparedness was strongest in consistently implemented DRRM education programs, digital awareness campaigns, barangay leadership, and active volunteer groups (all 5.00). Regular flood preparedness training also obtained a high mean of 4.80, followed by evacuation orientation (4.65), evacuation-center readiness (4.45), and early-warning response training (4.30). These indicators show that the participating municipalities have visible institutional and communication mechanisms. The strong leadership and volunteer results are consistent with community-based disaster management literature emphasizing collective organization, local knowledge, and mobilization (Rozi et al., 2021; Victoria, 2003). Digital campaigns may also offer a relatively low-cost way to distribute timely information across wide areas.

In contrast, household preparedness was the lowest-rated preparedness indicator (3.70), followed by active community participation (3.75), simulation drills and wide distribution of information materials (both 3.80), and school participation (3.85). Together, these results reveal a gap between institutional preparedness and repeated action at the household and community levels. Elum and Lawal (2022) emphasize that risk awareness must be converted into household behavior, such as family evacuation planning, emergency supplies, and protective action. Noor et al. (2022) likewise demonstrated that structured interventions can improve community knowledge and preparedness skills. The lower drill rating is significant because Bandura's (1977) social learning perspective suggests that knowledge is reinforced through observation, modeling, and practice; information alone may not produce automatic action during an emergency.

The lower scores may reflect practical constraints that are more demanding than running formal programs or online campaigns. Inclusive drills require scheduling, transport, facilitators, safety arrangements, participation of vulnerable groups, and post-drill review. School participation requires coordination among school calendars,

local offices, teachers, parents, and barangays. Printed materials require updating, translation, distribution, and replacement, while residents may face work, caregiving, or livelihood demands that reduce attendance. These interpretations are plausible rather than directly measured causes, but they are consistent with studies linking preparedness to resources, participation, and local implementation conditions (Kurata et al., 2023; Saifi et al., 2024; Yodsuban & Nuntaboot, 2021).

Disaster Response and Early Recovery

Table 3 presents the ratings for Disaster Response and Early Recovery. The overall mean was 4.45, interpreted as Strongly Agree.

Indicator	Mean	DE	Rank
Flood warnings are effectively disseminated to residents.	4.75	SA	2
Early warning systems are functional and accessible.	4.55	SA	3
Coordination between barangays and LGUs is evident during DRRM activities.	4.90	SA	1
Rescue and emergency equipment are readily available in the community.	3.60	A	4
Overall Mean	**4.45**	**SA**	

Barangay-LGU coordination was the highest-rated response indicator (4.90), followed by effective flood-warning dissemination (4.75) and functional and accessible early-warning systems (4.55). This suggests that communication lines and institutional coordination are perceived as established strengths. Victoria (2003) and the Asian Disaster Preparedness Center (2016) underscore that localized warning, barangay organization, and coordination can improve timely action and reduce flood impacts.

Rescue and emergency equipment, however, obtained only 3.60, the lowest score in this domain and the lowest indicator across the response items. The contrast indicates that organizational coordination may be stronger than material readiness. Equipment gaps may involve insufficient quantity, maintenance, operator training, accessibility, shared municipal inventories, or delayed pre-positioning in high-risk barangays. Alcayna-Stewart et al. (2016) similarly observed that strong Philippine DRRM policy and institutions may coexist with local resource and technical-capacity constraints. Thus, warning and coordination systems may function well but still be limited when boats, life vests, communication devices, first-aid supplies, lighting, or rescue tools are unavailable where and when needed.

Overall Implementation Pattern

Table 4 summarizes the three domains. The grand mean was 4.45, interpreted as Strongly Agree.

Area	Mean	DE	Rank
Disaster Prevention and Mitigation	4.53	SA	1
Disaster Preparedness	4.39	SA	3
Disaster Response and Early Recovery	4.45	SA	2
Grand Mean	4.45	SA	

The overall pattern is not simply that CBDRRM is highly implemented. More specifically, formal prevention systems, municipal and barangay leadership, digital communication, warnings, and intergovernmental coordination appear stronger than broad participation, household action, school-community integration, repeated simulation, localized interpretation of hazard information, and logistical readiness. This distinction is important because resilience requires both institutional systems and the capacity of households and communities to understand, practice, and act on those systems (Norris et al., 2008). A high grand mean should therefore be treated as evidence of a strong foundation rather than proof that implementation is uniformly complete.

The indicator pattern also converges with the completed qualitative strand of the parent dissertation, which identified financial and resource constraints, uneven community participation, communication and coordination issues during emergencies, and insufficient logistics and equipment. This convergence increases the plausibility of the interpretations offered above. Nevertheless, because the qualitative evidence is not fully presented or

jointly analyzed in this article, the manuscript should not be treated as a complete mixed-methods integration. The principal evidence here remains the quantitative ratings of the 20 purposively selected implementers.

Limitations, Triangulation, and Implications for Scalability

The findings are subject to several limitations. First, the sample consisted of only 20 purposively selected implementers from two municipalities. Their expertise makes their responses relevant to implementation, but the sample does not represent all residents, schools, civil-society organizations, or flood-prone municipalities in Pangasinan. Second, the results are based on self-reported agreement and may be affected by recall, social-desirability, or institutional-optimism bias. Third, the use of weighted means summarizes perceptions but does not independently verify whether activities occurred at the reported frequency, quality, geographic coverage, or outcome level.

Triangulation is also limited within this article. Although the parent dissertation completed a qualitative follow-up phase, the full interview evidence is reported separately. The present article does not include systematic document review, direct observation of drills, equipment audits, household surveys, or school-based assessments. Future studies should integrate these sources through a joint display or explicit convergence analysis so that survey perceptions can be checked against plans, attendance records, after-action reports, hazard-map orientations, equipment inventories, and community experiences.

For scalability, the three-domain instrument offers a useful common core, but direct replication without adaptation is not advisable. Flood-prone municipalities differ in coastal or inland exposure, urbanization, river and drainage conditions, population density, governance arrangements, fiscal capacity, communication coverage, and access to schools and evacuation centers. Scaling should therefore use a phased approach: retain common indicators for comparison, add locality-specific indicators, pilot the tool with a broader role-balanced sample, and link implementation ratings to observable preparedness outcomes. Multi-site studies should include residents, vulnerable groups, schools, health workers, civil society, and private-sector partners in addition to local implementers.

CONCLUSION

CBDRRM in Lingayen and Calasiao was perceived by selected implementers as highly implemented across prevention and mitigation, preparedness, and response and early recovery. The strongest features were inclusive and needs-based planning, monitoring, DRRM education, digital awareness, barangay leadership, volunteer engagement, warning dissemination, and barangay-LGU coordination. These results indicate a substantial institutional foundation for community-based flood risk reduction.

The lower indicators qualify this positive assessment. Hazard-map explanation, household preparedness, simulation drills, wider community and school participation, information-material distribution, and emergency equipment require more attention. The central implication is that policy, planning, and communication systems must be converted into repeated household and community practice and supported by adequate logistics. Given the bounded purposive sample and self-reported data, the findings should guide local improvement and further validation rather than be generalized to all municipalities.

RECOMMENDATIONS

1. **Convert risk information into household action.** LGUs and barangays should combine hazard-map orientation, household evacuation planning, emergency-contact arrangements, and go-bag demonstrations into a short, recurring barangay learning package. Using familiar landmarks, local language, and existing assemblies or digital channels makes this the most immediately feasible intervention.

2. **Institutionalize inclusive practice.** At least one regular flood simulation cycle should be jointly scheduled by the MDRRMO, barangays, schools, and volunteer groups in priority flood-prone areas. Drills should include vulnerable sectors and end with a brief after-action review that assigns corrective actions, responsible offices, and timelines.

3. **Close the logistical readiness gap.** Municipalities and barangays should maintain a risk-based inventory of rescue and emergency equipment, identify minimum requirements for high-risk locations, assign trained custodians, and schedule inspection, maintenance, and pre-positioning before the rainy season. Procurement may be phased according to hazard exposure and available budget.

REFERENCES

1. Alcayna-Stewart, A., Bollettino, V., Dy, P., & Vinck, P. (2016). Resilience and disaster trends in the Philippines: Opportunities for national and local capacity building. Harvard Humanitarian Initiative.
2. Asian Disaster Preparedness Center. (2016). Reducing flood disaster risk in Dagupan City, Philippines. Asian Disaster Preparedness Center.
3. Bandura, A. (1977). Social learning theory. Prentice Hall.
4. Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). SAGE Publications.
5. Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). SAGE Publications.
6. Elum, Z. A., & Lawal, A. (2022). Determinants of flood preparedness and risk perception among households in developing countries. International Journal of Disaster Risk Reduction, 72, Article 102908. https://doi.org/10.1016/j.ijdrr.2022.102908
7. Freire, P. (2000). Pedagogy of the oppressed (30th anniversary ed.; M. B. Ramos, Trans.). Continuum. (Original work published 1970).
8. Kurata, Y. B., Ong, A. K. S., Ang, R. Y. B., Angeles, J. K. F., Bornilla, B. D. C., & Fabia, J. L. P. (2023). Factors affecting flood disaster preparedness and mitigation in flood-prone areas in the Philippines. Sustainability, 15(8), Article 6657. https://doi.org/10.3390/su15086657
9. Nguyen, L. T., Bostrom, A., Abramson, D. B., & Moy, P. (2023). Understanding the role of individual- and community-based resources in disaster preparedness. International Journal of Disaster Risk Reduction, 96, Article 103882. https://doi.org/10.1016/j.ijdrr.2023.103882
10. Noor, M. T. M., Bhalaik, V., Rajendran, D., Baharuddin, K. A., Azman, A., & Nawi, A. M. (2022). Facing flood disaster: A cluster randomized trial assessing communities' knowledge, skills and preparedness utilizing a health model intervention. PLOS ONE, 17(11), Article e0271258. https://doi.org/10.1371/journal.pone.0271258
11. Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. American Journal of Community Psychology, 41(1-2), 127-150. https://doi.org/10.1007/s10464-007-9156-6
12. Republic Act No. 10121. (2010). Philippine Disaster Risk Reduction and Management Act of 2010.
13. Rozi, S., Ritonga, A. R., & Januar, J. (2021). Local community-based disaster management: The transformation of religious and local wisdom values in preparation to deal with natural hazards in West Sumatra, Indonesia. Jamba: Journal of Disaster Risk Studies, 13(1), Article a1020. https://doi.org/10.4102/jamba.v13i1.1020
14. Saifi, A.-G., Khlaif, Z. N., & Affouneh, S. (2024). The effect of using community-based learning program in science students achievement according to Kolbs learning styles. Social Sciences & Humanities Open, 10, Article 101125. https://doi.org/10.1016/j.ssaho.2024.101125
15. Smith, B., & Diedrich, A. (2024). A systematic review of current progress in community-based vulnerability assessments. Regional Environmental Change, 24, Article 21. https://doi.org/10.1007/s10113-023-02179-z
16. United Nations Office for Disaster Risk Reduction. (2015). Sendai framework for disaster risk reduction 2015-2030. United Nations.
17. Victoria, L. P. (2003). Community-based disaster management in the Philippines: Making a difference in people's lives. Philippine Sociological Review, 51, 65-80.
18. Yodsuban, P., & Nuntaboot, K. (2021). Community-based flood disaster management for older adults in southern Thailand: A qualitative study. International Journal of Nursing Sciences, 8(4), 409-417. https://doi.org/10.1016/j.ijnss.2021.08.008