



Stakeholder Engagement and Community Resilience in Disaster Risk Reduction: An Empirical Analysis from Catanduanes, Philippines

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Abstract

This study examines the perceived extent of community disaster resilience in Catanduanes, Philippines, by comparing the perspectives of Disaster Risk Reduction and Management (DRRM) program implementers and community beneficiaries. Anchored in Stakeholder Theory, Community Resilience Theory, and Systems Theory, the research employed a descriptive-comparative quantitative design to evaluate four core dimensions of resilience: human capital, social networks and community cohesion, economic capacity and livelihood resilience, and physical infrastructure and environmental robustness. Data were collected using a validated, researcher-developed survey instrument administered to 43 DRRM implementers (including municipal officers and barangay captains) and 401 household heads. Responses were measured using a 4-point Likert scale. Descriptive statistics were used to assess resilience levels, while independent samples z-tests determined statistically significant differences in stakeholder perceptions. Findings indicate that human capital was rated as “minimally resilient” by both groups (GWM: 2.27 for beneficiaries; 2.42 for implementers), reflecting critical gaps in mental health services and the deployment of specialized response teams. Social cohesion was perceived as “moderately resilient,” though challenges in knowledge management and inter-sectoral coordination persist. Notably, a statistically significant perceptual gap was found in the dimension of physical infrastructure, with implementers rating it more favorably than beneficiaries. This divergence suggests misalignment between program implementation and community experiences. The study proposes evidence-based recommendations to improve stakeholder engagement, enhance the inclusivity of DRRM policy frameworks, and strengthen localized resilience-building strategies. These insights are particularly relevant to disaster-prone island contexts, where governance capacity, community participation, and equitable service delivery remain critical to sustainable disaster resilience.

Keywords: Disaster Risk Reduction and Management, community resilience, stakeholder engagement, Catanduanes, human capital, social cohesion, livelihood resilience, infrastructure



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INTRODUCTION

The Philippines is among the most disaster-prone countries globally, frequently experiencing typhoons, floods, earthquakes, and volcanic eruptions that disrupt socio-economic stability and threaten human security (Bankoff, 2007; Gaillard et al., 2008). In response, the Philippine government institutionalized Disaster Risk Reduction and Management (DRRM) strategies through Republic Act 10121, in alignment with the Sendai Framework for Disaster Risk Reduction 2015–2030. These frameworks emphasize reducing vulnerabilities and enhancing resilience through capacity building, social capital development, economic diversification, and

infrastructure strengthening (Luna, 2014; Gaillard & Navarro, 2021).

In Catanduanes – known as the “Typhoon Capital of the Philippines” – DRRM programs have been consistently implemented to address frequent climate-induced hazards. However, empirical studies suggest that stakeholder perceptions of resilience and preparedness vary, which may undermine the impact and sustainability of such initiatives (Gaillard et al., 2008; Gaillard & Navarro, 2021). Although substantial progress has been made in DRRM policy enforcement, persistent gaps exist between the perspectives of program implementers and community beneficiaries, often influenced by disparities in resource

access, education, and involvement in planning processes (Marchezini et al., 2021; Cadag & Gaillard, 2012).

In other Philippine contexts, such as in Legazpi and Tacloban, studies have demonstrated the critical role of participatory governance and integration of local knowledge in enhancing disaster resilience (Delica-Willison & Willison, 2006; Florece et al., 2020). These findings highlight the importance of incorporating community voices in DRRM program development to ensure their contextual relevance and long-term effectiveness.

However, limited literature exists on the province of Catanduanes, particularly from a comparative stakeholder perspective. The absence of localized assessments across key resilience domains—human capital, social cohesion, economic capacity, and infrastructural robustness—hampers the formulation of inclusive and adaptive DRRM strategies.

In addressing this gap, the present study conducted a comparative analysis of DRRM implementation in Catanduanes, focusing on (1) assessing perceived community disaster resilience across four core dimensions, and (2) identifying statistically significant differences between the perceptions of program implementers and community beneficiaries. Grounded in Stakeholder Theory and systems resilience frameworks, this research aimed to offer evidence-based policy recommendations to support more inclusive, responsive, and sustainable DRRM governance in rural, hazard-prone Philippine communities.

Statement of the Problem. In the disaster-prone province of Catanduanes, the effectiveness of Disaster Risk Reduction and Management (DRRM) programs transcends mere technical implementation, relying heavily on how these initiatives are perceived and experienced by both program implementers and community beneficiaries. This study undertook a critical assessment of community disaster resilience – conceptualized across the dimensions of human capital, social cohesion, economic

capacity, and physical infrastructure—by examining the convergence and divergence in stakeholder perspectives to determine the depth and inclusivity of resilience outcomes derived from DRRM efforts. Specifically, the study was guided by the following research questions:

1. To what extent is community disaster resilience demonstrated in the implementation of Disaster Risk Reduction and Management (DRRM) programs in Catanduanes, as assessed by both beneficiaries and implementers across the following core dimensions:
 - 1.1 Human capital;
 - 1.2 Social networks and community cohesion;
 - 1.3 Economic capacity and livelihood resilience; and,
 - 1.4 Physical infrastructure and environmental robustness?
2. Are there significant differences between the perceptions of beneficiaries and implementers regarding the levels of community resilience within the DRRM program implementation?
3. Based on the assessed resilience dimensions and identified perceptual gaps, what evidence-based strategic interventions or policy recommendations can be proposed to enhance stakeholder engagement and the overall effectiveness of DRRM programs in the province?

Scope of the Study. Conducted from November 2024 to June 2025, this study examined disaster resilience in Catanduanes, Philippines, within DRRM programs. Drawing on Community Resilience Theory (Norris et al., 2008; Patel et al., 2017) and Stakeholder Theory (Freeman, 2010), it analyzed perceptions of implementers and beneficiaries across human, social, economic, and physical dimensions. Using structured surveys across all municipalities under Republic Act No. 10121, the study excluded technical and financial assessments to inform inclusive, evidence-based strategies in a high-risk provincial setting.

Theoretical/Conceptual Framework. This study is grounded in Stakeholder Theory, Community Resilience Theory, and Systems Theory, providing an integrated framework for analyzing Disaster Risk Reduction and Management (DRRM) in Catanduanes. Stakeholder Theory (Freeman, 2010; Hörisch et al., 2014) highlights how aligning implementers (e.g., MDRRMOs, barangay leaders) and beneficiaries (residents) enhances program legitimacy and effectiveness.

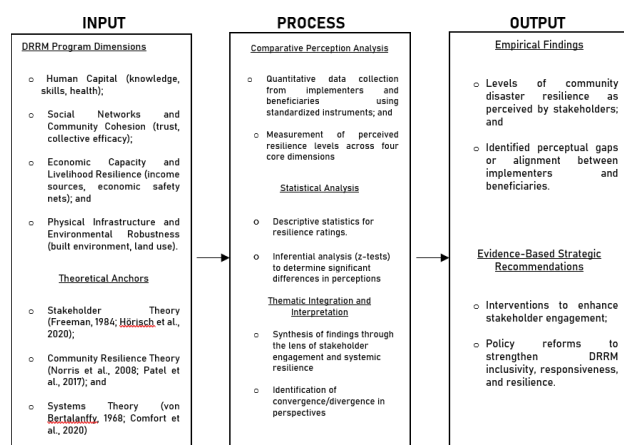


Figure 1
The Conceptual Paradigm of the Study

Community Resilience Theory emphasizes human, social, economic, and physical dimensions of resilience, with social capital as key to adaptive capacity (Patel et al., 2017; Zhou et al., 2022). Systems Theory views DRRM as adaptive and decentralized, requiring continuous learning across interconnected subsystems (Comfort et al., 2011). Guided by these frameworks, the study applies an Input-Process-Output (IPO) model: inputs reflect resilience dimensions; the process compares stakeholder perceptions via surveys and z-tests; outputs yield empirical insights and recommendations. This approach bridges theory and practice to support stakeholder-responsive DRRM in high-risk, resource-limited contexts.

LITERATURES

The implementation of Disaster Risk Reduction and Management (DRRM) in the Philippines, institutionalized through Republic Act 10121, underscores decentralized governance and

stakeholder inclusion. In high-risk provinces like Catanduanes, DRRM effectiveness depends on aligning legal mandates with stakeholder perceptions and multidimensional resilience outcomes across human, social, economic, and physical dimensions. Human capital is foundational, yet gaps remain. Mendoza et al. (2021) identified inadequate simulation-based training among DRRM personnel, while Santiago and Mabasa (2022) highlighted poor adherence to disaster protocols despite awareness, particularly among students. These align with Mendoza's (2025) call to integrate DRRM education into higher education. Cordial (2025) observed effective awareness campaigns and evacuation drills but noted deficiencies in psychological preparedness, underscoring the need for holistic human resilience initiatives.

Social capital also influences readiness. Mercado (2020, 2024) emphasized participatory governance and inclusive leadership, whereas Reyes et al. (2022) noted how risk communication often excludes vulnerable groups, reducing trust. In Catanduanes, limited access to information hubs amplifies this gap. Theories of bonding, bridging, and linking social capital (Tan-Mullins, 2021; Ludin et al., 2019) highlight trust and networks, yet Cordial (2025) reported coordination barriers among stakeholders. Economic resilience is equally crucial. delos Santos and Francisco (2021) criticized infrastructure-focused spending that neglects livelihood recovery, while Islam et al. (2025) promoted microfinance and cooperatives. Enerlan (2022) called for well-being-centered disaster evaluations. Cordial (2025) documented insufficient livelihood aid for informal laborers, emphasizing inclusive recovery strategies.

Physical resilience remains underdeveloped. Cruz and Rivera (2020) linked DRRM integration in Comprehensive Land Use Plans (CLUPs) to improved outcomes, but Fernandez et al. (2021) noted LGU resource limitations, reflected in Catanduanes' slow retrofitting. Cordial (2025) found beneficiaries rated infrastructure resilience lower than implementers, highlighting perception gaps. Similar disparities

were observed in service quality (Santos et al., 2021) and unmet public expectations (Ugaddan, 2021). Governance issues persist, including scarce resources, political discretion, and underfunded DRRM centers (Domingo & Manejar, 2021; Samson & Buot, 2023). Cordial (2025) emphasized inter-agency coordination and trust-building in isolated contexts.

Addressing these challenges requires context-sensitive frameworks. The ISLET framework (Santos et al., 2020; Lomboy, 2019) promotes coastal resilience, while SDG 11-aligned urban models (Hieu & Magnaye, 2025; Dulawan et al., 2024) provide transferable insights. Tools like Fuzzy Delphi and AHP (Pelone & Sanchez, 2024; Cajano & Olpenda, 2025) enhance vulnerability mapping. Moreno and Sulasa (2024) stressed equity-driven metrics, while simulation studies (Santos et al., 2023) identified sectoral gaps. Human Rights-Based Approaches (Recht, 2025) and participatory assessments (Cordial, 2025) reinforce ownership and long-term effectiveness. Overall, the reflected literature underscores multidimensional DRRM assessment, bridging perceptual gaps, and fostering stakeholder-driven, equity-focused resilience in vulnerable provinces like in Catanduanes.

METHODS

Research Design. This study employed a descriptive-comparative quantitative design to assess community resilience in DRRM implementation in Catanduanes, Philippines. Resilience, encompassing human, social, economic, and physical capacities (Sharifi, 2020; Aksha et al., 2020), reflects communities' ability to anticipate, absorb, and recover from disasters (Meerow et al., 2021; Vallance & Carlton, 2021). Grounded in Stakeholder and Systems Theories and participatory governance (Twigg, 2021; Iftekhar & Keya, 2022), it compared DRRM implementers and beneficiaries. Using validated surveys and stratified sampling (Aksha et al., 2020), data from 43 implementers and 401 beneficiaries were analyzed via descriptive statistics and z-tests (Gaillard et al., 2020).

Population Samples and Sampling Technique. This study targeted two populations: DRRM implementers (MDRRMOs and Barangay Captains) and household heads in hazard-prone barangays across Catanduanes' eleven municipalities. A proportional stratified random sampling technique ensured demographic and geographic representativeness (Taherdoost, 2021; Creswell & Creswell, 2022). From 315 barangays, 32 (10%) were selected, with 401 household heads and 43 implementers surveyed, totaling 444 respondents. This dual-sample structure enabled comparative analysis of community resilience across dimensions (Djalante et al., 2021; Alam & Rahman, 2022), with triangulated data enhancing insights on grassroots DRRM dynamics (Etikan & Babatope, 2022; Cutter, 2022).

Table 1
Summary of Sample Allocation Across Municipalities, Selected Barangays, and Households in Catanduanes

Municipality	Total No. of Barangays	Selected Barangays (10%)	MDRRM Officers	Total Key Informants (MDRRMOs + Barangay Captains)	Total Households Heads	Sampled Households Heads (10%)	Aggregate Sample Size
East Catanduanes							
Bagamanoc	18	2	1	3	250	25	28
Baras	28	3	1	4	400	40	44
Bato	27	3	1	4	370	37	41
Viga	32	3	1	4	380	38	42
Gigmoto	9	1	1	2	100	10	12
Pandan	26	3	1	4	360	36	40
Panganiban	23	2	1	3	240	24	27
San Miguel	24	2	1	3	250	25	28
West Catanduanes							
Caramoran	27	3	1	4	510	51	55
San Andres	38	4	1	5	340	34	39
Virac	63	6	1	7	810	81	88
Total	315	32	11	43	4,010	401	444

Legend: Sampling involved 10% of barangays and households per municipality, including MDRRMOs and barangay captains to ensure balanced stakeholder representation in disaster resilience assessment.

Instrumentation. This study employed a validated, reliable self-constructed survey to compare perceptions of DRRM implementers and community beneficiaries in Catanduanes on disaster resilience. Aligned with the DRRM framework, it covered human, social, economic, and physical dimensions using a four-point Likert scale with defined descriptors. Administered to MDRRMOs, barangay officials, and household heads, the instrument assessed preparedness, adaptability, and civic engagement. Validation included expert review and pilot-testing with 24 respondents, yielding a test-retest reliability of $r = 0.97$ – reflecting methodological rigor in disaster research (Marchezini, 2020).

Table 2
Rating Scale for Assessing Community Disaster Resilience in DRRM Program Implementation Across Four Core Dimensions: Human Capital, Social Cohesion, Economic Resilience, and Infrastructure Robustness.

Numerical Rating	Descriptive Category	Interpretation
4	Highly Resilient	The community reflects a strong capacity for resilience within the specified domain, marked by proactive preparedness, adaptive responses, and broad stakeholder involvement.
3	Moderately Resilient	The community maintains adequate resilience, with functional systems for disaster response and recovery, although improvements are needed in some critical areas.
2	Minimally Resilient	The community demonstrates limited ability to cope with disasters, characterized by significant gaps in planning, coordination, and available resources.
1	Not Resilient	The community is highly vulnerable due to the absence or severe inadequacy of mechanisms for disaster preparedness, mitigation, and recovery.

Note: This rating tool captures implementer and beneficiary perceptions of community resilience in Catanduanes, assessing four dimensions to enable comparative analysis and inform evidence-based DRRM policies and interventions.

Data Analysis. Survey data from 444 participants were analyzed using descriptive statistics and z-tests across human, social, economic, and physical dimensions, revealing perceptual gaps guiding localized, inclusive DRRM strategies in Catanduanes (Marchezini, 2020).

Ethical Considerations. This study followed ethical protocols, obtaining informed consent, ensuring voluntary participation, confidentiality, and withdrawal rights. Measures complied with the Philippine National Ethical Guidelines for Health and Health-Related Research (DOST-PCHRD, 2022), upholding participant rights and recognized ethical standards throughout data collection.

RESULTS

Extent of Community Disaster Resilience Demonstrated in the Implementation of Disaster Risk Reduction and Management (DRRM) Programs In Catanduanes. The assessment of community disaster resilience in Catanduanes, as reflected in the implementation of DRRM programs, was conducted from the perspectives of both

beneficiaries and implementers across four key dimensions: human capital, social cohesion, economic capacity, and physical infrastructure (see Table 3).

Table 3
Extent of community disaster resilience in Catanduanes as reflected in DRRM program implementation, assessed across multiple dimensions from the viewpoints of beneficiaries and implementers.

Items	Human Capital	Beneficiaries		Implementers	
		WM	QnR	WM	QnR
1	Availability of locally developed educational tools and community-focused awareness campaigns related to DRRM.	2.30	2	2.45	3
2	Implementation of community training sessions focused on disaster preparedness and emergency response strategies.	2.52	3	2.59	3
3	Deployment of specialized response teams with advanced DRRM training.	1.23	1	2.00	2
4	Functionality and autonomy of local DRRM councils actively involved in planning and implementation.	1.44	1	2.30	2
5	Growth in the involvement of civil society organizations (CSOs) in disaster preparedness efforts.	1.40	1	2.45	2
6	Percentage of disaster-affected individuals who received direct support through DRRM program implementation.	1.32	1	1.78	2
7	Number of people rescued, identified, and reunited with families as part of DRRM response operations.	2.93	3	2.49	2
8	Increase in the relocation of vulnerable individuals through proactive, voluntary, or mandated evacuation processes during disaster events.	3.72	4	3.93	4
9	Number of individuals provided with medical attention and other care services during DRRM interventions.	3.87	4	3.89	4
10	Increase in the number of at-risk children enrolled in emergency nutrition initiatives under DRRM programming.	1.90	2	1.95	2
11	Growth in the number of disaster survivors who accessed mental health and psychosocial support (MHPSS) services.	1.73	2	1.84	2
12	Number of individuals who took part in trauma and stress management sessions, particularly critical incident stress debriefing.	1.12	1	1.10	1
13	Percentage of affected populations who received psychological support through structured stress debriefing within DRRM frameworks.	2.20	2	2.65	3
14	Proportion of at-risk individuals who benefitted from adequate and appropriate protective interventions during disaster operations.	2.33	2	2.33	2
15	Percentage increase in vulnerable groups receiving comprehensive risk-reduction and protective services under DRRM schemes.	2.95	3	2.62	3
General Weighted Mean		2.27	2	2.42	2

Items	Social networks and community cohesion	Beneficiaries		Implementers	
		WM	QnR	WM	QnR
1	Functionality and presence of established local DRRM councils and offices facilitating coordination.	3.55	4	3.82	4
2	Availability and integration of hazard and vulnerability assessments, including sectoral risk evaluations within DRRM initiatives.	3.43	4	3.54	4
3	Implementation of systems for hazard monitoring and timely dissemination of risk-related information within the community.	3.57	4	3.58	4
4	Development and refinement of analytical tools and research methods for multi-hazard risk evaluation and cost-benefit analysis in DRRM.	1.23	1	1.54	2
5	Existence of an active knowledge management hub to centralize and share DRRM-related data and resources from various development actors.	1.30	1	1.27	1
6	Enhanced capacity of LGUs and local communities to perform vulnerability assessments, risk analysis, and continuous monitoring efforts.	2.55	3	2.75	3
7	Number of trained DRRM officers and key local decision-makers equipped with updated risk management skills.	3.48	4	3.78	4
8	Integration of multi-sectoral partnership frameworks into contingency planning under DRRM programs.	1.40	1	2.23	2
9	Activation of an Incident Command System (ICS) by the first emergency responder on site during disaster occurrences.	2.52	3	2.63	3
10	Timely execution of rapid needs assessments in all disaster-affected locations.	2.49	2	2.75	3
11	Implementation of comprehensive damage and needs assessments covering all impacted zones post-disaster.	2.31	2	2.90	3
12	Harmonized assessment and evaluation processes across national and local government levels to support DRRM interventions.	1.90	2	1.56	2
General Weighted Mean		2.64	3	2.70	3

Items	Economic capacity and livelihood resilience	Beneficiaries		Implementers	
		WM	QnR	WM	QnR
1	Effective allocation and use of the 5% Local Disaster Risk Reduction and Management Fund (LDRRMF) at the LGU level to support disaster-resilient Comprehensive Land Use Plans (CLUPs), Comprehensive Development Plans (CDPs), and related DRRM initiatives.	3.90	4	3.98	4
2	Ensured insurance coverage for assets owned by government entities to support risk transfer and recovery.	2.39	2	2.43	2
3	Availability of accessible and diversified financial mechanisms to support community-level disaster risk financing and recovery.	3.05	3	3.25	3
4	Proportion of economic activities restored or stimulated through interventions and financial support provided by national or local government under DRRM initiatives.	2.05	2	2.65	3
5	Growth in livelihood opportunities facilitated by government-led recovery programs and DRRM-related support interventions.	1.35	1	1.24	1
6	Increase in the volume or percentage of approved financial credit extended to disaster-affected economic sectors.	2.45	2	2.78	3
7	Designated areas established for the protection and shelter of animals, including poultry, livestock, and companion animals, as part of disaster preparedness planning.	2.56	3	3.37	3
8	Availability of timely, accurate, and reliable information dissemination mechanisms during disaster response operations.	1.77	2	1.98	2
9	Enhanced systems and strategies for the equitable and efficient distribution of emergency relief goods and services.	3.56	4	3.92	4
General Weighted Mean		2.56	3	2.84	3

Items	Physical Infrastructure and Environmental Robustness Indicators	Beneficiaries		Implementers	
		WM	QnR	WM	QnR
1	Integration of Disaster Risk Reduction and Management (DRRM) into local development plans such as the Comprehensive Land Use Plan (CLUP), including relevant laws, policies, and enacted ordinances.	3.58	4	3.50	4
2	Number of critical infrastructure facilities assessed and structurally improved to meet disaster-resilient standards.	1.40	1	1.73	2
3	Adoption and enforcement of local policies related to the establishment and operation of Early Warning Systems (EWS).	3.64	4	3.87	4
4	Number of functional Early Warning Systems (EWS) installed within the community.	2.51	3	2.61	3
5	Creation and dissemination of Information, Education, and Communication (IEC) materials to raise public awareness on disaster risks.	2.55	3	2.72	3
6	Delivery of community-based training programs on disaster preparedness and emergency response.	2.30	2	1.84	2
7	Provision of mother-friendly spaces within evacuation centers as part of DRRM planning.	2.55	3	2.58	3
8	Implementation and monitoring of safety standards and regulations for DRRM programs by Local Government Units (LGUs).	2.64	3	3.18	3
9	Allocation of secure and hazard-free relocation or resettlement areas by LGUs under DRRM initiatives.	2.55	3	2.58	3
10	Execution of housing programs that address the needs of disaster-affected populations through DRRM mechanisms.	2.30	2	2.40	2
11	Increase in the number of livelihood projects restored or reactivated through assistance from LGUs.	2.55	3	3.62	4
12	Growth in newly established livelihood opportunities supported by local government interventions under DRRM programs.	1.25	1	1.55	2
General Weighted Mean		2.49	2	2.68	3

**Legend: 4 = 3.50 - 4.00 - Highly resilient; 3 = 2.50 - 3.49 - Moderately resilient; 2 = 1.50 - 2.49 - Minimally resilient; 1 = 1.00 - 1.49 - Not resilient*

***WM - Weighted Mean*

****QnR - Quantitative Rating*

In the domain of human capital, both beneficiaries (GWM = 2.27) and implementers (GWM = 2.42) rated resilience as minimal, with relatively higher scores for medical care and evacuation services, but notably low ratings for mental health support, psychosocial interventions, and the deployment of specialized response teams.

Both beneficiaries (GWM = 2.64) and implementers (GWM = 2.70) rated social networks and community cohesion as moderately resilient, with strengths in DRRM council functionality, hazard monitoring, and

officer training, but weakened by deficiencies in knowledge management hubs, multi-sectoral coordination, and integrated contingency planning.

Economic capacity and livelihood resilience were rated as moderately resilient by both beneficiaries (GWM = 2.56) and implementers (GWM = 2.84), with favorable assessments of LDRRM Fund allocation and emergency relief distribution, but lower ratings for livelihood rehabilitation, risk transfer mechanisms, and post-disaster financial credit, while diversified financing options received moderate evaluations from both groups.

Physical infrastructure and environmental robustness was rated minimally resilient by beneficiaries (GWM = 2.49) and moderately resilient by implementers (GWM = 2.68), with strong performance noted in DRRM integration into land use plans, early warning systems, and public information efforts, but with significant shortcomings identified in infrastructure retrofitting, resettlement initiatives, and the creation of new livelihood projects.

Across all four dimensions, implementers consistently reported higher mean ratings compared to beneficiaries. While moderate levels of resilience were reflected in some areas, variations in perception and indicator performance suggest differentiated experiences and outcomes in DRRM program implementation across the province.

The results presented in Table 4 highlight the comparative perceptions of beneficiaries and implementers regarding community resilience levels in the implementation of Disaster Risk Reduction and Management (DRRM) programs in Catanduanes. A z-test was applied across four core dimensions of community resilience to determine whether a statistically significant difference existed between the two groups.

For Human Capital, the computed z-value was 1.25 with a p-value of 0.211, which is greater than the 0.05 significance level. This result indicates no statistically significant difference between the perceptions of beneficiaries and

implementers. Both groups assessed this dimension as Minimally Resilient, with general weighted means (GWM) of 2.27 and 2.42, respectively.

In the dimension of Social Networks and Community Cohesion, the z-value was computed at 0.45 with a p-value of 0.653. Similar to the previous result, this outcome exceeds the threshold for statistical significance, leading to the conclusion that there is no significant difference between stakeholder perceptions. Both groups considered this area to be Moderately Resilient, as reflected in the GWMs of 2.64 for beneficiaries and 2.70 for implementers.

With regard to Economic Capacity and Livelihood Resilience, the z-test produced a value of 1.75 and a corresponding p-value of 0.080. Although the result suggests a slightly greater difference in responses than the previous dimensions, it still does not reach the level of statistical significance. Both stakeholders rated this dimension as Moderately Resilient, with GWMs of 2.56 for beneficiaries and 2.84 for implementers.

In contrast, the dimension of Physical Infrastructure and Environmental Robustness yielded a computed z-value of 2.10 and a p-value of 0.036. Since this value is below the 0.05 significance level, the null hypothesis was rejected for this dimension. This indicates a statistically significant difference in the perceptions of both respondents. Implementers rated this as Moderately Resilient, while Minimally Resilient for beneficiaries.

Significant Differences Between the Perception of Beneficiaries and Implementers on the Level of Community Resilience Within the DRRM Program Implementation. Overall, the general z-test result showed a computed value of 1.39 and a p-value of 0.165, which is greater than the significance level of 0.05. This means that, taken as a whole, the study found no statistically significant difference in the overall perceptions of community resilience levels between the two stakeholder groups involved in DRRM implementation in Catanduanes.

Thus, there is no statistically significant difference between the perceptions of implementers and beneficiaries regarding the level of community resilience in Catanduanes.

Table 4
Comparative Analysis of Stakeholder Perceptions on Community Resilience Levels in the Implementation of DRRM Programs in Catanduanes

Core Dimensions	Test Statistic	Computed Value	p-value	Decision	Interpretation
1. Human Capital	z-test	1.25	0.211	Fail to reject Ho	No significant difference: both groups rated as <i>Minimally Resilient</i> (GWM: 2.27 vs. 2.42).
2. Social networks and community cohesion		0.45	0.653	Fail to reject Ho	No significant difference: both groups rated as <i>Moderately Resilient</i> (GWM: 2.64 vs. 2.70).
3. Economic capacity and livelihood resilience		1.75	0.080	Fail to reject Ho	Slight difference but not statistically significant; both groups rated as <i>Moderately Resilient</i> (2.56 vs. 2.84).
4. Physical Infrastructure and Environmental Robustness		2.10	0.036	Reject Ho	Significant difference: implementers rated higher (<i>Moderately Resilient</i>) vs. beneficiaries (<i>Minimally Resilient</i>).
Overall result		1.39	0.165	Fail to reject Ho	Overall, there is no significant difference in perceptions between implementers and beneficiaries.

Assessment of disaster resilience in Catanduanes revealed perceptual gaps, particularly in infrastructure, mental health, governance, and livelihoods. To address these, evidence-based interventions are proposed to enhance stakeholder engagement and align DRRM implementation with community needs and inclusive resilience strategies (Cordial, 2025; Mendoza, 2025; Reyes et al., 2022).

Evidence-Based Strategic Interventions and Rationale. This study proposes eight evidence-based interventions to address disaster resilience gaps. First, institutionalizing Mental Health and Psychosocial Support (MHPSS) within DRRM protocols, supported by funding for trauma-informed services, will address persistent weaknesses in psychosocial preparedness and recovery.

Second, strengthening local DRRM councils through participatory governance training and community mobilization will enhance grassroots leadership. Establishing localized digital DRRM hubs will improve knowledge management and awareness, while mandated multi-sectoral contingency planning among LGUs, NGOs, and national agencies will reduce fragmented coordination. Livelihood recovery through microinsurance, soft loans, and others will also support vulnerable sectors.

Finally, prioritizing infrastructure retrofitting, equitable resettlement, participatory monitoring tools (e.g., community scorecards), and inclusive, culturally tailored DRRM education will enhance accountability and preparedness. Grounded in empirical findings, these interventions align DRRM with community realities, advancing collaborative governance, transparency, and stakeholder-driven resilience planning adaptable to similarly vulnerable provincial contexts.

DISCUSSION

This study reveals the multidimensional nature of disaster resilience in Catanduanes, assessed across human capital, social cohesion, economic capacity, and physical infrastructure. Implementers consistently rated resilience higher than beneficiaries, reflecting perceptual gaps and implementation challenges (Santos et al., 2021; Ugaddan, 2021). Human capital emerged as a key vulnerability (GWM = 2.27 for beneficiaries; 2.42 for implementers), with notable deficiencies in trauma care, mental health services, and trained response teams. These findings support Mendoza et al. (2021), Santiago and Mabasa (2022), Mendoza (2025), and Cordial (2025), who emphasized institutionalizing DRRM education and trauma-informed care to enhance community preparedness and promote psychological resilience.

Social cohesion was rated as moderately resilient (GWM = 2.64 for beneficiaries; 2.70 for implementers), with strengths observed in DRRM council functionality and hazard monitoring. However, the absence of functional knowledge management systems and weak multi-sectoral coordination diluted overall performance. These findings mirror those of Reyes et al. (2022), who found that marginalized populations often lack access to DRRM information and decision-making platforms. The importance of fostering trust and strengthening social capital, as emphasized by Tan-Mullins (2021), Ludin et al. (2019), and Cordial (2025), is evident in this context, where gaps in coordination and communication persist.

Economic capacity and livelihood resilience were also assessed as moderately resilient (GWM = 2.56 for beneficiaries; 2.84 for implementers). While LDRRM fund utilization and emergency relief received favorable ratings, livelihood restoration, financial access, and risk transfer systems were perceived as inadequate. These results validate critiques by Delos Santos and Francisco (2021) on the overemphasis on physical infrastructure at the expense of economic recovery. Islam et al. (2025) and Enerlan (2022) stress the importance of incorporating inclusive financial mechanisms such as microfinance and cooperative-based risk management, which Cordial (2025) also advocated, especially in support of informal labor sectors frequently excluded from formal assistance schemes.

Physical infrastructure and environmental robustness yielded the most striking perceptual gap, with beneficiaries rating it as minimally resilient (GWM = 2.49) and implementers as moderately resilient (GWM = 2.68). Although positive assessments were given to DRRM integration in land use planning and early warning systems, significant weaknesses were found in infrastructure retrofitting, relocation, and livelihood-linked facilities. These results are consistent with Fernandez et al. (2021), who point to the technical limitations of LGUs, and Cruz and Rivera (2020), who stress the need for both policy and execution capacity. Cordial (2025) noted that the disconnect between implementers' optimism and beneficiaries' dissatisfaction in this area reflects deeper systemic issues in program delivery.

The persistent perceptual gap between DRRM implementers and beneficiaries across all dimensions highlights a critical misalignment that may compromise program legitimacy and trust. This aligns with Santos et al. (2021) and Ugaddan (2021), who, using SERVQUAL and EDM frameworks respectively, demonstrated how unmet expectations erode program credibility. Governance challenges persist, as the decentralization goals of Republic Act 10121 are often impeded in provincial settings like Catanduanes by limited resources, political discretion, and weak participatory governance

(Domingo & Manejar, 2021; Pulhin-Yoshida et al., 2021). Operational constraints and staff burnout further hinder resilience-building (Samson & Buot, 2023; Cordial, 2025).

Several frameworks present viable pathways for DRRM reform. The ISLET framework (Santos et al., 2020; Lomboy, 2019) emphasizes integrated, localized strategies for coastal areas. Urban resilience models aligned with SDG 11, as shown by Hieu and Magnaye (2025) and Dulawan et al. (2024), provide adaptive benchmarks. Decision-support tools like the Fuzzy Delphi Method and Analytical Hierarchy Process improve intervention prioritization (Pelone & Sanchez, 2024; Cajano & Olpenda, 2025). Cordial's (2025) Input-Process-Output (IPO) model identifies specific gaps and facilitates targeted, more specific and data-informed solutions.

The integration of Human Rights-Based Approaches (HRBAs) into DRRM adds an ethical and participatory dimension. Recht (2025) argues that HRBAs can support inclusive governance if properly institutionalized. Haque and Fatema (2022), drawing from the Bangladesh experience, emphasized the necessity of aligning DRRM strategies with cultural and contextual realities—a call echoed by Cordial (2025) in recommending participatory needs assessments to enhance local program ownership.

In conclusion, community disaster resilience in Catanduanes remains uneven across the assessed dimensions, with human capital and physical infrastructure emerging as the most critical areas requiring intervention. The observed perceptual divergences between implementers and beneficiaries reveal a significant gap in stakeholder engagement, transparency, and trust—barriers that can impede the effectiveness of DRRM implementation. While certain strengths were noted, such as in evacuation procedures, hazard monitoring, and fund utilization, there is a pressing need for integrated, inclusive, and context-sensitive strategies to address persistent vulnerabilities.

To enhance disaster resilience, this study recommends integrating DRRM education and mental health services within institutional and community systems, as proposed by Mendoza (2025) and Cordial (2025). Strengthening social capital through inclusive communication and coordination is vital, particularly for marginalized populations (Reyes et al., 2022; Tan-Mullins, 2021). Economic resilience requires flexible financial support for both formal and informal sectors (Islam et al., 2025; Enerlan, 2022). Infrastructure retrofitting and secure relocation are also essential (Cruz & Rivera, 2020; Fernandez et al., 2021). Sustained stakeholder engagement through SERVQUAL and IPO (Santos et al., 2021; Cordial, 2025) is crucial.

The comparative analysis of stakeholder perceptions on DRRM implementation in Catanduanes showed largely aligned views across core dimensions. Z-test results indicated no statistically significant differences in assessments of human capital, social cohesion, and economic resilience. Both implementers and beneficiaries rated human capital as minimally resilient (GWM: 2.42 vs. 2.27), echoing findings by Mendoza et al. (2021) and Santiago and Mabasa (2022) on training and mental health gaps. Cordial (2025) similarly highlighted the lack of trauma-informed care. Strengthening human capital requires investments in mental health services, localized training, and DRRM-integrated education (Mendoza, 2025; Cordial, 2025).

The absence of significant differences in perceptions of social cohesion (GWM: 2.70 vs. 2.64) indicates a shared view of moderate resilience. However, this may obscure the exclusion of vulnerable groups. Reyes et al. (2022) observed that risk communication often bypasses marginalized communities, eroding trust—a pattern evident in Catanduanes. Consistent with Tan-Mullins (2021) and Ludin et al. (2019), enhancing participatory governance and institutional trust is critical. Thus, DRRM mechanisms should prioritize multi-sectoral engagement and responsive communication strategies to strengthen community cohesion.

Economic capacity and livelihood resilience were perceived as moderately resilient by both implementers (GWM: 2.84) and beneficiaries (GWM: 2.56), with no significant difference ($p = 0.080$). However, scholars note a persistent bias toward infrastructure over livelihood recovery (Delos Santos & Francisco, 2021). In Catanduanes, Cordial (2025) found informal labor sectors inadequately supported. To promote equitable recovery, Islam et al. (2025) and Enerlan (2022) propose integrating microfinance and cooperative-based mechanisms. This study recommends incorporating such flexible, community-driven financial strategies into DRRM frameworks for inclusive resilience-building.

A significant perceptual gap was found in assessments of physical infrastructure and environmental robustness ($p = 0.036$), with implementers rating it moderately resilient (GWM: 2.68) and beneficiaries minimally resilient (GWM: 2.49). Fernandez et al. (2021) attributed such disparities to technical and fiscal limitations of local governments, while Cruz and Rivera (2020) stressed weak DRRM integration in land use planning. Cordial (2025) highlighted inequitable access and visibility. Addressing this requires infrastructure retrofitting, expanded relocation options, and participatory planning for equitable DRRM implementation.

Descriptive findings show implementers consistently rating community resilience higher than beneficiaries; however, inferential analysis confirms a statistically significant gap only in perceptions of physical infrastructure. This suggests generally aligned views across dimensions, except where infrastructure reveals deeper experiential mismatches. The significant divergence underscores the need for targeted inquiry and refined DRRM policies addressing implementation impact and community realities.

The computed z -value (1.39, $p = 0.165$) indicates no significant overall difference in resilience perceptions between implementers and beneficiaries. However, the divergence in infrastructure assessments reinforces

literature highlighting service delivery gaps and stakeholder misalignment (Santos et al., 2021; Ugaddan, 2021). Unresolved mismatched expectations may erode trust (Reyes et al., 2022; Recht, 2025). Institutionalizing perception assessments using tools like SERVQUAL, IPO, or EDM is essential for inclusive and adaptive DRRM governance (Cordial, 2025).

To contextualize these findings, broader governance challenges must be addressed. Despite the decentralized architecture of Republic Act 10121, local DRRM systems in island provinces like Catanduanes remain hindered by resource scarcity and fragmented inter-agency coordination (Domingo & Manejar, 2021; Pulhin-Yoshida et al., 2021). Samson and Buot (2023) report that DRRM operation centers are often under-resourced, further limiting institutional resilience. These structural issues demand data-driven, intersectoral strategies that enhance both administrative capacity and grassroots participation (Cordial, 2025).

In conclusion, although statistical analysis indicates general alignment in stakeholder perceptions, significant variance in infrastructure assessments highlights critical implementation gaps. This underscores the need for multidimensional resilience frameworks and localized models like ISLET (Santos et al., 2020; Lomboy, 2019), alongside SDG-aligned urban approaches (Hieu & Magnaye, 2025; Dulawan et al., 2024). Tools such as the Fuzzy Delphi Method and AHP (Pelone & Sanchez, 2024; Cajano & Olpenda, 2025), and HRBAs (Recht, 2025; Haque & Fatema, 2022) ensure inclusive, sustainable DRRM strategies. Grounded in empirical findings from Catanduanes, this section synthesizes stakeholder perceptions and systemic gaps in DRRM implementation to inform strategic, evidence-based interventions. Disparities emerged across human capital, social cohesion, economic resilience, and physical infrastructure, with a statistically significant gap in infrastructure assessments. Implementers rated it moderately resilient, while beneficiaries perceived minimal resilience – underscoring governance and communication issues (Santos et al., 2021;

Ugaddan, 2021). Higher implementer ratings overall suggest a persistent disconnect between policy intentions and community-level outcomes.

Resilience across human capital, social, and economic dimensions was generally perceived as moderate, yet critical gaps persist in mental health and psychosocial support (MHPSS), multi-sectoral coordination, and access to livelihood and financial services. These concerns echo findings by Mendoza et al. (2021), Reyes et al. (2022), and Delos Santos and Francisco (2021), underscoring the need for trauma-informed DRRM systems, inclusive risk financing, and participatory governance. The significant perceptual gap in infrastructure highlights uneven service delivery and the urgency of equitable investments in retrofitting, resettlement, and housing to strengthen resilience in Catanduanes.

To address systemic DRRM challenges, this study proposes eight strategic interventions: institutionalizing MHPSS services; strengthening local DRRM councils; creating centralized knowledge-sharing platforms; enhancing multi-sectoral coordination; improving livelihood recovery mechanisms; prioritizing infrastructure retrofitting; establishing participatory monitoring systems; and expanding inclusive DRRM education. These align with the ISLET framework's emphasis on localized, integrated approaches (Santos et al., 2020; Lomboy, 2019), and benefit from decision-support tools such as the Fuzzy Delphi Method and AHP (Pelone & Sanchez, 2024; Cajano & Olpenda, 2025). Supporting a rights-based paradigm, Recht (2025), Haque and Fatema (2022), and Cordial (2025) underscore culturally grounded, participatory DRRM planning.

In conclusion, the perceptual gap between implementers and beneficiaries – most evident in infrastructure and governance – signals the need for a participatory and community-centered DRRM approach. The proposed interventions offer a replicable model that incorporates stakeholder perceptions into resilience planning, enhancing program coherence and accountability. This strategy

supports sustainable and inclusive disaster governance, consistent with Republic Act 10121, the Sendai Framework, and Sustainable Development Goal 11, particularly in vulnerable, resource-constrained provincial contexts.

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