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An Integrated Approach to Flood Risk Governance in Barangay Tugbungan, Zamboanga City: Planning, Policy and Community-Based Adaptation

Lesley Ann F. Atilano-Tang, MPA, JD, DPA(Cand.)[1]*
Rodel Bello[2]

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A B S T R A C T

Flooding remains a chronic urban hazard in the Philippines, driven by inadequate drainage, accelerated urbanization, and climate change, and increasingly recognized as a governance challenge requiring integrated policy, planning, and community-based adaptation. This study examines flood risk governance in Barangay Tugbungan, Zamboanga City—an urban barangay experiencing recurrent flooding that disrupts livelihoods, mobility, and community safety. Anchored in Systems Theory, Adaptive Governance Theory, and Community-Based Adaptation (CBA), the research develops and tests an integrated framework linking (1) flood risk management planning, (2) policy and institutional implementation, and (3) household/community adaptation practices. Using a mixed-methods case study with an explanatory sequential and participatory orientation, data were gathered through household surveys (N = 30) and semi-structured interviews, complemented by document review and thematic analysis of qualitative responses. Descriptive results indicate moderate-to-high awareness of preparedness measures, strongest in knowledge of evacuation centers and routes, and moderately positive perceptions of early warning systems. However, clarity of disaster preparedness plans and the regularity/visibility of flood drills show weaker or uncertain ratings, indicating uneven institutional communication and preparedness routines. Flood exposure is universal among respondents within the last three years, with frequent flooding attributed primarily to river overflow and heavy rainfall, compounded by clogged waterways, poor drainage, and waste management issues. Governance perceptions are cautiously positive regarding the presence of barangay policies and coordination with city DRRM offices, but respondents' express uncertainty about disaster fund utilization and dissatisfaction with infrastructure maintenance. Qualitative findings further highlight delayed or uneven aid distribution, health and sanitation risks, and evacuation constraints, alongside strong informal social support among neighbors. The study proposes an Integrated Flood Governance Framework organized around resilient infrastructure and environmental management, responsive and equitable disaster management, community empowerment and capacity building, and accountable, aligned governance. Aligning with SDGs 11, 13, and 16, the framework emphasizes transparency, routine maintenance, strengthened volunteerism, and sustained multi-level coordination to advance inclusive and durable flood resilience in Barangay Tugbungan.

1. INTRODUCTION

In the Philippines, flooding is a persistent urban issue resulting from insufficient drainage, accelerated urbanization, and climate change (Santiago et al., 2019). Worldwide, flood governance has transitioned from solely technical solutions to integrated strategies that encompass policy, infrastructure, and community-based adaptation (Driessen et al., 2018; Rosendo et al., 2020). International research gaps endure restricted cross-country comparisons hinder the transfer of insights across varied contexts; the scaling of local adaptations to national policy is inadequately examined; the equity effects on vulnerable populations are insufficiently investigated; and long-term monitoring of non-structural

* Western Mindanao State University, Zamboanga City, Philippines
Email: atilano-tang.lesley@wmsu.edu.ph

measures and multi-level coordination mechanisms remains limited.

Barangay Tugbungan in Zamboanga City shows how flooding continues to affect people's lives and shows how inadequate disaster management is. At the national level, research deficiencies encompass insufficient assessment of the efficacy of current flood management measures and the translation of national strategies into local implementation. There is also a lack of research on how government financing and rules may help community-based adaptation more. At the city level, the main problems are that local authorities don't work together well, land-use and drainage rules aren't always followed, and residents don't have enough say in planning. There are not many studies that look at how city governments might combine community adaptation methods with official disaster risk reduction programs to make cities more resilient over time.

By analyzing the connections between planning, policy, and community-based adaptation, this study suggests an integrated approach to flood risk governance in Barangay Tugbungan. The study's objectives are to evaluate local adaptive practices, pinpoint institutional gaps, and jointly create governance plans that fortify grassroots resilience and municipal frameworks. By doing this, it hopes to help Zamboanga City and other urban communities adopt more sustainable and inclusive flood governance models.

By integrating local flood governance techniques with global development goals, this study emphasizes the importance of inclusive policy creation, resilience building, and participatory decision-making as critical mechanisms for empowering communities and strengthening institutional capacity. The integrated strategy proposed for Barangay Tugbungan is intended to not only alleviate the immediate effects of flooding, but also to promote long-term sustainable development. This approach is consistent with the United Nations Sustainable Development Goals (SDGs), specifically SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action), and SDG 16 (Peace, Justice, and Strong Institutions), which serve as the guiding framework for this research proposal.

Background of the Study

In the Philippines, flooding is one of the most urgent urban hazards, and it is often made worse by growing urbanization, poor drainage systems, and the escalating effects of climate change. Located in the typhoon belt, the Philippines is an archipelagic nation that frequently floods, endangering lives, upsetting livelihoods, and depressing local economies (Santiago et al., 2019). On their own, traditional flood control methods—which frequently focus on engineering solutions—have proven inadequate. Recent international research highlights a paradigm shift toward integrated flood risk governance, where community-based adaptation, policy, and planning are viewed as interrelated components essential to resilience development (Driessen et al., 2018; Rosendo et al., 2020).

This problem is best illustrated in Barangay Tugbungan, Zamboanga City, which, due to its location in a flood-prone area, experiences recurrent flooding that endangers community safety and health, damages property, and disrupts mobility. Despite existing disaster risk reduction (DRR) frameworks and local planning tools, their effective implementation remains limited. Research indicates that governance effectiveness is undermined by weak institutional coordination, fragmented policy responses, and limited community participation (Serrano & Yumul, 2021; Valenzuela et al., 2023). Complementing these findings, **Atilano-Tang, Zabala, Valerio, and Grande (2023)**, in their study *Enhancing Zamboanga City's Urban Flooding Resilience: A Forward-Looking Evaluation of Flood Management and Hazard Mitigation Strategies*, emphasized that while Zamboanga City has made strides in structural and non-structural flood mitigation, gaps remain in adaptive governance, stakeholder integration, and data-driven urban planning. Their study underscores the necessity of a more **comprehensive and inclusive flood governance approach**—one that harmonizes top-down planning and policy mechanisms with bottom-up, community-based adaptation strategies to enhance resilience and sustainability in flood-prone areas such as Barangay Tugbungan.

Community-based adaptation has emerged as a critical component of disaster resilience. By empowering local residents to develop coping mechanisms, share indigenous knowledge, and participate in decision-making, flood governance becomes more context-sensitive and sustainable (Rahman et al., 2022; Van der Keur et al., 2022). When integrated with formal policy and planning, such grassroots initiatives not only reduce vulnerability but also strengthen social cohesion and collective resilience. Furthermore, alignment with the United Nations Sustainable Development Goals (SDGs)—particularly Goal 11 (Sustainable Cities and Communities) and Goal 13 (Climate Action)—underscores the importance of governance models that are participatory, adaptive, and environmentally sound.

Furthermore, this study looks at how planning, policy, and community-based adaptation intersect to investigate an integrated approach to flood risk governance in Barangay Tugbungan. It seeks to evaluate local adaptive practices, pinpoint institutional deficiencies, and suggest cooperative approaches that could serve as a template for Zamboanga City and other similarly vulnerable communities in the Philippines.

1.1 Objectives of the Study

General Objective

The goal is to improve flood resilience, equity, and institutional responsiveness in Barangay Tugbungan, Zamboanga City, by examining and designing an integrated model of unified flood risk governance that

connects community-based adaptation (CBA) practices, public policy tools, and urban planning.

Specific Objectives

1. To evaluate the existing flood risk management planning frameworks in Barangay Tugbungan by assessing resident awareness and the perceived effectiveness of disaster preparedness plans and early warning systems.
2. To assess the level of community-based adaptation and household involvement in flood response, identifying the strengths and weaknesses of local cooperation and individual preparedness.
3. To analyze the perceived effectiveness of current flood governance and policy implementation, specifically regarding fund utilization, infrastructure maintenance, and inter-agency coordination.
4. To identify the primary causes of flooding and the challenges faced by residents to propose an integrated governance framework that enhances community resilience and policy alignment.

1.2 Significance of the Study

This study holds significance across various tiers of governance and society. At the city level, it gives the Zamboanga City Government evidence-based information that can help make disaster risk reduction and management strategies stronger, especially by improving urban planning, building infrastructure, and flood control measures. It also helps city policies include community-based adaptation techniques, which makes sure that disaster governance is both fair and long-lasting. At the barangay level, the findings will serve as a practical guide for Barangay Tugbungan officials in planning and implementing localized flood risk reduction strategies. The study also encourages residents to be more involved in their communities and aware of what's going on. This grants them more authority to take an active role in preparing for disasters and makes it easier for the municipal government to coordinate resources and respond to emergencies.

For the economic sector, the study is useful because it can help businesses, people, and infrastructure avoid harm, which can lead to economic losses. It makes sure that businesses can keep going and be strong in the face of floods by supporting investments and land-use practices that are sensitive to risk. It also gives techniques that assist in keeping agricultural production, microenterprises, and local industries going. In the academe, it also sets the stage for more academic research on integrated disaster risk management in urban barangays for scholars in the future. It offers a paradigm that may be duplicated or modified for other flood-prone regions in Zamboanga City and abroad, while also pinpointing research deficiencies in governance, climate adaptation, and community resilience to inform future studies.

For future researchers, the study establishes a basis for additional scholarly investigation into integrated disaster risk management within urban barangays. It offers a paradigm that may be duplicated or modified for other flood-prone regions in Zamboanga City and beyond, while also pinpointing research deficiencies in governance, climate adaptation, and community resilience to inform future studies.

This study will ultimately benefit a number of stakeholders, including barangay leaders in Tugbungan, policymakers in Zamboanga City, scholars and practitioners in disaster risk governance, and—above all—the locals who are directly in danger of floods. In flood-prone metropolitan areas, the research helps create safer, more resilient, and sustainable communities by fusing scientific knowledge with community-driven practices.

1.3 Scope and Delimitation

This study aims to investigate how planning, policy, and community-based adaptation intersect as elements of an integrated approach to flood risk governance. The study will evaluate how well the barangay's ongoing flooding is being addressed by the local government's disaster risk reduction policies, landuse planning programs, and community-based adaptation techniques. Document analysis, key informant interviews, household surveys, and community meetings will all be used to collect data in order to record institutional viewpoints as well as firsthand experiences.

The research is limited to Barangay Tugbungan, which may restrict the generalizability of its findings to other flood-prone barangays in Zamboanga City or in varying geographical contexts. The barangay serves as a pertinent case study owing to its susceptibility and persistent flood risks; however, the conclusions may not encompass the complete range of flood governance challenges and adaptation strategies existing throughout the city. The study does not utilize scientific hydrological modelling, extensive engineering design evaluations, or cost-benefit analyses of flood control infrastructure. Instead, it focuses on institutional planning, policy evaluation, and community-based adaptation strategies. These are useful, but they don't cover as much ground as studies of flood management that are based on technology.

The study's results might not be entirely applicable to other flood-prone barangays in Zamboanga City or in other geographic contexts because it is limited to Barangay Tugbungan. Because of its vulnerability and frequent flood risks, the barangay makes an interesting case study; however, the conclusions may not fully represent the range of flood governance issues and adaptation tactics that exist throughout the city. Additionally, the study does not use cost-benefit analyses of flood control infrastructure, large-scale engineering design evaluations, or scientific hydrological modelling. Rather, it places more emphasis on community-based adaptation strategies, policy evaluation, and institutional

planning—all of which are important, but they have a smaller scope than technically driven flood management studies.

Furthermore, the study is limited by practical constraints such as time and resources. These constraints may limit the size and representativeness of the respondent pool, the scope of the fieldwork, and the amount of longitudinal data that can be collected. As a result, the analysis may only capture current situations rather than longer-term patterns in governance and community response.

Despite these acknowledged limitations, the study aims to make a significant contribution by providing fresh insights into integrated methods to flood risk governance. Its emphasis on institutional planning, participatory governance, and localized adaptation approaches creates a useful knowledge base for regional planning and policy development. The study promotes itself as a useful reference for decision-makers, community leaders, and scholars interested in improving sustainable and community-centered disaster risk reduction measures.

1.4 Brief Literature Review

Flooding remains one of the most pervasive and destructive natural hazards globally, particularly in developing countries like the Philippines where urban expansion, inadequate drainage, and climate change exacerbate flood risks. In recent years, scholars and policymakers have emphasized the need for integrated approaches that combine planning, policy, and community-based adaptation to strengthen resilience at the local level (Alcayna et al., 2016; Lopez & Moreno, 2024). Flood risk governance has thus evolved from a purely technical or engineering problem into a multi-dimensional governance challenge involving coordination among institutions, stakeholder participation, and adaptive management of risk (Mees et al., 2016). This review of related literature explores three major dimensions relevant to the proposed study in Barangay Tugbungan, Zamboanga City: (1) flood risk management planning, (2) community risk, adaptable strategies, and involvement in flood response and preparation—with attention to the advantages and disadvantages of local adaptation—and (3) flood governance mechanisms. Together, these themes highlight the importance of integrated flood governance that combines top-down policy frameworks with bottom-up community action.

Figure 1
Flood Risk Management Planning

Flood risk management planning serves as the cornerstone of disaster preparedness and resilience, guiding actions to mitigate flood impacts through coordinated planning, land-use regulation, and infrastructure development. Earlier approaches relied mainly on structural interventions such as levees, floodwalls, and drainage systems, but these measures have been criticized for their short-term focus and failure to address underlying vulnerabilities (Sayers et al., 2013). In response, contemporary frameworks promote integrated flood risk management (IFRM), which balances structural and non-structural strategies, including hazard mapping, zoning, early warning systems, and community education (Van Alphen & Lodder, 2021).

In the Philippines, the National Disaster Risk Reduction and Management Act of 2010 (Republic Act No. 10121) requires all barangays to formulate a Barangay Disaster Risk Reduction and Management Plan (BDRRMP) aligned with municipal, city, and regional frameworks (World Bank, 2021). Alcayna et al. (2016) emphasize that effective planning must be participatory, evidence-based, and adequately funded, ensuring that risk assessments inform development priorities. This approach underscores that community involvement and multisectoral participation are central to sustainable and inclusive flood management.

However, persistent challenges remain. Lopez and Moreno (2024) note that in many localities, including Tugbungan, Zamboanga City, in particular, institutional fragmentation, limited technical expertise, and inconsistent budget allocation weaken the operationalization of flood management plans. These gaps highlight that flood risk management planning must extend beyond addressing physical hazards; it must also reinforce governance coordination, capacity development, and community engagement to build long-term resilience and support sustainable local development.

Flood Response and Preparation

At the community level, adaptation and participation play a vital role in reducing flood vulnerability and enhancing preparedness. Community-based adaptation (CBA) emphasizes the active involvement of local populations in identifying risks, developing adaptation measures, and managing flood responses based on indigenous knowledge and local priorities (Reid, 2016). Empirical studies in Southeast Asia demonstrate that communities implement a variety of local strategies, such as elevating homes, maintaining drainage systems, organizing local emergency committees, and developing early warning systems (Bhanye et al., 2025). These bottom-up initiatives build social capital and foster a sense of collective responsibility during disaster events (Allen et al., 2019).

The advantages of local adaptation include its contextual relevance, cost-effectiveness, and rapid implementation compared to externally imposed measures (Sovacool et al., 2018). Furthermore, it strengthens social networks and promotes local

ownership, ensuring that interventions are culturally and socially appropriate (Reid, 2016). However, several disadvantages and limitations are noted in the literature. Local adaptation strategies often lack scalability and technical precision, and without integration into broader governance systems, they may lead to fragmented or short-lived outcomes (Azhar et al., 2025). Inequalities in resources and capacity among households can also result in uneven adaptation, leaving the poorest sectors more exposed to risk (Spires et al., 2014). In some cases, local coping mechanisms can even produce maladaptive outcomes, such as when raised embankments shift floodwaters to neighboring areas (Bahadur et al., 2020). Therefore, while community involvement is essential for effective flood response and preparation, it must be complemented by institutional support, training, and continuous monitoring to ensure inclusiveness and long-term resilience.

Flood Governance Mechanisms

Flood governance encompasses the institutional frameworks, policies, and coordination mechanisms that define how decisions are made, implemented, and evaluated in managing flood risks. Mees et al. (2016) describe effective flood governance as multi-actor and multi-level, involving collaboration among government agencies, private sectors, and local communities. Adaptive governance—characterized by flexibility, learning, and stakeholder participation—is increasingly recognized as essential for dealing with climate-induced flood uncertainties (Folke et al., 2021). In the Philippines, the decentralization of disaster risk management through Republic Act No. 10121 empowers local governments, including barangays, to allocate funds and implement flood management programs (World Bank, 2021).

However, studies reveal persistent challenges in local flood governance, such as fragmented institutional roles, inadequate funding, and limited technical capacity (Lopez & Moreno, 2024). Political turnover and overlapping responsibilities among government offices also weaken policy implementation (Asian Development Bank, 2022). Nonetheless, best practices in various Philippine localities show that strong leadership, participatory mechanisms, and transparent fund utilization significantly enhance local flood resilience (Lebel et al., 2011). Moreover, governance systems that integrate scientific data with community knowledge—through participatory risk mapping and monitoring—achieve more inclusive and adaptive outcomes (Allen et al., 2019). The literature therefore supports the notion that an integrated governance model, combining effective planning, inclusive participation, and adaptive institutions, is vital for sustainable flood risk reduction in vulnerable communities like Barangay Tugbungan.

An integrated flood risk governance framework—blending top-down policy support and bottom-up community participation—is therefore imperative. Brown and Adger (2020) argue that multi-stakeholder collaboration combining government policy, technical innovation, and community-based adaptation best enhances flood resilience. This resonates with Sajor et al. (2019) and Ponce et al. (2020), who advocate aligning national policies with local realities through coordinated disaster risk reduction and climate adaptation planning. The findings of Atilano-Tang et al. (2025) and Marcos et al. (2024) reinforce this approach by demonstrating that localized governance reforms and participatory mechanisms are key to sustainable flood management in Zamboanga City.

The reviewed literature collectively underscores the importance of an integrated approach to flood risk governance that harmonizes planning, policy, and community-based adaptation. Flood management planning provides the technical and institutional foundation, while community adaptation ensures local relevance and participation. Governance mechanisms, meanwhile, bridge these dimensions by fostering coordination, accountability, and adaptability. However, existing research reveals gaps in linking these components into a cohesive framework at the barangay level. For Barangay Tugbungan, integrating flood risk management planning with community participation and responsive governance mechanisms can enhance resilience, equity, and institutional responsiveness. This integrated approach aligns with global and national priorities for disaster risk reduction and climate adaptation, offering a practical pathway toward sustainable flood resilience in Zamboanga City.

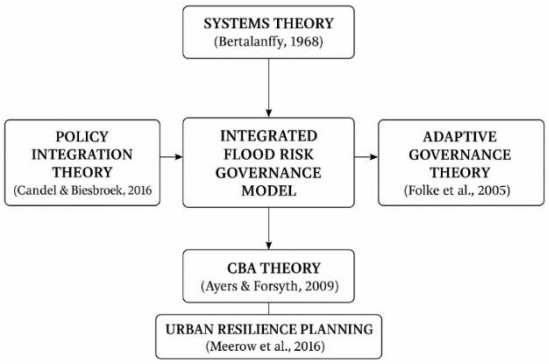
The reviewed literature collectively highlights that effective flood risk governance requires integration, participation, and sustainability. While the Philippines has established a robust legal framework for disaster governance, implementation at the local level—such as in Barangay Tugbungan—remains constrained by resource scarcity and weak coordination. Bridging these gaps demands inclusive governance structures, equitable resource allocation, and the institutionalization of community-based and ecosystem-based strategies. Building on the insights of Atilano-Tang et al. (2025) and Marcos et al. (2024), future research and practice should focus on strengthening local adaptive capacity through multi-level collaboration, continuous learning, and evidence-based policy innovation.

1.5 Theoretical Framework

The theoretical framework of this study is anchored in Systems Theory, Adaptive Governance Theory, and Community-Based Adaptation (CBA) Theory, integrating planning, policy, and community action into a unified flood risk governance model. Guided by Systems Theory (Bertalanffy, 1968), flood risk governance in Barangay Tugbungan is viewed as an interconnected system where institutional, policy, and community components must function cohesively to enhance resilience. Adaptive Governance Theory (Folke et al., 2005) provides the foundation for analyzing institutional responsiveness, flexibility, and collaboration across governance levels,

emphasizing learning and coordination in managing dynamic flood risks.

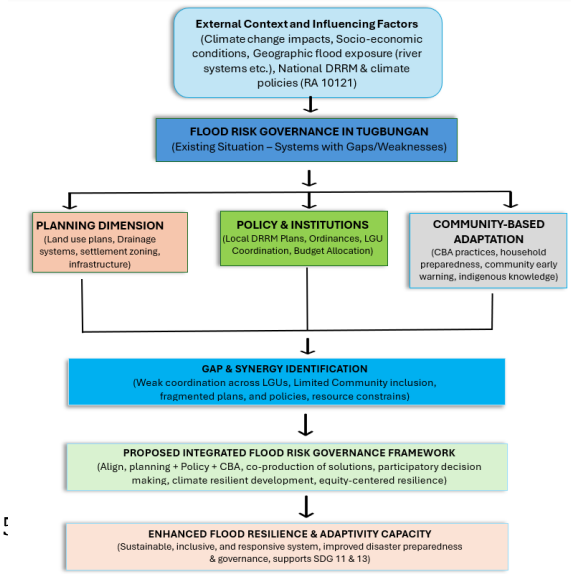
Figure 2
Integrated Theoretical Framework Model



Meanwhile, CBA Theory (Ayers & Forsyth, 2009) underscores the importance of local participation, knowledge sharing, and empowerment in building sustainable adaptation strategies at the grassroots level. Complemented by Policy Integration Theory (Candel & Biesbroek, 2016) and Urban Resilience Planning concepts (Meerow et al., 2016), the framework promotes coherence among planning instruments, policy mechanisms, and community practices. Collectively, these theories inform the design of an integrated flood risk governance model that strengthens resilience, equity, and institutional responsiveness, aligning with the Sustainable Development Goals (SDGs), particularly SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action).

1.6 Conceptual Design framework

Figure 3
An integrated approach to flood risk governance in Barangay Tugbungan,
Zamboanga City: Planning, Policy and Community-Based Adaptation
(Bello, R. A. Model, 2025)



The conceptual framework design illustrates a comprehensive and integrative approach to flood risk governance in Barangay Tugbungan, Zamboanga City, emphasizing the interaction between environmental, institutional, and community-based elements that shape local flood resilience. At its foundation, the framework acknowledges the external context and influencing factors, which include climate change impacts, socio-economic conditions, geographic flood exposure, and national policies such as Republic Act 10121 and the Philippine Disaster Risk Reduction and Management (DRRM) Framework. These external drivers define the contextual environment in which local governance systems operate, influencing both the vulnerability of communities and the effectiveness of flood management strategies. By situating local governance within these broader factors, the framework highlights the necessity of aligning local initiatives with national and global climate resilience agendas.

The second component focuses on the existing state of flood risk governance, which comprises three main dimensions: Planning, Policy and Institutions, and Community-Based Adaptation (CBA). The Planning Dimension addresses technical and structural measures, including land use planning, drainage system development, zoning regulations, and infrastructure management aimed at minimizing exposure to flood hazards. Policy and Institutional mechanisms involve the formulation and implementation of local DRRM plans, ordinances, inter-agency coordination, and budget allocation that define the administrative and regulatory capacity of local government units (LGUs). In parallel, Community-Based Adaptation underscores the participatory dimension of governance, recognizing the importance of local knowledge, household preparedness, early warning systems, and indigenous coping mechanisms as essential components of flood resilience. These three domains collectively reflect the multidimensional nature of flood risk governance but also reveal institutional fragmentation and uneven implementation across governance levels.

The third stage of the framework centers on gap and synergy identification, which exposes the systemic weaknesses and missed opportunities within the current governance structure. These include inadequate coordination among LGUs, limited community participation, fragmented planning processes, overlapping policies, and constrained financial and human resources. The identification of these gaps is essential for understanding why existing flood risk management efforts have limited impact and for formulating integrative strategies that promote cross-sectoral collaboration. This stage also underscores the need for harmonized institutional efforts that can bridge the divide between policy formulation and community-level implementation.

In response to these gaps, the framework proposes a Unified and Integrated Flood Risk Governance Framework, which seeks to align planning, policy, and community-based adaptation through collaborative,

participatory, and evidence-informed processes. This proposed model advocates for co-production of solutions, where stakeholders—government institutions, communities, and civil society organizations—jointly design and implement flood risk reduction measures. Such integration promotes climate-resilient development, encourages equity-centered resilience, and enhances decision-making transparency. By fostering synergy between top-down institutional structures and bottom-up community initiatives, the integrated model addresses both structural and social dimensions of vulnerability, thereby promoting sustainable and inclusive governance practices.

Ultimately, the framework envisions enhanced flood resilience and adaptive capacity, wherein local systems evolve into sustainable, inclusive, and responsive governance mechanisms capable of managing complex and dynamic flood risks. This outcome entails improved disaster preparedness, efficient resource management, and increased community empowerment in line with the Sustainable Development Goals (SDGs) 11 and 13, which emphasize sustainable urban development and climate action. The conceptual framework thus serves as both an analytical tool and a guiding model for designing flood risk governance systems that are adaptive, participatory, and equity-driven. It underscores the principle that resilience is not solely a product of infrastructure and policy, but of collaborative governance that integrates environmental realities, institutional capacities, and community strengths into a unified system of flood risk management.

2. RESEARCH METHODOLOGY

2.1 Research Design

This study uses a mixed-methods case study with an explanatory sequential design and participatory elements to examine flood risk governance. Quantitative data will identify patterns of exposure and vulnerability, while qualitative methods and triangulation capture governance processes and community perspectives, supporting the co-creation of practical adaptation strategies.

2.2 Research Locale

The study will be conducted in Barangay Tugbungan, Zamboanga City, focusing on local flood risk governance. It will examine areas most vulnerable to flooding, including existing planning measures, policy implementation, and community-based adaptation practices. The research aims to evaluate current strategies and identify opportunities to strengthen preparedness, resilience, and collaborative management of flood risks.

2.3 Data Sources and Respondents

The sampling design for this study is strategically structured to ensure that the data collected is representative, relevant, and sufficient to achieve the research objectives. Participants and data sources will be randomly selected for their direct relevance to flood exposure, community adaptation practices, and local governance processes in Barangay Tugbungan. This approach enables a comprehensive understanding of the factors influencing effective flood risk management and community resilience.

2.4 Target Population

The study population includes residents and institutional stakeholders of Barangay Tugbungan, Zamboanga City, with primary focus on households—specifically household heads or adult representatives—to assess exposure, vulnerability, and adaptation practices. Secondary participants comprise barangay officials (such as the captain, kagawads, and BDRRM officers), as well as school and health facility leaders and other community leaders involved in flood risk governance.

2.5 Research Instruments

The study employs the following research instruments:

a. Semi-Structured Interview Questions: These questions are designed to gather in-depth insights from key stakeholders regarding their experiences, perspectives, and suggestions related to flood risk management. It aim to explore how local planning, policies, and community-based adaptation practices influence resilience and response to flooding. The responses will help identify strengths, gaps, and opportunities for enhancing integrated flood risk governance in the community.

b. *Survey Questionnaire:* The survey questionnaire is organized into six parts to gather detailed information on flood risk governance in Barangay Tugbungan. It covers demographic profiles, flood exposure and preparedness, planning and preparedness dimensions, policy and governance implementation, and community-based adaptation, with a final section of open-ended questions for additional insights. This design ensures a comprehensive assessment of residents' perceptions, experiences, and engagement in local flood risk management.

2.6 Sampling Method

Random Sampling: Respondents were randomly selected to ensure a representative sample of households and key stakeholders in Barangay Tugbungan. This approach allows the study to capture diverse perspectives on flood exposure, preparedness, and community-based adaptation practices. By including a wide range of participants, the research aims to provide a comprehensive understanding of local flood risk governance and resilience strategies.

2.7 Sample Size

A sample of approximately 30 respondents will be randomly selected from Barangay Tugbungan, ensuring representation across different households and key stakeholders. This size is considered sufficient to capture variations in flood exposure, preparedness, and community-based adaptation practices. It allows the study

to explore the factors influencing effective flood risk governance and local resilience strategies.

2.8 Data Collection procedure

Surveys and Questionnaires: Structured questionnaires were administered to randomly selected residents in flood-prone areas of Barangay Tugbungan (particulary in Los Primos, Dagalea Compounad, Rojas compound all the way to Barigon-Zampen area) to gather data for the study on flood risk governance, planning, policy, and community-based adaptation.

Interviews: Semi-structured interviews were conducted with three selected residents to gain in-depth qualitative insights into the key factors influencing flood risk governance and the perceived effectiveness of local planning, policies, and community-based adaptation strategies.

2.9 Data Treatment and Analysis

The qualitative data collected from surveys and interviews are rigorously coded and subjected to thematic analysis. Each transcript is thoroughly examined, with codes systematically organized into key themes, providing a nuanced understanding of the factors shaping flood risk governance, policy effectiveness, and community-based adaptation in Barangay Tugbungan. Meanwhile, quantitative data from the survey questionnaires are analyzed using robust statistical techniques, including descriptive and inferential analyses, to reveal patterns, trends, and relationships that inform evidence-based planning, policy formulation, and strategies to strengthen local flood resilience.

2.10 Ethical Considerations

This study adheres to established ethical research standards to protect the rights, safety, and well-being of all participants. Participation in the study will be entirely voluntary, and participants will be fully informed about the purpose, objectives, and procedures of the research. They will also be made aware of their right to withdraw at any point without any negative consequences. Prior to data collection, informed consent will be obtained from all participants to ensure their understanding and agreement to participate.

Confidentiality and privacy will be strictly maintained throughout the study. Personal information and responses will be securely stored and anonymized in all reports, analyses, and publications. The researcher will ensure that no harm, coercion, or deception is involved during the research process, and participants' identities will not be disclosed without their explicit permission.

The researcher also ensures objectivity and transparency in conducting the study. Any potential conflicts of interest are declared nonexistent, and the findings will be presented honestly and accurately. Approval from the appropriate academic or institutional ethics review body will be sought prior to the commencement of data collection, ensuring that the study complies fully with ethical guidelines and standards.

2.11 Right to Withdraw

Participants retain the absolute right to withdraw from the study at any point, without the need to provide justification. Withdrawal will not entail any penalty, loss of benefits, or negative implications of any kind. Should a participant decide to discontinue, all data previously collected from them will be excluded from the analysis to preserve their confidentiality and autonomy. This provision safeguards the voluntary nature of participation and upholds the ethical principle of respect for individual rights.

2.12 Language Simplification (Tagalog)

To ensure full understanding among participants, some information, instructions (survey form), and consent forms will also be explained in Tagalog, using clear and simple language. This approach promotes inclusivity and comprehension, particularly for participants who may be less familiar with technical or academic English. The use of Tagalog ensures that participants clearly understand the study's purpose, procedures, and their rights—especially their right to decline or withdraw from participation at any time without negative consequences.

3. RESULTS AND DISCUSSIONS

The study surveyed a total of 30 respondents from Barangay Tugbungan, with the demographic profile revealing notable trends that may influence residents' perspectives on flooding and disaster preparedness. The largest age unit was 36 to 45 years, representing 30% of participants, while the smallest groups were 18 to 25 years and those above 56 years, each constituting 13.3% of the sample (please see graph below). Female respondents predominated, comprising 90% of the population, whereas males represented only 6.7%, and 3.3% preferred not to disclose their gender. Regarding civil status, half of the respondents were married (50%), 40% were single, 6.7% were widowed, and 3.3% were separated. Long-term residency was also prominent, with 66.7% of participants reporting residence in Tugbungan for 11 years or more, 20% for 6–10 years, and 13.3% for 1–5 years; no respondents reported residing in the area for less than one year. Collectively, these data indicate a survey population that is predominantly middle-aged, female, and married, which may have implications for their lived experiences and perceptions of flood risk.

Flood risk management planning and preparedness

The table 1 highlights that the responses indicate generally positive perceptions of flood risk management planning in Barangay Tugbungan, with residents showing moderate to high awareness of key preparedness measures. For the clarity of the barangay's disaster preparedness plan (Item 1), responses are mixed, with the largest group being neutral (30.00%), and positive responses (Agree + Strongly Agree = 43.30%) only slightly higher than the combined negative responses (Strongly Disagree + Disagree = 26.60%), suggesting that while many recognize a plan, a substantial portion are

uncertain or unconvinced. Evacuation routes (Item 2) are viewed more favorably, as the majority responded Agree (36.70%) or Strongly Agree (20.00%), indicating clear identification for most residents. However, regularity of flood drills (Item 3) appears weaker, with the highest proportion again being neutral (36.70%) and relatively low Strongly Agree (13.30%), implying that drills may be irregular or not widely noticed. In contrast, the presence of an early warning system (Item 4) is perceived positively, with the highest single response in Agree (40.00%) and limited strong disagreement (6.70%), reflecting reasonable confidence in early warning mechanisms. The strongest and most positive result overall is in residents' knowledge of designated evacuation centers (Item 5), where half Strongly Agree (50.00%) and an additional 26.70 Agree, making this the item with the highest positive response and indicating that awareness of evacuation centers is the clearest and most firmly established component of the barangay's flood preparedness framework.

Table 1
Resident Perceptions of Flood Preparedness Measures in Barangay Tugbungan
(N = 30)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Our barangay has a clear disaster preparedness plan	7 (23.30 %)	1 (3.30 %)	9 (30.00 %)	6 (20.00 %)	7 (23.30 %)
2. Evacuation routes are clearly identified in our community.	2 (6.70 %)	3 (10%)	8 (26.70 %)	11 (36.70 %)	6 (20.00 %)
3. Flood drills are conducted regularly.	3 (9.70 %)	6 (20.00 %)	11 (36.70 %)	6 (20.00 %)	4 (13.3 %)
4. There is an early warning system for floods.	2 (6.70 %)	6 (20.00 %)	7 (23.30 %)	12 (40.00 %)	3 (10%)
5. I know where the designated evacuation centers are.	2 (6.70 %)	0 (0%)	5 (16.70 %)	8 (26.70 %)	15 (50.00 %)

Flood Experience Community-Based Flood Adaptation and Preparedness

In assessing the level of community-based adaptation and household involvement in flood response, identifying the strengths and weaknesses of local cooperation and individual preparedness. The table 2 shows that the residents of Barangay Tugbungan report frequent flooding experiences, highlighting a critical need for enhanced community-based adaptation and household preparedness. Flooding occurs very often for 40% of respondents, often for 26.70%, and sometimes for 33.30%, indicating that the area faces recurrent flood events as a persistent environmental challenge rather than isolated incidents. Among the common causes (multiple responses allowed), river overflow dominates at 42.90%, followed by heavy rainfall (25%) and garbage clogging canals (14.30%), with poor drainage 17.90% underscoring natural factors like river dynamics as the primary driver alongside human-induced issues such as waste management and infrastructure deficits. Notably, every household (100%, n=30) has been affected by flooding in the last three years, revealing universal vulnerability and emphasizing the urgency for stronger local cooperation. These patterns point to strengths in community awareness of flood causes but expose weaknesses in adaptation measures, as high exposure rates without mitigation suggest limited individual and collective preparedness, calling for targeted interventions in drainage, waste control, and household resilience strategies.

Table 2
Residents Flood Experience in Barangay Tugbungan
(N = 30)

Flood Experience	F	%
How often does flooding occur in your area?		
Often	8	26.70
Sometimes	10	33.30
Very Often	12	40.00
What are the common causes of flooding in your area? (Check all that apply)		
Garbage Clogging canals	4	14.30
Heavy rainfall	7	25.00
Poor drainage	4	17.90
River overflow	12	42.90
Has your household been affected by flooding in the last 3 years?	30	100

Yes

On the other hand, table 3 presents residents' responses (N=30) to five statements on community-based flood adaptation and household preparedness, revealing a generally positive outlook with moderate levels of agreement across most items, though tempered by notable neutral responses indicating room for improvement. For statement 1 (residents' participation in preparedness activities), responses are evenly split (33.3% Agree/Neutral each, 10% Strongly Agree/Disagree), suggesting middling engagement. Stronger positivity emerges in statement 2 (community organizations' help: 36.7% Agree, 26.7% Strongly Agree—highest total positive at 63.4%), statement 3 (household plans: 30% Agree, 26.7% Strongly Agree—total positive 56.7%), and especially statement 4 (neighbors' help: 40% Agree, 23.3% Strongly Agree—total positive 63.3%, the overall peak). Statement 5 (volunteers' support) shows the weakest positivity (20% Agree, total positive only 20% with 43.3% Neutral and 30% Disagree), highlighting a key weakness in organized volunteer efforts. Collectively, positive responses prevail (averaging ~50-63% across items), affirming strengths in neighborly and organizational support while pinpointing weaknesses in proactive participation, household planning consistency, and volunteer capacity amid prevalent uncertainty.

Table 3
Residents Responses to Statements on Community-Based Flood Adaptation and Preparedness (*N* = 30)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Residents participate in disaster preparedness activities.	3 (10.00 %)	4 (13.30 %)	10 (33.30 %)	10 (33.30 %)	3 (10.00 %)
2. Community organizations help during floods.	1 (3.30 %)	2 (6.70 %)	8 (26.70 %)	11 (36.70 %)	8 (26.70 %)
3. Households have their own flood preparedness plans.	4 (13.30 %)	1 (3.30 %)	8 (26.70 %)	9 (30.00 %)	8 (26.70 %)
4. Neighbors help each other during floods.	2 (6.70 %)	3 (10.00 %)	6 (20.00 %)	12 (40.00 %)	7 (23.30 %)
5. Community volunteers support evacuation and relief.		2 (6.70 %)	9 (30.00 %)	13 (43.30 %)	6 (20.00 %)

Perceived effectiveness of current flood governance and policy implementation

Table 4 exemplifies that the responses indicate a generally positive perception of current flood governance and policy implementation, though with some reservations. For barangay flood disaster response policies, a majority of respondents agreed or strongly agreed (63.3%), suggesting that policies are perceived as clearly in place. For disaster fund utilization, opinions are more mixed, with 40% neutral and only a combined 40% agreeing or strongly agreeing, indicating uncertainty and only moderate confidence in proper use of funds. Coordination between the barangay and city DRRM is viewed quite favorably, with 66.7% agreeing or strongly agreeing, showing that inter-agency coordination is largely seen as effective. Assessments of flood control infrastructure maintenance are less positive and more divided: only 40% agreed or strongly agreed, while 33.3% disagreed or strongly disagreed and 26.7% remained neutral, pointing to concerns over the adequacy and consistency of maintenance. Policies on waste disposal are perceived more positively, with 43.3% agreeing or strongly agreeing and 33.3% neutral, suggesting that while many recognize their role in reducing flooding, a substantial portion of respondents are unconvinced or uncertain. Overall, the highest positive responses are seen in perceived clarity of barangay policies and effectiveness of DRRM coordination, whereas infrastructure maintenance and fund utilization attract more neutrality and skepticism.

Table 4
Residents Perceived Effectiveness of Flood Governance and Policy Implementation (n = 30)

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. There	2	5	4	12	7

are clear barangay policies for flood disaster response.	(6.70 %)	(16.70 %)	(13.30 %)	(40.00 %)	(23.30 %)
2. Disaster funds (e.g. 5% DRRM fund) are properly utilized.	2 (6.70 %)	4 (13.30 %)	12 (40.00 %)	7 (23.30 %)	5 (16.70 %)
3. Coordination between barangay and city DRRM is effective.	1 (3.30 %)		9 (30.00 %)	11 (36.70 %)	9 (30.00 %)
4. Flood control infrastructures (canals, drainage) are maintained.	3 (10.00 %)	7 (23.30 %)	8 (26.70 %)	6 (20.00 %)	6 (20.00 %)
5. Policies on waste disposal help reduce flooding.	3 (10.00 %)	4 (13.30 %)	10 (33.30 %)	4 (13.30 %)	9 (30.00 %)

Causes of flooding and challenges

The table 5 illustrates that flooding in Barangay Tugbungan is mostly caused by a combination of structural, environmental, and governance-related issues. Residents regularly cited inadequate drainage systems, damaged rip-rap, and insufficient flood-control equipment as the primary culprits, in addition to river overflow and obstructed waterways. These problems get worse when people don't throw away their trash properly and when it rains a lot, which makes already weak systems even weaker. In general, the results show that flooding is not simply a natural disaster, but also a result of poor maintenance of infrastructure, poor environmental management, and ineffective implementation of policies at the barangay level.

Table 5
Thematic Analysis of Qualitative Responses on Flood Governance

Research Area	Theme	Description	Sample Evidence from Responses
Causes of Flooding	Poor Drainage and Infrastructure	Flooding linked to clogged canals, substandard drainage, broken rip-rap, and lack of flood-control structures.	“Poor drainage system”; “Broken rip rap (Los Primos area)”; “No proper flood control system”
	River Overflow and Waterway Issues	Overflowing rivers, narrow canals, and rising water levels during heavy rain worsen flooding.	“River overflow”; “Water rises quickly”; “Maliit ang agusan ng tubig”
	Poor Waste Management	Garbage disposal problems and lack of discipline contribute to clogged waterways.	“Garbage clogging”; “Throwing garbage in the river”; “Poor garbage disposal”
	Heavy Rainfall	Natural factor that overwhelms weak infrastructure systems.	“Heavy rainfall causes flooding”; “Rain overwhelms drainage system”
Challenges During Floods	Delayed or Lack of Assistance	Residents report late, unequal, or absent distribution of relief goods (ayuda).	“No ayuda”; “Late response”; “Not all residents receive food packs”
	Economic and Property Loss	Floods damage appliances, homes, and disrupt livelihood	“Appliances damaged”; “House and valuables destroyed”; “Job delayed”

		s.	
	Health and Sanitation Risks	Exposure to dirty water, health threats, and stress during floods.	“Health risks”; “Contaminated water”; “Worries and stressful”
	Mobility and Evacuation Difficulties	Roads become impassable; evacuation becomes difficult.	“Difficult to evacuate”; “Muddy roads”; “Always go to barangay to evacuate”
Preparedness and Response Suggestions	Infrastructure Improvement	Calls for repairing rip-rap, improving drainage, roads, and widening waterways.	“Fix rip rap”; “Improve drainage”; “Widen river and canal”
	Regular Environmental Maintenance	Emphasis on routine canal cleaning, decloggin g, and river clean-up.	“Clean drainage every month”; “Regular cleaning of river”
	Faster and Fair Disaster Response	Need for quicker relief distributio n and better coordinati on.	“They are always late”; “Improve speed of giving relief goods”
	Community Education and Training	Need for disaster preparedn ess training, waste managem ent education, and first responder programs.	“Proper education/orient ation”; “Training for first responder”
Policy Improvement Suggestions	Governance and Accountability	Residents call for strict policy enforceme nt, budget transparen cy, and anti-corruption .	“Must have budget”; “Corruption not allowed”; “Strict policy”
	Equity in Aid Distributio n	Relief should prioritize most affected residents and be accessible.	“Ayuda should be distributed equally”; “Not only at barangay hall”
	Communic ation and Awareness	Disaster plans must be clearly communic ated to the communit y.	“Disaster plan should be communicated”; “Promote disaster awareness”
	Long-Term Resilience Planning	Investmen t in flood-resistant infrastruct ure and continuou s monitorin g.	“Invest in flood-resistant infrastructure”; “Regular maintenance”

Flooding in Barangay Tugbungan is driven by a combination of structural, environmental, and governance-related factors. Residents consistently identify inadequate drainage systems, damaged rip-rap, and insufficient flood-control equipment as key contributors, compounded by river overflow and obstructed waterways. These issues are exacerbated by improper waste disposal and heavy rainfall, which strain already fragile systems. Overall, the findings indicate that flooding is not merely a natural event but the result of insufficient infrastructure maintenance, poor environmental management, and ineffective policy implementation at the barangay level.

The challenges faced during flood events reveal significant gaps in disaster response and community protection. Delayed or uneven distribution of aid, damage to property and livelihoods, health and sanitation risks, and evacuation difficulties underscore both the vulnerability of residents and the limitations of existing governance mechanisms. Respondents’ recommendations highlight the need for an integrated approach that combines infrastructure upgrades, routine environmental maintenance, timely and equitable disaster response, and enhanced community education. These insights underscore the importance of strengthening accountability, improving communication, and implementing long-term resilience planning to achieve more effective, inclusive, and sustainable flood governance in Barangay Tugbungan.

The key informant interviews (please see table 6) reveal a distinct disparity between official flood planning and the lived realities of residents in the barangay. The barangay leadership outlined current initiatives, including preparedness systems, evacuation planning, drainage maintenance, and infrastructure projects, while acknowledging limitations such as insufficient funding and obstacles in information distribution. Conversely, other respondents highlighted that flood management is predominantly reactive, characterized by inadequate early warning systems, insufficient evacuation facilities, a deficiency in training and orientation, and uneven rule enforcement. They highlighted disparities in aid, noting that food distribution is limited to individuals within evacuation centers, leaving some trapped households without assistance. Notwithstanding these governance deficiencies, community cohesion persists, with neighbors aiding one another through food sharing, providing temporary shelter, and assisting with relocation to elevated areas. The findings indicate that although certain frameworks exist, more inclusive planning, robust policy execution, and improved community cooperation are essential for advancing flood risk governance.

Figure 4
Proposed Integrated Flood Governance Framework for Barangay Tugbungan

Proposed Integrated Flood Governance Framework

The diagram presents an Integrated Flood Governance Framework for Barangay Tugbungan centered on the core goal of enhancing community resilience and policy effectiveness. At the center of the model is the idea that effective flood governance can only be achieved when infrastructure systems, institutional response, community participation, and governance mechanisms function together rather than independently. The circular design of the framework emphasizes that flood resilience is a continuous and interconnected process, where each pillar reinforces the others.

The four surrounding pillars explain how this integration works. Resilient Infrastructure and Environmental Management addresses the physical causes of flooding by prioritizing drainage improvement, rip-rap repair, waterway maintenance, and waste management enforcement. Responsive and Equitable Disaster Management focuses on operational capacity, ensuring timely aid distribution, early warning systems, and effective evacuation planning. Community Empowerment and Capacity Building highlights the importance of educating residents, strengthening volunteerism, and building preparedness skills, recognizing the community as an active partner in resilience. Finally, Accountable and Aligned Governance emphasizes transparency, anti-corruption, policy enforcement, and community engagement to ensure that leadership actions are consistent with community needs.

Overall, the framework illustrates that flood resilience in Barangay Tugbungan is not achieved through infrastructure alone, but through the integration of governance, community action, and policy implementation, making disaster risk reduction both sustainable and inclusive.

4. CONCLUSION

This study concludes that flooding in Barangay Tugbungan is a persistent and multidimensional problem shaped not only by natural factors such as heavy rainfall and river overflow, but also by structural deficiencies, weak infrastructure maintenance, and governance challenges. While residents generally demonstrate moderate to high awareness of preparedness measures—particularly regarding evacuation centers, routes, and early warning systems—there remain clear gaps in the clarity of disaster plans, the regular conduct of flood drills, and the consistency of community participation. The community shows strengths in neighborly support and organizational assistance during flood events, yet weaknesses are evident in volunteer mobilization and proactive household preparedness, indicating that resilience is often informal rather than systematically organized.

Perceptions of flood governance and policy implementation are cautiously positive, especially in terms of the presence of barangay policies and coordination with the city DRRM. However, uncertainty surrounding disaster fund utilization and dissatisfaction with infrastructure maintenance highlight critical areas requiring greater transparency, accountability, and sustained investment. Qualitative findings further reinforce that flooding is worsened by inadequate drainage systems, damaged protective structures, and poor waste management, while challenges such as delayed aid, livelihood disruption, and health risks expose the limitations of current response mechanisms. Overall, the findings emphasize the need for an integrated and inclusive flood risk governance approach—one that strengthens infrastructure, ensures effective policy implementation, promotes equitable disaster response, and deepens community engagement—to build long-term resilience in Barangay Tugbungan.

5. POLICY RECOMMENDATIONS

The findings of this study highlight the urgent need to strengthen flood risk governance in Barangay Tugbungan

through more responsive policies and practical interventions. Effective flood management requires not only sound plans but also strong implementation, transparency, and active community involvement. Based on the results, several key policy directions and recommendations are proposed to improve disaster preparedness, reduce vulnerability, and enhance long-term resilience in the community, the following:

Strengthen Policy Implementation and Transparency: The barangay should enhance the implementation of existing disaster risk reduction policies by ensuring greater transparency in the utilization of the 5% BDRRM fund. Regular public reporting, community consultations, and the posting of budget allocations can improve accountability and build residents' trust. Clear communication of disaster preparedness plans must also be prioritized so that all households understand procedures before, during, and after flood events.

Improve Infrastructure and Environmental Management: Local government units should prioritize the repair and maintenance of drainage systems, canals, and damaged rip-rap structures, as these were consistently identified as major causes of flooding. Regular canal declogging, river clean-up drives, and stricter enforcement of waste management policies are necessary to reduce flood risks. Long-term investment in flood-resilient infrastructure should be incorporated into barangay and city development plans.

Enhance Community-Based Preparedness and Capacity Building: The barangay should conduct regular flood drills, disaster preparedness trainings, and first-aid workshops to strengthen household and community readiness. Organizing and supporting community volunteer groups can improve evacuation, relief distribution, and on-the-ground response during disasters. Schools, youth groups, and women's organizations can be actively engaged to broaden participation.

Strengthen Inter-Agency Coordination and Equitable Disaster Response: Coordination between the barangay and city DRRM offices should be further strengthened to ensure faster, fairer, and more inclusive distribution of aid. Relief systems must consider households that cannot immediately reach evacuation centers. Establishing clearer protocols for response, communication, and monitoring will help ensure that assistance reaches the most vulnerable residents.

These policy directions and recommendations emphasize the need for an integrated approach—combining good governance, strong infrastructure, and active community participation—to achieve more effective and sustainable flood risk governance in Barangay Tugbungan.

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