COLLABORATIVE GOVERNANCE IN URBAN FLOOD MITIGATION POLICY: ANALYSIS OF MULTI-ACTOR GOVERNANCE IN MALANG CITY

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Abstract

Flood mitigation in Malang City faces complex governance challenges involving cross-sectoral, cross-regional, and multi-actor dynamics, making a government-only approach insufficient. This study critically examines the practice of collaborative governance in flood mitigation policy, focusing on collaboration processes, actor capacity, and institutional design. Using a qualitative case study approach, the research applies Soft Systems Methodology (SSM) to capture the complexity of social and institutional relationships among stakeholders. Data were collected through in-depth interviews, participant observation, and policy document analysis involving local government, BPBD, relevant agencies, communities, academics, and the private sector. The findings reveal that collaboration remains largely symbolic and administrative, marked by the dominance of government actors, limited community participation, and the absence of facilitative leadership and deliberative mechanisms.

Keywords : Collaborative Governance, Flood Mitigation, Policy Disaster Governance, Malang City

1. Introduction

Urban flooding is a phenomenon increasingly evident in many cities worldwide, driven by various anthropogenic pressures and environmental changes. Rapid urbanization drives the conversion of green open spaces into built-up areas, thereby reducing water infiltration capacity and significantly increasing surface runoff, which in turn heightens the risk of surface flooding and waterlogging in urban areas. Urbanization and unplanned settlement growth have a direct impact on the degradation of natural drainage systems, making flooding a structural consequence of urban development that lacks adequate integration of hydrological functions (Ardiansyah & Ilyas, 2025). In this context, a comprehensive risk management approach is critical to reducing losses from urban flooding. The impacts of urban flooding are multidimensional, encompassing not only physical damage but also social, economic, and environmental aspects. Flood events can disrupt access to basic services such as clean water and transportation, result in economic losses, and worsen public health conditions due to environmental contamination and sanitation disruptions (Adger, W. N., Arnell, N. W., & Tompkins, 2005). In addition, flooding can weaken social structures by damaging housing and infrastructure and disrupting public service systems. In many cases, sectoral and technocratic mitigation strategies have proven to be less effective because they tend to focus solely on structural solutions, such as river normalization and the construction of drainage infrastructure, without adequately considering social interactions and broader cross-sectoral policy

frameworks in disaster risk management.

Flood mitigation is essentially part of a public policy framework that is cross-sectoral and multi-actor in nature, linking local governments, the private sector, civil society, and local communities in an effort to reduce disaster risk. In practice, flood mitigation policies often face coordination barriers among government agencies, both between the central and local levels and among local government organizations (LGOs) at the local level. Problems of policy fragmentation and overlapping authorities are frequently viewed as the root causes of the weak effectiveness of flood mitigation policy implementation (Newig, J., Challies, E., Jager, N. W., Kochskämper, E., & Adzersen, 2018). In addition, the limited participation of non-governmental actors and communities in decision-making processes results in mitigation policies that are often normative in nature and insufficiently responsive to local needs (Sukartara & Romadhona, 2024). This condition highlights the limitations of traditional technocratic sectoral approaches, which inadequately bridge the dynamics of inter-actor relationships and marginalize the role of communities within risk management systems.

In addressing the complexity of urban flooding, there has been a paradigm shift from traditional government, which positions the state as the sole actor, toward governance that emphasizes the involvement of multiple actors in the processes of decision-making, implementation, and evaluation of public policy (Helma Sofyta P, Wydha Mustika M, 2024). The collaborative governance approach represents an operational form of the governance paradigm, positioning government, communities, the private sector, and other stakeholders as partners in the synergistic management of disaster risk (Susilowati et al., 2025). This collaborative governance emphasizes formal and informal coordination mechanisms among actors, open dialogue, and shared commitment to flood mitigation goals, all of which can enhance the legitimacy, effectiveness, and sustainability of policies. The collaborative model requires the presence of network structures, trust building, shared understanding, and equitable access to authority and resources among participants, elements recognized as key indicators of successful collaborative governance in the context of disaster risk management (Herman et al., 2023)

Effective flood governance requires synergy among actors across different stages of the policy process. Within the realm of multi-actor governance, collaboration occurs not only between government and communities but also involves the private sector, academia, and non-governmental organizations, each with distinct roles and interests (Hurlbert & Gupta, 2023). The dynamics of power relations, resource capacities, and the interests of individual actors are critical aspects that must be considered in building collaborative governance. In many cases, imbalances in resources among actors become a major obstacle to effective collaborative implementation (Bryson, J. M., Crosby, B. C., & Stone, 2015). The risk of collaborative failure may arise when it is not supported by strong coordination mechanisms, when trust among participants is low, or when certain actors become dominant and hinder inclusive dialogue and decision-making processes. This situation illustrates that collaborative governance is not without challenges; rather, it demands a deep understanding of the social and political dynamics among actors in the context of urban flood risk mitigation.

As one of Indonesia's developing cities, Malang has experienced a significant increase in urbanization and population density. Local statistical data indicate annual population growth

and urban land expansion. This condition has led to growing pressure on drainage systems, changes in land use, and increased vulnerability to flood disasters, including both surface water inundation and river overflows in low-lying areas (Johan B.S, Andy Fefta W, Lely Indah M, 2024). In this context, flood risk management has become an important agenda in Malang's urban governance. Previous studies indicate collaboration among stakeholders in various Indonesian cities in flood management efforts, including initiatives involving local governments, community groups, and the private sector. However, their implementation continues to face challenges related to coordination and resource limitations. The actors involved in flood mitigation policy in Malang include the local government, the Regional Disaster Management Agency (BPBD), community groups in flood-prone areas, non-governmental organizations (NGOs), and the private sector participating through corporate social responsibility (CSR) programs (Suyeno & Sumartono, 2024). The involvement of these non-government actors increasingly highlights the importance of a multi-actor approach in developing flood mitigation strategies that are more responsive to local contexts.

Although flood mitigation policies and programs have been established in the City of Malang, various indications suggest that coordination and collaboration among actors have not yet functioned optimally. Descriptive studies in the context of local collaboration indicate that the roles and responsibilities of disaster management institutions are formally well-defined. Still, they have not adequately anticipated social dynamics or fully incorporated community participation. As a result, practices in the field do not yet fully reflect ideal collaborative principles (Huitema, D., 2009). The gap between formal policy and on-the-ground implementation, along with the limited space for community participation in policy formulation and decision-making, raises questions about the effectiveness of flood mitigation at the local level (Lassa, 2018). This situation calls for a more in-depth analysis of how collaborative governance can improve these conditions and how non-government actors can be involved in more systematic and sustainable collaborative mechanisms. (Ardiansyah & Ilyas, 2025)

Based on the discussion above, there is a need to examine flood mitigation not only from technical and infrastructural aspects, but also from a governance perspective that involves multiple actors and collaborative mechanisms. Research specifically analyzing the practices and dynamics of collaborative governance in urban flood mitigation, particularly in Malang City, remains very limited. This study is expected not only to enrich academic scholarship on collaborative governance in urban flood mitigation but also to provide more inclusive, adaptive, and sustainable policy recommendations for local policymakers. This approach may serve as an alternative mitigation strategy that is more holistic and responsive to the needs of local communities, as well as to the increasingly complex challenges of governmental governance.

2. Methods

This study employs a qualitative case study approach to analyze collaborative governance policies for flood management in Malang City. A qualitative approach is appropriate because it allows for an in-depth exploration of complex social phenomena, particularly governance processes that involve multiple actors, interests, and institutional arrangements (Creswell, 2014). The case study method is selected because it enables a comprehensive understanding of

real-life contexts in which the boundaries between the phenomenon and its setting are not clearly evident (Patton, 2015), making it suitable for examining flood management as a contextual and multi-dimensional governance issue. The Soft Systems Methodology (SSM) analytical framework is employed as the main analytical tool, as it is specifically designed to address complex, ill-structured problems involving human activity systems. SSM is widely used in public policy and governance research because it facilitates mapping diverse perspectives, power relations, and stakeholder interactions (Yin, 2018). In the context of collaborative governance, SSM helps to capture the dynamic relationships between government agencies, communities, and other actors, aligning with Ansell and Gash's (2008) view that collaborative governance involves iterative processes of communication, negotiation, and shared understanding.

The research is conducted in Malang City, East Java, with a focus on collaborative governance in addressing flood risk and management. This focus encompasses the roles of actors, coordination mechanisms, institutional arrangements, and challenges faced by government agencies, communities, and other relevant stakeholders. According to Emerson, Nabatchi, and Balogh (2012), effective collaborative governance depends on shared motivation, principled engagement, and joint capacity, all of which are critical dimensions explored in this study. Primary data were collected through in-depth interviews with key informants from the Regional Disaster Management Agency (BPBD), the Public Works Department, the Environmental Agency, community leaders, and academics. In-depth interviews are a common qualitative data collection technique that allows researchers to explore participants' experiences, perceptions, and interpretations in detail (Kvale & Brinkmann, 2009). This method is particularly relevant for governance research, as it captures subjective meanings and institutional perspectives that are often inaccessible through quantitative approaches. Participatory observation was also conducted to enhance contextual understanding and to observe interactions, coordination practices, and decision-making processes directly, thereby increasing data credibility through methodological triangulation (Patton, 2015).

Secondary data were obtained from official documents, including local regulations, policy documents, agency reports, and relevant academic articles. Document analysis is a valuable qualitative data source for understanding policy frameworks, institutional mandates, and historical developments (Bowen, 2009). The use of both primary and secondary data strengthens the validity of the findings through data triangulation, as recommended in qualitative research methodology (Miles, M. B., Huberman, A. M., & Saldaña, 2014). Data analysis was conducted using the stages of SSM, including problem situation exploration, rich picture development, root definition formulation, and conceptual model construction. This analytical process allows the study not only to describe existing conditions but also to interpret the underlying social, institutional, and structural relationships within the flood management system. By integrating empirical findings with conceptual models, SSM supports the formulation of relevant and actionable policy recommendations that are grounded in stakeholders' realities and aligned with practical governance needs (Checkland & Poulter, 2010).

3. Results and Discussion

a) The Phenomenon of Urban Flooding and Its Root Causes

The phenomenon of urban flooding is a direct consequence of anthropogenic pressures and environmental change, particularly rapid urbanization. Urbanization expands built-up areas and systematically reduces the land's capacity to absorb water (infiltration), thereby increasing surface runoff, which is the primary trigger of urban flooding. Land-use changes, especially the conversion of green open spaces into built-up areas, significantly contribute to the increased flood risk in many cities worldwide. For example, land-use change studies in Jakarta show a 30% increase in urban land accompanied by a 24% decline in vegetation cover, resulting in higher peak flood discharges and the expansion of high-risk flood areas. From a risk management perspective, urban flooding is also a manifestation of the unpreparedness of fragmented risk management systems. Numerous studies indicate that technocratic, structural strategies such as river normalization and the construction of drainage infrastructure are insufficiently effective without the integration of institutional and social approaches. Technical interventions often fail to account for social dimensions and multi-actor interactions in mitigation decision-making (Sørensen, E., & Torfing, 2009).

b) Risk Management Approach and Multi Stakeholder Collaboration

The disaster risk management framework emphasizes the need for a comprehensive approach that involves risk identification, assessment of community vulnerability, development of mitigation plans, implementation, monitoring, evaluation, and revision to enable continuous policy adaptation. Such an approach has been proposed in the literature as a more holistic strategy compared to purely technical solutions. In the context of disaster governance, the flood risk governance literature highlights the importance of collaborative mechanisms that create space for government actors, the private sector, communities, and academics to develop integrated, adaptive strategies (Imperial, 2005). his approach places responsibility beyond the governmental domain, incorporating non-governmental stakeholders into the planning and implementation of mitigation (Ishiwatari, 2019). Empirical studies in Lahat Regency confirm that collaborative models of flood mitigation tend to be effective when multiple actors are involved in identifying opportunities and constraints, strategic planning, and the implementation of joint actions (Lahat et al., 2025). The main barriers identified include limited resources, lack of coordination, and imbalanced stakeholder participation, all of which reduce the overall effectiveness of collaboration (Bodin, 2017).

c) Governance Theory and Collaboration in Risk Management

1) Governance Perspective

Governance theory underpins a paradigm shift from a hierarchical model of single, centralized government to collaborative governance that involves multiple stakeholders in decision-making and the implementation of public policy (Alexander, M., Priest, S., & Mees, 2016). Governance is understood as networked governance, which emphasizes coordination, trust-building among actors, and shared understanding to address

complex issues such as urban flooding. In the context of flood risk management, the governance approach accommodates both structural factors (such as institutions and regulations) and non-structural factors (including participation and inter-actor relationships), thereby strengthening the legitimacy and sustainability of mitigation policies (Folke, C., 2005). This theory also positions community participation as a key element in enhancing adaptation and disaster mitigation responses. (Donahue & Zeckhauser, 2011)

2) Soft Systems Methodology (SSM) for Understanding Collaborative Practices

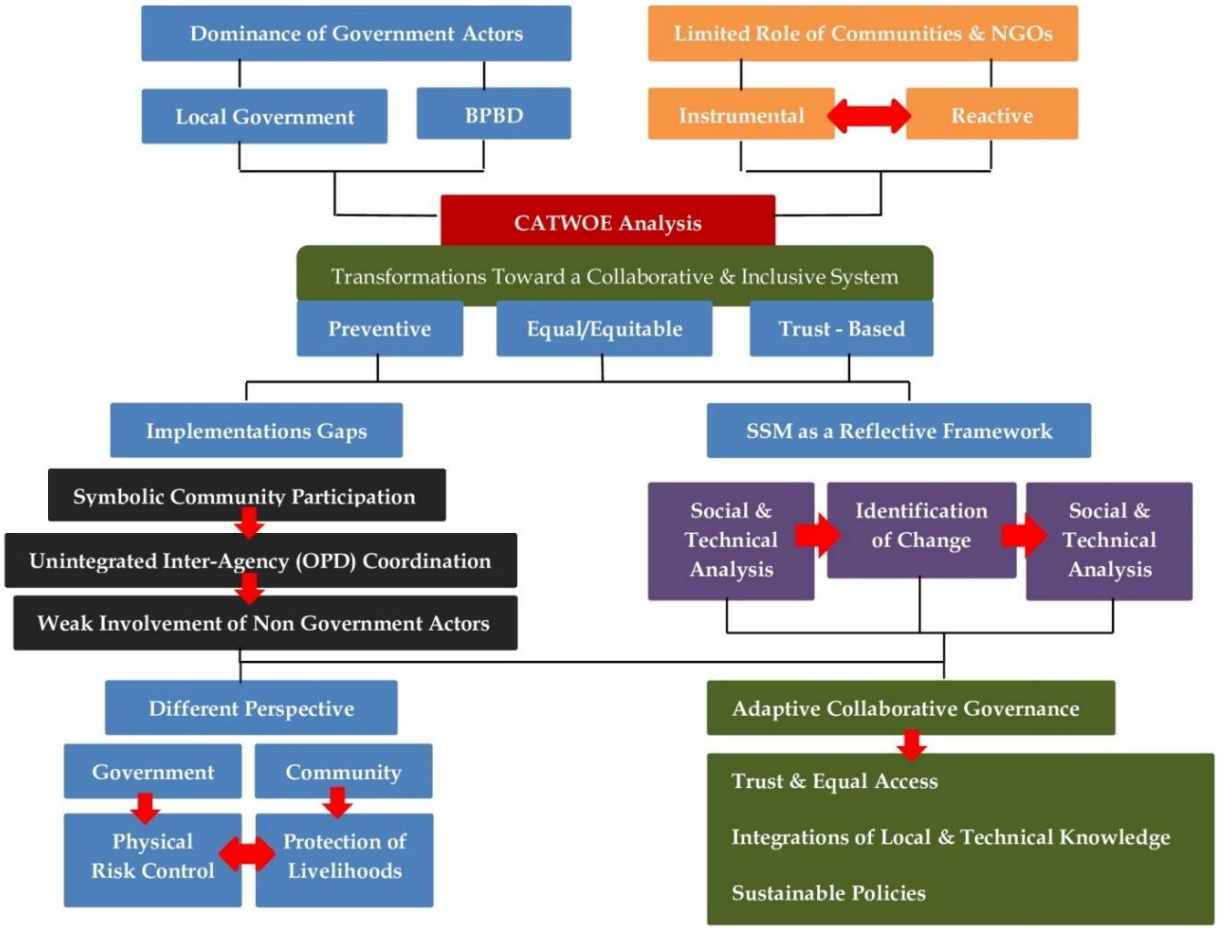
Urban flooding is a complex problem (a wicked problem) that cannot be explained or resolved solely through technical hydrological approaches. In line with urban political ecology and risk society theory (Beck, 1992), urban flooding results from interactions among changes in the physical environment and social, institutional, and public policy dynamics. Numerous studies show that rapid urbanization and land-use change increase surface runoff while weakening natural drainage systems, thereby heightening the risk of waterlogging and flooding (Tim et al., 2015).

In this context, the failure of sectoral technocratic approaches strengthens the case for a collaborative governance paradigm. Collaborative governance theory (Ansell & Gash, 2008) emphasizes that the effectiveness of public policy in complex situations depends on multi-actor involvement, sustained dialogue, and the development of shared understanding. However, empirical research in many developing cities indicates that collaboration is often constrained by institutional fragmentation, resource asymmetries, and low levels of community participation (Jonas et al., 2016). Soft Systems Methodology (SSM) offers an analytical framework that is well-suited to understanding this complexity. SSM views flood mitigation policy not as a closed technical system, but as a human activity system characterized by differing perceptions, interests, and power relations (Checkland & Poulter, 2010). Through the stages of SSM from unstructured problem situations and rich pictures to root definitions and conceptual models, research can reveal gaps between formal policy and on-the-ground practice.

3) The Malang City Case : Collaborative Dynamics and Their Challenges

The City of Malang, as a developing city facing pressures from urbanization and development demand, exhibits clear dynamics of urban flooding. Local empirical studies find that actors collaborate in addressing potential flooding, particularly through the roles of the Regional Disaster Management Agency (BPBD) and surrounding communities. Still, these dynamics are not yet optimal, even though duties and responsibilities are formally defined. Obstacles include, for example, limited community participation at the policy formulation stage and implementation that tends to be normative, lacking strong social adaptation. Another study in areas around Bandung shows that effective, sustainable flood management requires the simultaneous involvement of all stakeholders, supported by systematic collaboration systems and strong institutional network behavior. Synergy and shared commitment among actors are key determinants of the effectiveness of long-term mitigation strategies (Head, 2008). The theoretical implication is that collaboration involves not only formal relationships but also informal mechanisms such as face-to-face communication, shared

commitment, and the adaptation of actors' roles in managing flood risks. Values such as trust and coordination quality are significant determinants in enhancing the effectiveness of cross-sectoral mitigation. The following is an illustrative image of the challenges of flood mitigation in Malang City:



Picture 1. An Illustrative of The Challenges Flood Mitigation In Malang City
Source : Processed by Author, 2026

In the context of Malang City, the findings indicate that although the institutional structure for flood mitigation has been formally established, relationships among actors do not yet fully reflect collaborative principles. SSM analysis suggests that local government and the Regional Disaster Management Agency (BPBD) remain dominant actors. In contrast, the roles of local communities and non-governmental actors tend to be instrumental and reactive. This condition aligns with previous studies showing that state dominance in collaborative arrangements often hinders the development of trust and shared learning (Benson et al., 2013). Root definition analysis using the CATWOE framework shows that flood mitigation should ideally be understood as a transformation from a sectoral, reactive management system to a collaborative, preventive, and inclusive system. The worldview underlying this transformation emphasizes that sustainable flood risk reduction can only be achieved through multi-actor collaboration, grounded in trust, equitable access to resources, and the integration of technical and local knowledge. This perspective aligns with collaborative governance theory, which positions dialogue, shared commitment, and social learning as prerequisites for

successful public policy (Emerson et al., 2012).

Picture 2. Challenge of Cross-Actor Collaborations
Source: Synthesis of Flood Management Result, 2026

The comparative analysis of the Soft Systems Methodology (SSM) conceptual model and existing flood mitigation practices in Malang City reveals a persistent, structural discrepancy between formal policy design and practical implementation. Although an institutional framework for disaster risk reduction and flood mitigation has been formally established through regulations, organizational arrangements, and strategic planning instruments, its operationalization remains fragmented and uneven. Mechanisms intended to facilitate cross-actor collaboration, such as coordination among local government agencies (OPD), structured engagement with non-governmental organizations, academic institutions, and the private sector, and meaningful community participation, have not been fully institutionalized. Consequently, flood mitigation initiatives tend to be implemented in sectoral silos, characterized by limited information sharing, weak accountability mechanisms, and overlapping mandates. Community participation, despite being emphasized in policy rhetoric, remains largely symbolic and procedural rather than substantive and empowering (Mees, H. L. P., 2016). These findings suggest that persistent flood risks in Malang City cannot be explained solely by limitations in physical infrastructure or technical capacity, but are also deeply embedded in governance deficiencies, institutional fragmentation, and weak inter-actor relations. Within this context, Soft Systems Methodology serves as a critical, reflective, and analytical framework that bridges conventional technical approaches to flood mitigation with collaborative governance perspectives. Unlike linear and technocratic planning models, SSM explicitly acknowledges the complexity, uncertainty, and contested nature of urban flood risk management.

Table 1. Characteristics of Respondents and Key Stakeholders

Stakeholder Group	Number of Respondents	Percentage (%)
Municipal government agencies (OPD)	18	40,0
Sub-district and village	7	15,6

Stakeholder Group	Number of Respondents	Percentage (%)
authorities		
Flood-affected community members	12	26,7
NGOs / environmental community groups	5	11,1
Academics / experts	3	6,6
Total	45	100

Source : Compilations of Representing Major Stakeholder Groups Engaged In Flood Mitigation Governance in Malang City, 2026

The table shows the characteristics of respondents and stakeholders involved in flood mitigation governance in Malang City in 2026, with a total of 45 respondents (100%). The largest group of respondents came from city government agencies (OPD), with 18 respondents (40.0%). This indicates the dominant role of local government in flood mitigation. Furthermore, 12 respondents (26.7%) were from flood-affected communities. This percentage indicates the significant involvement of groups directly affected by the floods, ensuring their perspectives were adequately represented in the study.

Sub-district government groups comprised 7 respondents (15.6%). Their involvement is crucial as they act as a liaison between the city government and the community. Meanwhile, NGOs/environmental communities represented 5 respondents (11.1%), reflecting the participation of civil society organizations in supporting mitigation and environmental management efforts. The fewest respondents were from academics/experts, with 3 respondents (6.6%). Despite their small size, this group has the potential to contribute in the form of scientific studies and technical recommendations.

Overall, the distribution of respondents shows a predominance of the government sector, followed by affected communities, with additional participation from lower-level government, NGOs, and academics. This indicates a collaborative approach to flood mitigation governance, although the government remains the dominant role.

Table 2.
Compilations of Average Scores Were Calculated for Each Dimension of Collaborative Governance

Collaboration Dimension	Mean Score	Interpretation
Coordination among municipal agencies	2.6	Low
Community involvement	2.3	Low
Involvement of non-government actors	2.2	Low
Information and data sharing	2.8	Low–Moderate
Clarity of roles and responsibilities	30	Moderate
Overall average	2.56	Low

Source : Processed by Author, 2026

In the case of Malang City, the application of SSM enables the identification of changes that are not only technically viable, such as improvements in drainage systems, river

management, and early warning mechanisms, but also socially feasible and politically acceptable within the existing governance environment. By systematically incorporating stakeholder perspectives, power relations, and institutional constraints, SSM grounds policy recommendations in local socio-political realities rather than abstract or idealized policy assumptions. Theoretically, this approach advances flood mitigation scholarship by integrating systems thinking with collaborative governance theory. Empirically, it provides a robust analytical foundation for formulating flood mitigation policies that are more inclusive, adaptive, and sustainable at the local level. Furthermore, the application of SSM facilitates a more rigorous and systematic identification of divergent worldviews (Weltanschauung) among key stakeholders concerning the meaning, scope, and objectives of flood mitigation. Government institutions at both municipal and sub-municipal levels tend to conceptualize flood mitigation primarily as a technical and physical intervention. From this perspective, flooding is framed as an engineering problem to be managed through infrastructure development, regulatory instruments, spatial planning controls, and standardized operational procedures (Bixler, R. P., 2018). Policy effectiveness is often assessed through measurable physical outputs, such as the length of drainage networks constructed, the number of retention facilities developed, or improvements in floodwater conveyance capacity (Pahl-Wostl, 2009). In contrast, local communities, particularly those residing in flood-prone areas, tend to interpret flood mitigation as a broader socio-economic and livelihood-oriented process. For these communities, flood mitigation is closely associated with housing security, income stability, access to basic services, and the capacity to cope with and recover from recurrent flood events.

Tabel 3. Differences in Weltanschauung Among Actors Were Identified Through The Classification of Dominant Perceptions Regarding Flood Mitigation Priorities

Primary Focus of Flood Mitigation	**Percentage (%)**
Technical and infrastructural measures	76
Regulatory and enforcement mechanisms	16
Community empowerment	12
Government Actors (n = 25)	
Primary Focus of Flood Mitigation	**Percentage (%)**
Technical and infrastructural measures	76
Regulatory and enforcement mechanisms	16
Community empowerment	12
Community Members and Non-Government Actors (n = 20)	

Source: The Results Reveal a Perception Gap of Approximately 44% Between Government and Non Government Actors Regarding The Primary Objectives of Flood Mitigation, 2026

This divergence in perspectives reflects not only differences in institutional mandates and professional rationalities but also asymmetries in lived experience, vulnerability, and exposure to flood risks. While government agencies often operate within long-term planning horizons and regulatory frameworks, affected communities prioritize immediate risk reduction measures and everyday resilience strategies that directly influence their well-being. The lack of alignment between these worldviews substantially undermines the effectiveness

of collaborative flood mitigation policies, as shared problem definitions, mutual trust, and sustained stakeholder cooperation remain limited (Driessen, P. P. J., Dieperink, C., van Laerhoven, F., Runhaar, H. A. C., & Vermeulen, 2012). In this regard, SSM serves as a critical facilitative tool that promotes structured dialogue, mutual learning, and negotiation among actors with diverse and often conflicting perspectives. By encouraging stakeholders to articulate and reflect on their underlying assumptions, values, and expectations, SSM makes implicit conflicts explicit and identifies potential areas of convergence. This process enables the formulation of interventions that are systemically desirable from a technical and organizational standpoint, while remaining culturally feasible and socially legitimate within the local context (Lely Indah M, Mochammad Zainal M, 2024). Rather than privileging a single dominant perspective, SSM supports the co-production of flood mitigation strategies that balance technical efficiency with social acceptability. Both theoretical insights and empirical evidence presented in this study confirm that effective urban flood mitigation cannot be achieved through top-down, technocratic approaches alone. Instead, it requires adaptive, inclusive, and participatory governance arrangements capable of addressing the complex, multidimensional nature of urban flood risk.

Tabel 4. Level of Community Participation Across Flood Mitigation Stages

Flood Mitigation Stage	Active Participation (%)
Problem identification	41
Program planning	27
Implementation	33
Monitoring and evaluation	18

Source: Community Participation Was Assessed Across Four Key Stages of Flood Mitigation Policy and Program Implementation, 2026

The average level of meaningful community participation was 29.8%, indicating that participation largely remains tokenistic rather than substantive. By integrating principles of collaborative governance with Soft Systems Methodology, this study helps bridge the persistent divide between the technical and social dimensions of flood risk management. At the same time, it enhances the institutional learning processes and adaptive capacities of local actors involved in flood mitigation. Ultimately, this integrated analytical and governance approach holds significant potential for generating more inclusive, context-sensitive, and sustainable flood mitigation policies, particularly in rapidly urbanizing cities in developing countries such as Malang. The findings of this study indicate that the interaction among government institutions, community organizations, and non-governmental actors strongly shapes flood mitigation in Malang City. Local government agencies, particularly the Malang City Disaster Management Agency (BPBD Kota Malang), play a central coordinating role in structural and non-structural mitigation efforts. These include river normalization, drainage maintenance, early warning dissemination, and disaster preparedness training. This result aligns with Indonesia's disaster management framework, which emphasizes decentralization and local government responsibility in disaster risk reduction (Law No. 24/2007).

At the community level, neighborhood associations (RT/RW), *kelurahan* officials, and

community-based disaster preparedness groups (*Kelompok Siaga Bencana* / KSB) contribute significantly to flood mitigation through participatory actions. These actors are involved in routine river cleaning, waste management initiatives, and community-based early warning systems. The active involvement of these local actors supports previous studies on community-based disaster risk reduction (CBDRR), which highlight that local knowledge and social capital enhance adaptive capacity and response effectiveness, particularly in urban flood-prone areas. Non-governmental organizations (NGOs) and local universities in Malang also play an important supporting role by providing technical assistance, environmental education, and risk mapping. Their involvement strengthens collaboration between communities and government institutions, especially in awareness-raising and capacity-building programs. This multi-actor collaboration reflects a governance-based approach to disaster risk reduction, where mitigation outcomes improve when responsibilities are shared among stakeholders rather than centralized.

However, the results also reveal challenges in coordination and sustainability. Limited funding, uneven community participation, and weak enforcement of spatial planning regulations reduce the effectiveness of mitigation efforts. Similar issues have been identified in other Indonesian cities, where rapid urbanization and land-use change exacerbate flood risk despite local mitigation initiatives. Therefore, strengthening institutional coordination and long-term community engagement remains critical for improving flood resilience in Malang City. Overall, the results demonstrate that local actors are essential to flood mitigation in Malang City, particularly in implementing context-specific and participatory measures. Enhancing collaboration, institutional support, and community empowerment can further optimize the role of these actors in reducing flood risk.

Tabel 5. Perceived Effectiveness of Technical Flood Mitigation Approaches

Perceived Effectiveness	Percentage (%)
Very effective	9
Moderately effective	31
Less effective	44
Not effective	16

Source : Respondents Were Asked to Evaluate The Effectiveness of Existing Technical and Infrastructural Flood Mitigation Measures, 2026

Overall, 60% of respondents perceived technical approaches as less effective or ineffective, underscoring the need for more integrative and collaborative governance. By aligning technical interventions with local socio-political realities and governance capacities, urban flood mitigation efforts can move beyond reactive and fragmented responses toward more resilient, adaptive, and transformative flood risk management strategies. This divergence in perspectives reflects not only differences in institutional mandates and professional rationalities but also asymmetries in lived experience, vulnerability, and exposure to flood risks.

a) Transformative Flood Risk Management in Malang City

The results of this study indicate that a complex interaction of hydrological, spatial, institutional, and socio-economic factors shapes flood risk in Malang City.

While conventional flood management approaches such as river normalization, drainage improvement, and embankment construction have contributed to localized risk reduction, the findings suggest that these measures alone are insufficient to address the increasing frequency and intensity of flooding experienced in the city. This reinforces the need for a shift toward transformative flood risk management strategies that move beyond structural solutions and incremental adaptation.

b) Limitations of Conventional Flood Management Approaches

The results reveal that existing flood mitigation efforts in Malang City remain largely reactive and infrastructure-focused. Structural measures have reduced flood depths in certain areas but have simultaneously transferred risk downstream and failed to address upstream land-use change, informal settlements along riverbanks, and inadequate maintenance of drainage systems. This aligns with broader findings in urban flood management literature, which emphasize that structural defenses can create a false sense of security and may increase long-term vulnerability when not integrated with spatial planning and governance reforms. Furthermore, the persistence of flooding in high-risk sub-districts indicates that current approaches do not sufficiently account for climate variability and future urban growth. The findings highlight a gap between flood risk reduction planning and actual urban development practices, particularly in areas where enforcement of zoning regulations is weak.

c) Evidence Supporting a Transformative Approach

The results demonstrate that transformative flood risk management characterized by systemic change in governance, planning, and community engagement offers greater potential for long-term resilience in Malang City. The identified strategies, such as integrating flood risk considerations into land-use planning, restoring natural river functions, and enhancing community-based early warning systems, represent a shift from controlling floods to living with water. Notably, the findings suggest that non-structural measures, including risk awareness programs, participatory planning, and institutional coordination, have a significant influence on reducing vulnerability. Areas where community participation and local knowledge were incorporated into flood management planning showed improved preparedness and faster recovery following flood events. This underscores the importance of social and institutional transformation alongside physical interventions.

d) Governance and Institutional Transformation

A key result of the study is the identification of fragmented governance as a major barrier to effective flood risk management in Malang City. Responsibilities for water management, spatial planning, and disaster risk reduction are distributed across multiple agencies, often with limited coordination. Transformative strategies that promote cross-sectoral collaboration and data sharing were found to enhance decision-making and implementation effectiveness. The results also highlight the need for stronger alignment between local government policies and national disaster risk reduction frameworks. Institutional learning, adaptive management, and long-term planning horizons are critical components of transformation, enabling authorities to respond flexibly to evolving flood risks under climate change.

Implications for Urban Resilience and Sustainability. The findings suggest that transformative flood risk management can contribute not only to reduced flood losses but also to broader urban sustainability goals in Malang City. Nature-based solutions, such as riparian buffer restoration and increased urban green spaces, were shown to provide co-benefits, including improved water quality, enhanced biodiversity, and reduced urban heat. These outcomes support the integration of flood risk management into sustainable urban development strategies. Overall, the results indicate that achieving flood resilience in Malang City requires a paradigm shift from short-term, project-based interventions toward a holistic, adaptive, and participatory flood risk management framework. Transformative strategies offer a pathway to address root causes of vulnerability and build long-term resilience in the face of climate change and rapid urbanization. While government agencies often operate within long-term planning horizons and regulatory frameworks, affected communities prioritize immediate risk reduction measures and everyday resilience strategies that directly influence their well-being.

Tabel 6. Perceived Contribution of Soft Systems Methodology (SSM)

Aspect Improved by SSM	Mean Score (1–5)
Shared understanding among stakeholders	4.2
Quality of inter-actor dialogue	4.0
Clarity of institutional roles	3.9
Social feasibility of policies	4.3
Political feasibility of policies	4.1

Source: Scores Indicate A Substantial Perceived Improvement (Approximately 60–70%), In Collaborative Capacity Compared To The Baseline Condition, 2026

The lack of alignment between these worldviews substantially undermines the effectiveness of collaborative flood mitigation policies, as shared problem definitions, mutual trust, and sustained stakeholder cooperation remain limited. In this regard, SSM serves as a critical facilitative tool that promotes structured dialogue, mutual learning, and negotiation among actors with diverse and often conflicting perspectives. Overall, the quantitative findings indicate that inter-actor collaboration in flood mitigation governance in Malang City remains low, with an average collaboration score of 2.56 on a five-point scale. Meaningful community participation is limited, averaging below 30% across the key stages of flood mitigation, particularly in planning and monitoring processes. A substantial perception gap of approximately 44% exists between government and non-government actors regarding the primary objectives of flood mitigation, reflecting divergent worldviews and priorities. In addition, 60% of respondents assessed existing technocratic and infrastructure-based flood mitigation approaches as less effective or ineffective in addressing recurrent flood risks. In contrast, the application of Soft Systems Methodology was perceived positively, with mean scores exceeding 4.0 across key dimensions, indicating its strong potential to enhance shared understanding, improve inter-actor dialogue, and increase the social and political feasibility of collaborative flood mitigation policies.

By encouraging stakeholders to articulate and reflect on their underlying assumptions,

values, and expectations, SSM makes implicit conflicts explicit and identifies potential areas of convergence. This process enables the formulation of interventions that are systemically desirable from a technical and organizational standpoint, while remaining culturally feasible and socially legitimate within the local context. Rather than privileging a single dominant perspective, SSM supports the co-production of flood mitigation strategies that balance technical efficiency with social acceptability. Both theoretical insights and empirical evidence presented in this study confirm that effective urban flood mitigation cannot be achieved through top-down, technocratic approaches alone. Instead, it requires adaptive, inclusive, and participatory governance arrangements capable of addressing the complex, multidimensional nature of urban flood risk. By integrating principles of collaborative governance with Soft Systems Methodology, this study helps bridge the persistent divide between the technical and social dimensions of flood risk management. At the same time, it enhances the institutional learning processes and adaptive capacities of local actors involved in flood mitigation. Ultimately, this integrated analytical and governance approach holds significant potential for generating more inclusive, context-sensitive, and sustainable flood mitigation policies, particularly in rapidly urbanizing cities in developing countries such as Malang. By aligning technical interventions with local socio-political realities and governance capacities, urban flood mitigation efforts can move beyond reactive and fragmented responses toward more resilient, adaptive, and transformative flood risk management strategies.

4. Conclusion

Urban flooding is a complex problem triggered by the interaction between changes in the physical environment resulting from rapid urbanization and weaknesses in disaster risk governance. Land use conversion and the reduction of green open spaces have increased surface runoff and heightened flood risk. At the same time, technocratic approaches, whether sectoral or structural in nature, have proven insufficient to address the problem effectively. Various studies indicate that failures in flood mitigation are not solely due to infrastructural limitations, but also to institutional fragmentation, low levels of coordination, and minimal participation and collaboration among actors.

In this context, the collaborative governance paradigm emerges as a relevant approach for addressing urban flooding as a wicked problem. The involvement of multiple actors, government, the private sector, communities, and academia through continuous dialogue, equitable role-sharing, and the integration of technical and local knowledge constitutes a prerequisite for effective and sustainable mitigation policies. Empirical findings from Malang City show that although an institutional framework for flood mitigation exists, collaborative practices remain weak, as reflected in the dominance of state actors, symbolic community participation, and the lack of institutionalized mechanisms for cross-actor collaboration. The application of Soft Systems Methodology (SSM) has proven effective in revealing gaps between formal policy design and the realities of on-the-ground implementation, as well as differences in actors' (Weltanschauung) perspectives on the objectives of flood mitigation. By viewing flood mitigation as a human activity system, SSM functions as a reflective framework that bridges technical and social dimensions and helps formulate changes that are not only systemically desirable but also socially and politically feasible. Thus, the integration of

collaborative governance and SSM makes both theoretical and practical contributions to the development of more inclusive, adaptive, and sustainable flood mitigation policies, particularly in developing cities such as Malang.

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