Community-Level Disaster Rehabilitation and Recovery: Performance of Barangay Disaster Risk Reduction and Management Committees in the Tagoloan River Basin, Southern Philippines

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Abstract

The recurrence of climate-related hazards highlights the critical role of local governments in ensuring resilience and recovery. This study assessed the performance of Barangay Disaster Risk Reduction and Management Committees (BDRRMCs) in implementing post-disaster rehabilitation and recovery functions in the Tagoloan River Basin (TRB) in the Southern Philippines. Using a descriptive mixed-methods design, data were collected from 152 respondents across 26 barangays and complemented by focus group discussions. Results show that BDRRMC tasks were only partially accomplished, with overall performance rated satisfactory (mean = 3.28). Multiple linear regression analysis identified the Punong Barangay's educational attainment and years in service, BDRRMC budget allocations, and community experience with floods and heavy rainfall as significant predictors of performance. Qualitative findings revealed persistent challenges related to resource constraints, coordination gaps, environmental governance issues, and limitations in recovery planning. While barangay mechanisms demonstrate commitment to post-disaster functions, systemic institutional and capacity constraints hinder effectiveness. The study concludes that strengthening leadership capacity, ensuring sustained financing, and reinforcing institutional support mechanisms are essential to improving post-disaster recovery outcomes. The findings underscore the need for targeted capacity-building and governance reforms to bridge the gap between statutory mandates and community-level implementation in river basin settings.

Keywords: disaster rehabilitation; recovery governance; barangay DRRMC; community resilience; river basin; local governance; Philippines.

Introduction

The Philippines is consistently ranked among the most disaster-prone countries in the world, with river basin communities particularly vulnerable to climate-related hazards. In 2011, Tropical Storm Sendong (international name Washi) devastated Cagayan de Oro City and communities along the Tagoloan River Basin (TRB), resulting in catastrophic losses of lives, livelihoods, and infrastructure. Six years later, Tropical Storm Vinta (Tembin) again struck Northern Mindanao, displacing families in Tagoloan, Misamis Oriental, due to flash floods originating from upland headwaters (Citizens' Disaster Response Center, 2017). These recurrent disasters underscore the urgent need for sustained governance interventions that go beyond emergency response toward long-term rehabilitation and recovery.

In response to the country's heightened disaster risks, the Philippine government institutionalized a comprehensive disaster risk governance framework through the enactment of the Philippine Disaster Risk Reduction and Management Act of 2010 (Republic Act 10121) and its Implementing Rules and Regulations (IRR). The law devolved primary responsibilities to local government units (LGUs), mandating the creation of Barangay Disaster Risk Reduction and Management Committees (BDRRMCs) as frontline institutions responsible for the four thematic areas of disaster risk reduction and management: prevention and mitigation, preparedness, response, and rehabilitation and recovery. Funding support is provided through the Barangay DRRM Fund, equivalent to five percent of barangay revenues, including a Quick Response Fund.

The Tagoloan River Basin, the country's 13th largest river system, spans approximately 180,000 hectares across Bukidnon and Misamis Oriental and encompasses 26 barangays draining into Macajalar Bay. Its diverse topography sustains agriculture, industry, and settlements, yet simultaneously exposes communities to recurrent flooding and heavy rainfall. For communities in this watershed, climate-related hazards are not isolated events but persistent governance challenges that require institutionalized recovery mechanisms.

Within this context, the role of BDRRMCs in disaster rehabilitation and recovery, the fourth pillar of the DRRM framework, becomes particularly critical. This pillar involves post-disaster damage and needs assessment (PDNA), restoration of basic services, rehabilitation of infrastructure, and the implementation of adaptive measures to reduce future risks. Despite its importance, empirical assessments of barangay-level performance in disaster rehabilitation and recovery remain limited, particularly in river

basin settings.

Beyond its local empirical contribution, this study situates barangay-level disaster rehabilitation and recovery within broader global development and governance agendas. Specifically, it contributes to the United Nations Sustainable Development Goals (SDGs), notably SDG 11 (Sustainable Cities and Communities) through its focus on community recovery institutions; SDG 13 (Climate Action) by examining adaptive responses to climate-related hazards; and SDG 16 (Peace, Justice, and Strong Institutions) through its analysis of leadership capacity, institutional performance, and accountability at the barangay level. By grounding these global goals in the governance realities of river basin communities in the Philippines, the study demonstrates how frontline institutions shape recovery outcomes, resilience, and long-term sustainability.

Objectives of the Study

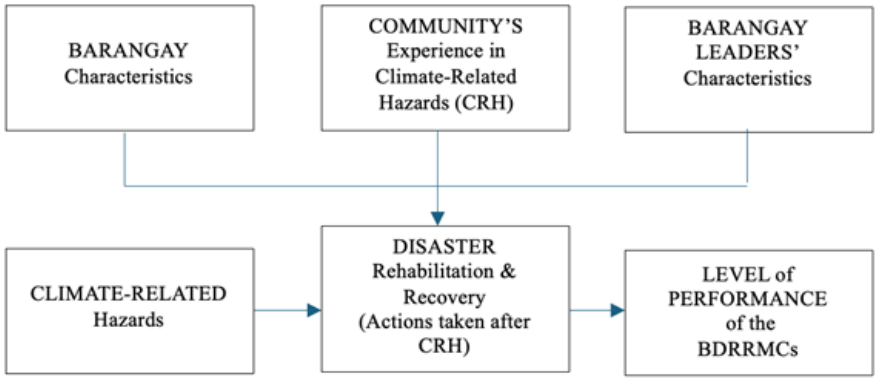
The primary objective of this study is to assess the performance of Barangay Disaster Risk Reduction and Management Committees (BDRRMCs) in the Tagoloan River Basin with respect to their mandated functions in disaster rehabilitation and recovery under Republic Act 10121 and its IRR.

Specifically, the study seeks to:

1. Determine the level of performance of BDRRMCs in disaster rehabilitation and recovery.
2. Examine the extent to which barangay characteristics, leadership attributes of the Punong Barangay, and community experiences with climate-related hazards explain variations in BDRRMC performance; and
3. Identify issues and concerns affecting the effectiveness of BDRRMCs in post-disaster rehabilitation and recovery.

Figure 1

Schematic Diagram Showing the Relationship of the Variables of the Study.



Theoretical Framework

This study is anchored on community-based disaster risk governance and institutional resilience theory, which emphasize the central role of local institutions, leadership, and collective learning in shaping disaster recovery outcomes (Stoker, 1998; Norris et al., 2008; Tierney, 2014). Community-based disaster governance conceptualizes barangays not merely as implementers of national policies but as frontline governance units whose effectiveness depends on leadership capacity, organizational resources, and social context.

Institutional resilience theory explains how organizations adapt, reorganize, and learn following repeated shocks. In hazard-prone environments, such as river basins, repeated exposure to disasters fosters institutional learning and adaptive practices that enhance recovery performance over time (Lindell & Hwang, 2008; Onuma et al., 2017). These perspectives are consistent with disaster risk management and recovery models that emphasize adaptive capacity, multi-level coordination, and institutional learning as determinants of effective post-disaster rehabilitation.

Guided by these theories, the study posits that BDRRMC performance in disaster rehabilitation and recovery is shaped not solely by compliance with RA 10121, but by the barangay's institutional resilience - its capacity to mobilize leadership, resources, and collective experience to restore and improve post-disaster conditions.

Conceptual Framework

This study is anchored on the principles of community-based disaster risk governance, which emphasize the role of local institutions, leadership, and contextual factors in shaping recovery outcomes (Gaillard, 2007; Norris et al., 2008; Tierney, 2014). Specifically, the framework situates Barangay Disaster Risk Reduction and Management Committees (BDRRMCs)' performance in rehabilitation and recovery as the dependent variable, influenced by both institutional and contextual determinants.

The independent variables are drawn from the literature on disaster resilience and localized governance. These include:

1. Barangay characteristics - population size and budget allocations, which shape the committee's capacity to mobilize resources.
2. Leadership attributes of the Punong Barangay - educational attainment, age, gender, and years in service, reflecting the importance of capable and experienced leadership in mobilizing recovery.
3. Community exposure to climate-related hazards - specifically floods, heavy rainfall, and erratic or unseasonal rain- conditions the level of institutional learning, preparedness, and adaptive response.

The linkages among these variables are informed by global and local literature. Studies show that well-resourced barangays with strong leadership and prior hazard experience are better able to mobilize collective action, conduct post-disaster needs assessments, and implement effective rehabilitation programs (Kusumasari et al., 2010; DILG-LGA, 2018). The framework thus posits that BDRRMC performance varies as a function of these interrelated factors, mediated by the statutory mandates of RA 10121 and guided by the National DRRM Plan.

Through this conceptual lens, BDRRMC performance is assessed by the extent to which BDRRM committees fulfill their mandated roles in rehabilitation and recovery, including restoring community functions, supporting displaced populations, and adopting measures to reduce future risks. The framework highlights that recovery effectiveness is not solely determined by compliance with policies but also by the interplay of leadership, institutional capacity, and lived hazard experience.

Disaster Rehabilitation and Recovery

Measuring disaster recovery is central to disaster governance because it informs policy decisions, resource allocation, and institutional

accountability (Cheng et al., 2015). Recovery outcomes vary according to hazard characteristics, socio-cultural context, geographic conditions, and the policy frameworks adopted by authorities (Gaillard, 2007). Scholars emphasize that recovery is not merely a return to pre-disaster conditions, but a process of building resilience and reducing future risks (UNDRR, 2015).

In the Philippine context, studies on barangay disaster governance have focused largely on preparedness and coordination, often highlighting gaps between statutory mandates and implementation capacity (DILG-LGA, 2018; Nacaya, 2021). Research consistently shows that leadership competence, resource availability, and hazard experience influence local disaster governance outcomes (Kusumasari et al., 2010; Kim & Zakour, 2017). However, few studies have examined disaster rehabilitation and recovery at the barangay level, particularly within river basin systems. This study addresses this gap by providing an empirical, basin-scale assessment of BDRRMC recovery performance.

Demographics, Leadership, and Hazard Experience in Community DRRM

Disaster governance literature highlights the influence of demographic conditions, leadership capacity, and hazard experience on community-level DRRM outcomes. Communities with stronger administrative and fiscal capacity tend to mobilize recovery interventions more effectively (Kim & Zakour, 2017). Leadership features, particularly educational attainment and experience, are consistently associated with improved coordination, policy interpretation, and collective action during recovery (Kusumasari et al., 2010; Thomas et al., 2015). Moreover, prior exposure to floods and heavy rainfall enhances risk perception, institutional learning, and adaptive behavior (Lindell & Hwang, 2008; Onuma et al., 2017). These strands of literature collectively support the analytical framework of this study.

Methodology

Research Design

The study employed a descriptive mixed-methods design, integrating quantitative survey data with qualitative insights from focus group discussions.

Assessment Parameters for BDRRMC Performance

The performance of Barangay Disaster Risk Reduction and Management Committees (BDRRMCs) was assessed using a set of indicators derived from Republic Act 10121, its Implementing Rules and Regulations (IRR), and the operational guidance issued through Operation Listo! and Listo si Kap!, which delineate the roles and responsibilities of the Punong Barangay and BDRRMCs in implementing the Philippine Disaster Risk Reduction and Management (PDRRM) framework. These policy instruments collectively define the statutory and operational standards for barangay-level disaster risk reduction, including rehabilitation and recovery functions.

Based on these mandates, assessment parameters focused on the extent to which BDRRMCs performed their prescribed post-disaster rehabilitation and recovery tasks. Data were generated through structured survey instruments administered to Punong Barangays and BDRRMC members, supplemented by coordination with municipal and barangay offices to validate information through in-person interviews and focus group discussions. Respondents were asked to rate the extent of implementation for each mandated function using a five-point Likert scale, with higher scores indicating greater compliance and functionality.

Statistical Tools

A range of statistical techniques was applied to ensure rigor in data analysis, aligned with the study's objectives:

- Descriptive Statistics (frequency, percentages, mean, and standard deviation): Used to summarize the demographic profile of respondents and to assess the overall performance level of BDRRMCs (Objectives 1 and 2).
- Inferential Statistics (T-test and F-test): Employed to test for significant differences in BDRRMC performance across groups defined by selected independent variables.
- Multiple Linear Regression Analysis (MLRA), including MLRA with dummy variables: Utilized to determine the extent to which barangay characteristics, leadership attributes, and hazard experiences explain variations in BDRRMC performance. All regression models were tested for multicollinearity, and the results confirmed that the independent variables were not collinear, ensuring the validity of the findings.

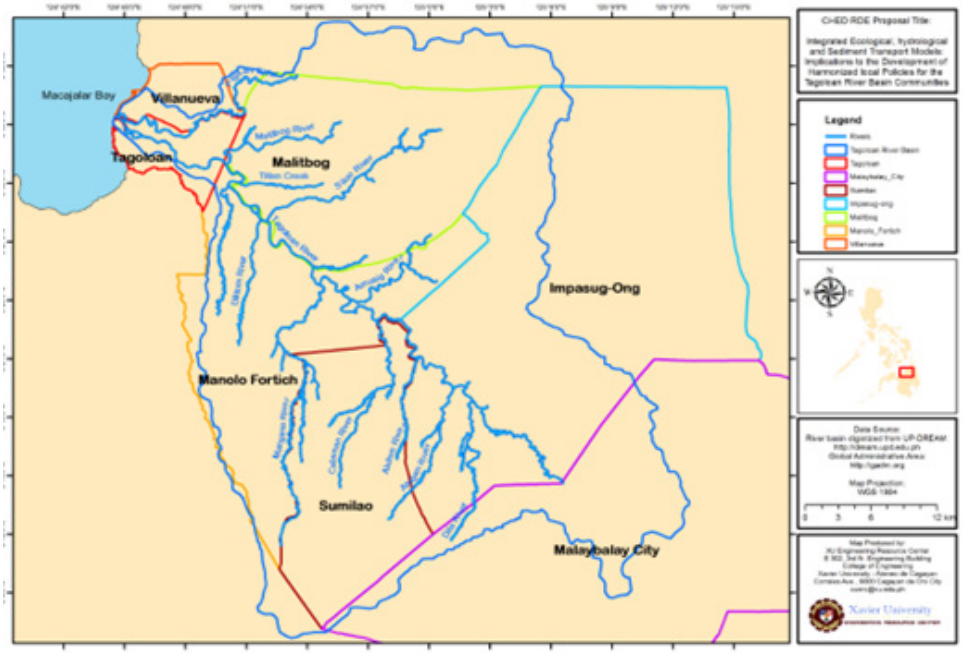
These methods collectively allowed the study to capture both the descriptive state of BDRRMC performance and the explanatory power of leadership, institutional, and contextual factors.

Research Environment

The research was conducted in the Tagoloan River Basin (TRB), located in Northern Mindanao, Southern Philippines. The basin spans eight local government units (LGUs), consisting of three downstream municipalities in Misamis Oriental Province and five upstream municipalities in Bukidnon Province. The TRB encompasses 26 barangays distributed across these LGUs, covering approximately 180,000 hectares of forest, plateaus, valleys, and waterways. The basin's major rivers include the Tagoloan, Malitbog, Siloo, Titian, Mangima, Alulum, Amusig, and Dila rivers (see Figure 2). These hydrological systems play a vital role in sustaining livelihoods but also expose communities to recurrent floods and climate-related hazards.

Figure 2

Map Showing the Municipalities Included in the Study



Respondents and Sampling Procedure

A total of 152 respondents were included in the study, with the

sample size determined using Cochran's formula at a 95% confidence level ($\alpha = 0.05$, $Z = 1.96$) and a margin of error of 0.103. The sample was proportionately allocated across the 26 barangays within the Tagoloan River Basin (TRB) to ensure adequate representation of each community.

Respondents consisted of barangay council members, BDRRMC members from the private sector, and key barangay officials, including the Punong Barangays, Barangay Secretaries, and Barangay Treasurers. A combination of random and purposive sampling techniques was employed to capture both general representation and the inclusion of respondents with direct roles in disaster rehabilitation and recovery. This sampling approach ensured that the perspectives of both barangay leadership and committee members actively involved in post-disaster governance were adequately represented.

Results and Discussion

Performance of BDRRMCs in Disaster Rehabilitation and Recovery

Table 1 summarizes respondents' ratings on the performance of Barangay Disaster Risk Reduction and Management Committees (BDRRMCs) in disaster rehabilitation and recovery across the Tagoloan River Basin (TRB). Overall, 51.32% of respondents rated BDRRMC performance as very satisfactory to excellent, 15.13% as satisfactory, while 33.55% rated performance as low to very low. The overall mean score of 3.28 (SD = 1.55) indicates a generally satisfactory level of performance, though with marked variability across barangays.

Indicator-level results reveal that BDRRMCs performed better in coordination and control functions than in resource and planning-intensive tasks. Higher levels of implementation were reported for ensuring peace and order (72.37%), assisting clearing operations (70.39%), coordinating with the Local DRRM Office on community re-entry advisories (66.45%), and submitting consolidated reports (65.13%). These functions reflect strong vertical coordination with higher LGUs and are essential during the immediate post-disaster phase.

In contrast, rehabilitation-focused and resource-dependent functions were less consistently implemented. Less than 58% of respondents affirmed effective performance in post-disaster needs assessment, the distribution of financial and material assistance from the Barangay DRRM Fund, the procurement of additional relief goods, and the proposal of priority infrastructure projects for risk reduction. These findings suggest

partial compliance with RA 10121 mandates, particularly in activities requiring technical capacity, budget management, and long-term recovery planning. The results indicate that while barangays can manage short-term coordination, sustained recovery efforts remain uneven.

Table 1

Distribution of Respondents by Ratings on the Performance of the BDRRMCs Considering Disaster Rehabilitation & Recovery (Actions taken after Climate-related Hazard)

Level of Performance	Frequency	Percent (%)
Excellent (4.60-5.00)	49	32.24
Very Satisfactory (3.70-4.59)	29	19.08
Satisfactory (2.80-3.69)	23	15.13
Low (1.90-2.79)	18	11.84
Very Low (1.0-1.89)	33	21.71
Total	152	100.00

Mean: 3.28 Standard Deviation:1.55

Description: satisfactory

Indicators	% mean	Desc
Actions taken after Climate-related Hazard	3.28	Sat

BDRRMC had recommended to the SB (Barangay Council) the following	
1. Continuously assisted the city/municipality rescue teams	57.89
2. Coordinated with LDRRMO regarding the advisory to return to Communities	66.45
3. Procured additional goods, if necessary	54.61
4. Assisted the city/municipal engineering office in clearing operations	70.39
5. Conducted ocular inspection around the community for post-disaster needs assessment	53.95
6. Ensured peace and order in the barangay	72.37
7. Proposed to the city/municipality priority infrastructure projects for the protection of the residents to reduce residents risk against climate-related hazard	55.26
8. Accomplished and submitted consolidated report upon termination of the disaster operations to LDRRMO	65.13
9. All agencies concerned were furnished with copies of the reports	56.58
10. Financial & material support distributed to affected residents from BDRRM Fund	53.29
11. Assisted the Higher LGUs and other organization/s in the distribution of financial & material support to affected residents	55.92

Determinants of BDRRMC Performance

Table 2 presents the results of the Multiple Linear Regression Analysis (MLRA) examining the influence of barangay characteristics, Punong Barangay (PB) attributes, and community hazard experience on BDRRMC performance. The model was highly significant ($F = 9.82$, $p < 0.01$) and explained 23% of the variance in performance.

Among leadership attributes, the educational attainment of the Punong Barangay exerted the strongest influence, with a one-unit increase associated with a 0.74-point improvement in BDRRMC performance. Years of service also contributed positively ($\beta = 0.06$), underscoring the importance of experience, institutional memory, and governance networks in disaster recovery leadership. These findings affirm the role of human capital in effective barangay-level disaster governance.

Resource availability, as reflected in the BDRRMC budget, showed a positive, though modest, relationship with performance, indicating that access to financial resources enhances the capacity to support affected households and sustain recovery activities. In addition, community experience with floods ($\beta = 0.04$) and heavy rainfall ($\beta = 0.01$) were significant predictors, suggesting that repeated exposure to hazards fosters institutional learning and adaptive practices that improve recovery performance.

Collectively, these results demonstrate that BDRRMC performance is shaped by an interaction of leadership capacity, resource sufficiency, and experiential learning, rather than by formal mandates alone.

Table 2

Dependent Variable: Functionality of the BDRRMC in Disaster Rehabilitation and Recovery

Independent Variables	•Regression Coefficients	T Values
X1: Educational attainment	0.74	4.01**
X2: Gender	-0.009	-0.03ns
X3: Age	0.01	1.11ns
X4: Years in the service	0.06	2.58**
X5: BDRRM budget	0.000003	1.81+
X6: Experience in floods	0.04	5.07**
X7: Experience in heavy rainfall	0.01	2.57**
Constant: -4.01		

Initial MLRA	Final MLRA
Adjusted R2: 0.22 F value: 7.17**	Adjusted R2: 0.23 F value: 9.82**
FINAL MODEL: $\hat{y} = -2.84 + 0.67X1 + 0.06X4 + 0.000003X5 + 0.03X6 + 0.01X7$	

Legend: • Regression coefficients generated at the Initial MLRA
ns not significant (□ ≥ 0.10) ** highly significant (□ □ 0.01)
* significant (0.01 < □ □ 0.05) + significant (0.05 < □ < 0.10)

Key Issues and Governance Implications

Qualitative findings from focus group discussions contextualize the quantitative results and reveal governance constraints affecting disaster rehabilitation and recovery. Participants identified relocation of residents in flood-prone areas as a persistent challenge, particularly where Indigenous Peoples' Rights Act (IPRA) protections intersect with disaster safety mandates. This highlights the need for rights-sensitive yet risk-informed relocation strategies.

Environmental governance concerns were also raised, notably soil erosion linked to upland agricultural plantations and inadequate enforcement of buffer zone regulations, both of which were perceived as exacerbating downstream flooding. In addition, barangay leaders emphasized the lack of technical capacity to prepare infrastructure project proposals, limiting access to external funding for priority recovery interventions.

These issues indicate that limitations in BDRRMC performance stem not only from internal capacity gaps but also from broader legal, environmental, and inter-institutional constraints. Strengthening disaster rehabilitation and recovery, therefore, requires integrated governance reforms that combine leadership development, predictable financing, technical assistance, and stronger accountability mechanisms across government and private stakeholders.

Synthesis

Overall, the findings affirm that disaster rehabilitation and recovery at the barangay level are fundamentally governance challenges. While BDRRMCs demonstrate competence in immediate coordination tasks, weaknesses in resource mobilization and long-term recovery planning constrain resilience building. Enhancing recovery outcomes in climate-exposed river basin communities requires targeted investments in leadership

capacity, institutional support, and adaptive learning systems that enable barangays to translate statutory mandates into sustained recovery action.

Conclusion

This study examined the performance of Barangay Disaster Risk Reduction and Management Committees (BDRRMCs) in disaster rehabilitation and recovery within the Tagoloan River Basin, a climate-exposed river system in Southern Philippines. Findings indicate that while BDRRMCs generally demonstrate a satisfactory level of performance, effectiveness varies across mandated recovery functions.

Barangays perform more consistently in coordination, reporting, and peace and order functions, reflecting strong vertical linkages with municipal governments during the immediate post-disaster phase. However, limitations persist in resource mobilization, post-disaster needs assessment, and long-term recovery planning. These gaps indicate partial realization of Republic Act 10121's rehabilitation and recovery mandates and point to systemic constraints in leadership capacity, technical competence, and financing.

Regression results confirm that leadership attributes of the Punong Barangay, particularly educational attainment and years of service, significantly influence recovery performance, alongside budget availability and cumulative experience with climate-related hazards. Qualitative findings further reveal governance challenges related to relocation policy tensions, environmental regulation enforcement, and limited technical capacity for recovery-oriented project development. Collectively, these results affirm that disaster rehabilitation and recovery at the barangay level are fundamentally governance challenges requiring institutional strengthening rather than procedural compliance alone.

Recommendations

1. **Institutionalize Leadership Development for Disaster Recovery Governance** *(SDG 16)*
   Barangay-level leadership development programs should be institutionalized to strengthen the capacity of Punong Barangays and BDRRMC members in recovery planning, policy interpretation, coordination, and accountability. Strengthening leadership and institutional competence directly contributes to more effective, transparent, and accountable local institutions, consistent with the

governance objectives of SDG 16.

2. **Strengthen Technical Capacity for Post-Disaster Needs Assessment and Recovery Planning** *(SDG 11; SDG 13)*

Municipal and city DRRM offices should provide sustained technical assistance to barangays in conducting post-disaster needs assessments and in formulating recovery-oriented infrastructure and risk-reduction projects. Enhancing technical capacity supports safer, more resilient communities (SDG 11) while enabling adaptive responses to climate-related hazards (SDG 13).

3. **Ensure Predictable and Accountable Financing for Rehabilitation and Recovery** (SDG 11; SDG 16)

Clear guidelines and monitoring mechanisms should be reinforced to ensure effective and transparent utilization of the Barangay DRRM Fund for rehabilitation and recovery. Predictable financing enables barangays to implement recovery measures that protect lives and livelihoods (SDG 11) while strengthening fiscal accountability and institutional trust (SDG 16).

4. **Institutionalize Learning from Recurrent Climate Hazards** (SDG 13)

Barangays should establish mechanisms to document and integrate lessons from recurring flood and rainfall events into DRRM planning and decision-making. Institutionalizing experiential learning enhances adaptive capacity and supports climate action at the community level, directly advancing SDG 13.

5. **Enhance Multi-Level and Cross-Sectoral Governance in River Basin Settings** (SDG 11; SDG 16)

Disaster rehabilitation and recovery in river basin communities require coordinated action among barangays, higher LGUs, national agencies, and private sector actors. Strengthening enforcement of environmental regulations and aligning disaster safety measures with legal and cultural safeguards can reduce systemic risk, promote resilient settlements (SDG 11), and reinforce effective, inclusive institutions (SDG 16).

Synthesis Statement on SDG Contribution

Overall, the study demonstrates that strengthening barangay disaster rehabilitation and recovery simultaneously contributes to safer, more resilient communities (SDG 11), enhanced adaptive capacity to climate-related hazards (SDG 13), and more effective, accountable local governance

institutions (SDG 16). By grounding global development goals in the empirical realities of barangay-level governance, the findings offer policy-relevant insights for disaster-prone river basin communities in the Philippines and similar contexts.

To Future Researchers

Future studies may examine the implementation of Republic Act 10121 by analyzing the effectiveness of coordination between national government agencies and local government units (LGUs). Such research can assess whether the DRRM framework is not only compliant with statutory mandates but also effectively enforced across governance levels. Further inquiry into the functionality of Local DRRM Councils, particularly their capacity to coordinate, mobilize resources, and implement the four DRRM thematic areas, would be valuable. Comparative studies across provinces, cities, and river basin contexts may also help explain variations in local disaster governance performance.

Limitations of the Study

This study focused on the performance of Barangay Disaster Risk Reduction and Management Committees (BDRRMCs) in the Tagoloan River Basin, specifically examining the rehabilitation and recovery pillar of DRRM. The analysis was limited to recurrent hazards in the study area on floods, heavy rainfall, and unseasonal rain, and to respondents directly involved in barangay-level DRRM operations. Higher-level LGUs were excluded, as the management of the 5% Barangay DRRM Fund falls under the barangays' legal mandate. Accordingly, the findings are contextualized within the basin for barangay-level recovery governance.

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