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Analysis of Flood Disaster Mitigation Through Spatial and Environmental Policies for Flood Management in Bekasi City, West Java

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Abstract:

This study aims to analyze the effectiveness of the implementation of spatial and environmental policies in flood mitigation in Bekasi City and identify the main supporting and inhibiting factors. The city of Bekasi as part of the Greater Jakarta metropolitan area faces an increased risk of flooding due to urbanization, land conversion, and weak spatial control. This study uses a descriptive qualitative approach with in-depth interview techniques and Focus Group Discussion (FGD) with stakeholders, including DLH, PUPR, BPBD, Bappeda, WALHI, and community representatives in flood-prone areas. Data analysis was carried out using NVivo software through open coding stages, thematic categorization, and frequency analysis to identify dominant issues based on Mazmanian and Sabatier policy implementation models. The results of the thematic analysis identified seven main themes, namely policies and regulations (85), institutional capacity (78), coordination and collaboration (82), resources and infrastructure (74), community participation (69), challenges and obstacles (62), and recommendations for improvement (88). The findings show that the main obstacles lie in weak regulatory enforcement, sub-optimal cross-sectoral coordination, and limited resources and technical capacity. This study concludes that effective flood mitigation requires strengthening collaborative governance, risk-based policy integration, and the development of green and blue infrastructure and integrated disaster information systems. This study makes a theoretical contribution to the study of public policy implementation and practical recommendations for strengthening urban resilience to flood risk.

Keywords: flood mitigation, policy implementation, spatial planning, collaborative governance, NVivo.

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Introduction

Floods are one of the most dominant hydrometeorological disasters in Indonesia's

urban areas. In the context of the Greater Jakarta metropolitan area, the intensity and frequency of flooding events show an increasing trend in line with urbanization pressures and changes in land use. Bekasi City, as an integral part of the urban system, has a high level of vulnerability due to the characteristics of lowland topography, population density, and its position as a downstream area of several watersheds (DAS) upstream in the Bogor and Depok areas.

Data from the National Disaster Management Agency (BNPB, 2025) shows that flood incidents in Bekasi City have increased significantly in the last five years, both in terms of frequency and area of inundation. The impact is not only in the form of damage to public infrastructure and settlements, but also macroeconomic losses, disruption of educational activities, and increased risk of environment-based diseases. Conceptually, this phenomenon reflects the low adaptive capacity of cities in dealing with hydrometeorological risks in the midst of climate change and urban expansion (UNDRR, 2023).

The Bekasi City Government has responded through a number of policy instruments, including the Regional Spatial Plan (RTRW) 2011–2031, the Regional Medium-Term Development Plan (RPJMD), and the Regional Environmental Action Plan (RAD-LH). However, the implementation of the policy is considered not optimal. The realization of Green Open Space (RTH) has only reached around 14% of the minimum target of 30% as mandated in Law Number 26 of 2007 concerning Spatial Planning. This condition shows that there is a gap between policy design and implementation gap, especially in controlling the conversion of land into residential and industrial areas.

Various previous studies have confirmed the existence of structural problems in flood mitigation in Bekasi City. The river normalization program has not been effective due to weak institutional coordination and budget limitations (Fathurrahman & Sulastri, 2020). Another opinion emphasized the importance of community participation in flood mitigation, but noted that disaster literacy among residents is still low (Nurhidayati & Rahmawati, 2021). This is because spatial planning policies in Bekasi are still sectoral and have not fully integrated the principles of disaster mitigation into development planning (Siregar & Lestari, 2022).

More recent studies confirm that the problem is not only technical, but also related to metropolitan governance. The overlap of authority between local governments in the Greater Jakarta area hinders the effectiveness of cross-regional flood control (Sudarmono & Hidayat, 2023). Failure to manage floods in Southeast Asian cities is generally caused by institutional fragmentation and weak horizontal and vertical coordination (UN Habitat, 2024).

Furthermore, Urban Flood Risk Management in Southeast Asia emphasizes that the success of flood mitigation is largely determined by the integration of spatial policies, institutional capacity building, technology-based risk information systems, and community participation (World Bank, 2023). Without a collaborative and risk-informed development planning approach, policies tend to be reactive and oriented towards handling emergencies, rather than long-term prevention.

These findings show that flood mitigation depends not only on technical and physical measures but also on the effectiveness of public policy implementation. The success of policy implementation is determined by the clarity of policy objectives, the availability of resources, communication between organizations, the disposition of implementers, and external support (Mazmanian & Sabatier, 1989). This framework is

relevant for analyzing flood mitigation policies in Bekasi City, which involves various actors and sectors with diverse interests. This research has two main objectives: first, to analyze the effectiveness of the implementation of spatial and environmental policies for flood mitigation in Bekasi City; and second, to identify the main supporting and inhibiting factors using NVivo-based thematic analysis. This study is expected to contribute theoretically to the field of public policy implementation and practically to strengthen urban flood mitigation policies in Indonesia.

Method

This study uses a descriptive qualitative approach to analyze the dynamics of public policy implementation in urban flood mitigation. Qualitative design was chosen to provide an in-depth understanding of the complex institutional and social processes that influence policy outcomes (Creswell, 2014).

Primary Data Sources and Collection Techniques were collected through in-depth interviews and focus group discussions (FGDs) with key stakeholders, including: Bekasi City Environment Agency (DLH), Department of Public Works and Spatial Planning (PUPR), Regional Disaster Management Agency (BPBD), Regional Development Planning Agency (Bappeda), Indonesian Forum for Environment (WALHI), and community representatives from flood-prone areas in East Bekasi, North Bekasi, and Pondok Gede.

Secondary data was obtained from related documents such as the Regional Spatial Plan (RTRW), the Regional Environmental Action Plan (RAD LH), the Medium-Term Regional Development Plan (RPJMD), as well as annual reports from the BPBD and the National Disaster Management Agency (BNPB).

The data was analyzed using the stages of data reduction, data display, and conclusion drawing (Miles, Huberman & Saldaña, 2014). All qualitative data from interviews and FGDs. The data analysis in this study uses the help of NVivo software to manage and organize qualitative data from in-depth interviews. The analysis process is carried out through open coding stages, thematic categorization, and grouping of inter-concept relationship patterns to identify key issues in the implementation of flood mitigation. NVivo is used to map the frequency of code occurrences, build a hierarchy of themes, and visualize the relationships between categories through matrix coding queries and word frequency analysis. This approach allows researchers to conduct analysis in a systematic, transparent, and structured manner, thereby increasing the validity of findings through data trail tracking (audit trail) and consistency of interpretation between themes.

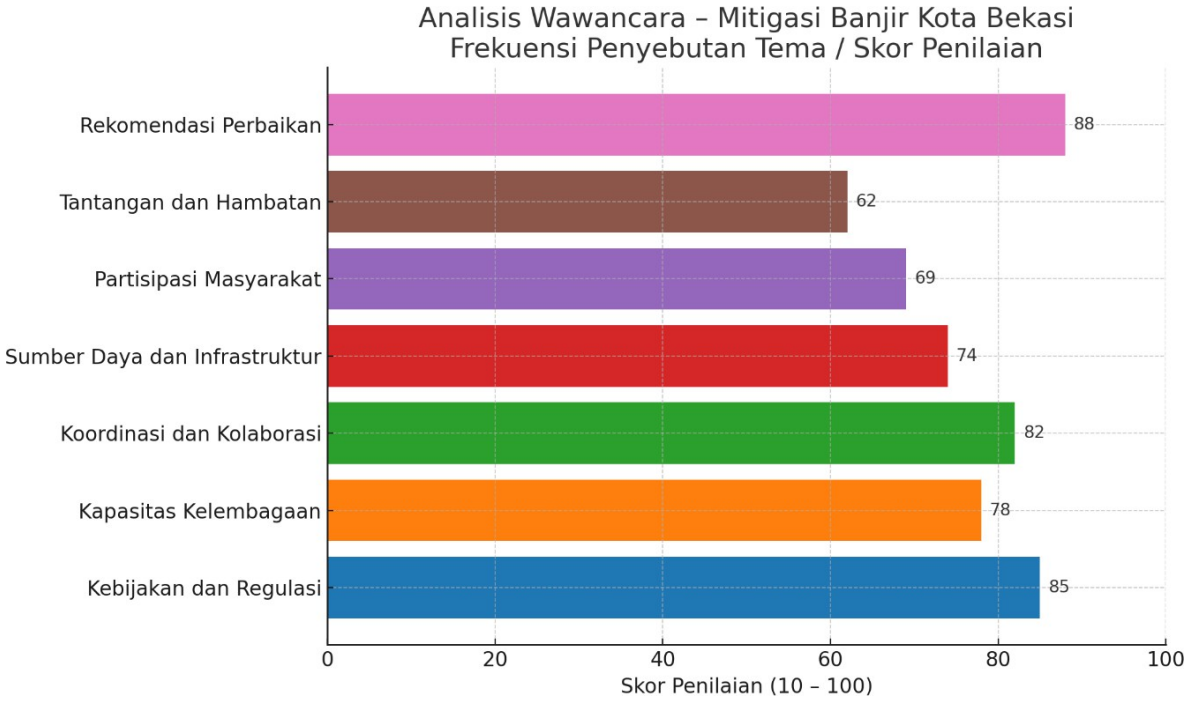
The thematic analysis was carried out based on the policy implementation model of Mazmanian and Sabatier (1989), which identified six determinants of successful implementation: clarity of policy objectives and content, availability of resources, inter-organizational communication, implementing disposition, characteristics of implementing agencies, and external environmental support.

Furthermore, in the data analysis using Nvivo, it is divided into 7 (seven) thematic areas, namely policies and regulations, institutional capacity, coordination and collaboration, resources and infrastructure, community participation, challenges and obstacles, and recommendations for improvement. Data validity is maintained through source triangulation, cross-verification between respondents, and member checking to ensure consistency between the researcher's interpretation and the participant's

perspective.

Result And Discussion

NVivo-based thematic analysis identified seven dominant themes that determine the effectiveness of the implementation of flood mitigation policies in Bekasi City. Each theme was evaluated using an urgency score ranging from 0-100, based on the frequency and depth of discussion in interviews and FGDs, as shown in Figure 1 below.



Gambar 1: Hasil Analisis Tematik NVivo untuk Mitigasi Banjir di Kota Bekasi
Sumber: Olah data Nvivo, 2026

Thematic Analysis: Policy and Regulation (Score 85)

The theme of policies and regulations obtained an urgency score of 85, showing that this aspect is a high priority in flood mitigation in Bekasi City. Normatively, the legal framework and regional planning documents are adequate and refer to national policies through the National Disaster Management Agency. However, its effectiveness is still hampered by weak spatial enforcement, inconsistency in the supervision of land use transfer, and coordination between OPDs that have not been integrated. Policy implementation tends to be reactive and not fully based on risk prevention. The success of flood mitigation is highly dependent on consistency and enforcement of the policy framework. Although local regulations such as the RTRW and RAD LH incorporate flood control principles, their implementation is often undermined by overlapping authorities and weak law enforcement.

Thus, such high scores reflect the gap between regulation and practice. Strengthening supervision, harmonization of authority, and shifting to a preventive approach are the keys to increasing the effectiveness of flood mitigation.

These findings are in line with the results of research by Siregar, M., & Lestari, N (Siregar & Lestari, 2022) entitled Spatial planning policy evaluation for flood control in Bekasi City, which found that spatial planning policies in Bekasi are still fragmented and less integrated with the disaster mitigation framework. Similarly, the research by Sudarmono, A., & Hidayat (Sudarmono & Hidayat, 2023) with the research title

Governance challenges in flood management in the Jabodetabek area noted that overlapping institutions and conflicting priorities among regional institutions in Greater Jakarta have created fragmented policy outcomes and reduced coordination efficiency.

Thematic Analysis: Institutional Capacity (Score 78)

The thematic institutional capacity obtained an urgency score of 78, which shows that institutional capacity in flood mitigation in Bekasi City is in the medium category, but still needs continuous strengthening. Structurally, institutional tools through the Regional Disaster Management Agency are available and some apparatus have basic disaster certification. This indicates that there is a sufficient organizational foundation.

However, the main challenge lies in the limitations of advanced technical competence, particularly in data-driven risk analysis, the use of early warning technologies, and the management of complex emergency coordination. Existing capacity is still dominant in the administrative aspects and emergency response response, not fully strong in the dimensions of preventive mitigation and risk-based planning.

The urgency score of 78 reflects that capacity building is not a crisis, but strategic and long-term. A periodic technical competency improvement program, the development of disaster specialist training, and the strengthening of the organizational *learning system* are needed so that institutions are able to adapt to the increasingly complex dynamics of flood risk.

Institutional capacity emerges as an important factor in determining the quality of policy implementation. Interviews reveal that most local government agencies face a shortage of personnel with adequate expertise in disaster risk reduction and spatial-based mitigation. Technical training and certification remain limited, resulting in an inconsistent understanding of policy mandates.

This supports the statement of Mazmanian, D. A., & Sabatier, P. A (Mazmanian & Sabatier, 1989) in *the research Implementation and public policy,* which states that the success of policies depends on the institutional capacity, communication, and commitment of implementers. Furthermore, it is also in line with Budiarto, A., & Wahyuni, E (Budiarto & Wahyuni, 2019) in their research Integrating disaster mitigation in urban spatial planning: Lessons from Bekasi and Tangerang, which observes that intersectoral coordination between technical departments in Bekasi and Tangerang is still limited, especially in harmonizing urban planning and flood control measures.

Data management and spatial mapping remain another obstacle. Hydrological maps and flood risks from DLH, BPBD, and PUPR are often inconsistent or outdated. This lack of an integrated data system leads to fragmented planning and slower emergency response operations.

Thematic Analysis: Coordination and Collaboration (Score 82)

The coordination and collaboration thematic obtained an urgency score of 82, which shows that this aspect is a strategic issue in the effectiveness of flood mitigation in Bekasi City. Structurally, a coordination mechanism across Regional Apparatus Organizations (OPD) has been available through coordination meeting forums, emergency command centers, and work networks with vertical agencies. However, the implementation has not been fully optimal.

The findings show that there are obstacles in the form of sectoral egos, overlapping authority, and less responsive communication flows in emergency situations. This condition causes slow information exchange, lack of synchronization of decision-making, and lack of real-time integrated disaster data. In the context of metropolitan areas connected to upstream areas such as Bogor and Depok, weak cross-regional coordination further complicates systemic flood control.

From a *collaborative governance perspective*, the effectiveness of disaster mitigation requires clarity of roles, integration of information systems, and coordinated leadership that is able to penetrate sectoral boundaries. The urgency score of 82 reflects

that although a formal coordination structure already exists, the quality of interaction and synergy between actors still needs to be strengthened.

Strengthening coordination and collaboration needs to be directed at the harmonization of authority, the development of technology-based integrated communication systems, and the strengthening of collaborative work culture between institutions. Without solid integration, risk mitigation policies remain fragmented and less effective in reducing flood risk in a sustainable manner.

Thematic Analysis: Resources and Infrastructure (Score 74)

The thematic of resources and infrastructure obtained an urgency score of 74, which shows that this aspect is at the level of medium-high importance in flood mitigation in Bekasi City. In general, budget support and basic infrastructure are available, but they are still insufficient to address the increasing complexity of urban flood risk.

Limited funding is a major obstacle, especially since budget allocations are more focused on handling emergency response than preventive mitigation efforts and long-term risk reduction. This condition indicates that the *risk-based budgeting approach* in regional planning is not optimal. As a result, the development of flood control infrastructure, such as integrated drainage systems, retention ponds, and normalization of waterways, has not been fully integrated within the framework of sustainable development.

In addition, the use of disaster technologies, such as CCTV-based monitoring systems and early warning devices, is still partial and not yet connected in one integrated information system. These integration weaknesses have an impact on delays in early detection and less than optimal data-driven responses.

The urgency score of 74 reflects that strengthening resources and infrastructure is not at crisis level, but remains strategic to be improved. Increased investment in prevention-based mitigation, integration of disaster information technology, and infrastructure planning that is adaptive to climate change is needed so that flood mitigation systems become more effective and sustainable.

The success of the river normalization project in Bekasi depends on a consistent technology monitoring system and data sharing (Fathurrahman & Sulastri, 2020). To improve sustainability, the study recommends prioritizing green-blue infrastructure, an approach that integrates ecological water systems and urban green spaces to improve water uptake, reduce surface runoff, and strengthen the resilience of urban ecosystems.

Thematic Analysis: Community Participation (Score 69)

The thematic community participation obtained an urgency score of 69, which shows that public involvement in flood mitigation in Bekasi City is in the category of adequate, but not optimal. The local government has initiated participatory programs such as Disaster Preparedness Village (KELANA) and Disaster Resilient Village (KATANA) which aim to strengthen community-based preparedness. This program reflects a commitment to *a community-based disaster risk reduction* approach.

However, the effectiveness of participation is still limited by low literacy of community disasters. The low level of disaster literacy among Bekasi residents hinders early prevention measures (Nurhidayati & Rahmawati, 2021). Risk awareness, the ability to read early warnings, and early reporting of potential floods are not evenly distributed throughout vulnerable areas. The participation that is formed tends to be mobilizing when disasters occur, rather than active involvement in the mitigation and prevention stages. Public involvement remains concentrated in the emergency response phase, with limited involvement in prevention and planning.

An urgency score of 69 indicates that this aspect is not at a critical level, but still requires strategic intervention. Strengthening disaster education, increasing the capacity of local volunteers, and integrating communities in risk-based planning are important steps to build a *risk-aware society*. Without increased literacy and collective awareness,

participatory programs have the potential to not achieve long-term impact in reducing flood risk.

Thematic Analysis: Challenges and Barriers (Score 62)

The thematic challenges and obstacles obtained an urgency score of 62, which shows that the obstacles faced in flood mitigation in Bekasi City are structural but can still be managed through strengthening governance. The main obstacles include budget limitations, uneven human resource capacity, and spatial conflicts due to the pressure of land conversion.

Although multi-sectoral participatory programs such as KELANA and KATANA have been underway, low community disaster literacy limits the effectiveness of community-based interventions. Participation that is not entirely risk-conscious causes programs to be more responsive than preventive.

From an institutional perspective, budget constraints have an impact on priorities that are more inclined towards emergency handling than long-term mitigation. HR constraints, especially in technical and managerial competence, also affect the quality of planning and coordination. Meanwhile, spatial conflicts, such as development in catchment areas and river borders, show a lack of synchronization between spatial planning policies and disaster risk reduction.

A score of 62 reflects that the challenge is not in the absence of programs, but in the consistency of implementation and integration across sectors, so that it is necessary to harmonize spatial policies, strengthen human resource capacity, and optimize risk-based funding so that structural obstacles do not continue to reduce the effectiveness of flood mitigation in a sustainable manner.

The main challenge in implementing flood mitigation policies lies in the weak collaborative governance between institutions. The Bekasi City Government needs to improve policy coherence between planning documents and establish a formal coordination mechanism that integrates provincial and national agencies.

In the book (Driessen et al., 2016) titled Toward more resilient flood risk governance and the article Mees, H. L. P., Driessen, P. P. J., & Runhaar, H. A. C. (Mees et al., 2018), titled Exploring the scope of public and private responsibilities for climate adaptation, argues that effective disaster risk management requires multi-stakeholder collaboration, data-driven decision-making, and socio-ecological integration. Adopting a green-blue infrastructure framework offers a transformative path to balancing structural interventions with ecosystem-based and community-centered adaptation.

Thematic Analysis: Recommendations for Improvement (Score 88)

The thematic recommendations for improvement obtained the highest urgency score, which is 88, which shows that the need for a reformulation of flood mitigation strategies in Bekasi City is very urgent. This score reflects concrete proposals from stakeholders, but its implementation requires strong and consistent cross-sectoral commitments.

The recommendations emphasized the importance of strengthening the integration of risk-based spatial policies, increasing institutional technical capacity, optimizing preventive mitigation funding, and developing an integrated disaster information system. Conceptually, this step is in line with a *risk-informed governance* approach that places mitigation as an integral part of development planning, not just a response to disasters.

However, the main challenge lies in commitment and synchronization between actors, both between OPDs and across metropolitan areas. Without solid coordination and collaborative leadership, strategic recommendations have the potential to stop at the normative level. Therefore, performance-based monitoring and evaluation mechanisms, harmonization of authority, and strengthening pentahelix partnerships are needed to ensure sustainable implementation.

The urgency score of 88 confirms that flood mitigation governance reform is no longer an option, but a strategic need to increase the resilience of cities to increasingly complex flood risks.

Effectiveness of Spatial and Environmental Policy Implementation in Urban Flood Mitigation

The effectiveness of spatial and environmental policy implementation in Bekasi City reflects a complex interaction between normative regulatory frameworks and practical enforcement constraints in rapidly urbanizing areas. Formally, the Regional Spatial Plan (RTRW) 2011–2031 and related environmental policy instruments provide a legal basis for flood control integration within development planning (Pemerintah Kota Bekasi, 2023). However, statistical data indicate a consistent increase in flood frequency and inundation coverage over the past five years (Badan Nasional Penanggulangan Bencana, 2025). This discrepancy suggests that regulatory instruments have not been sufficiently translated into effective spatial control mechanisms. From a global disaster risk perspective, such conditions illustrate limited adaptive urban capacity amid accelerating climate change and land-use transformation (United Nations Office for Disaster Risk Reduction, 2023). Consequently, the effectiveness of policy implementation cannot be assessed solely through regulatory availability but must consider enforcement performance and spatial compliance.

Spatial policy implementation in Bekasi demonstrates persistent challenges in controlling land conversion, particularly in water catchment and riparian buffer zones. Empirical evaluation shows that spatial planning policies remain partially fragmented and insufficiently integrated with disaster mitigation frameworks (Siregar & Lestari, 2022). Similarly, comparative research on Bekasi and Tangerang confirms that mitigation principles are often weakly embedded within urban planning processes (Budiarto & Wahyuni, 2019). The increasing intensity of rainfall extremes combined with land cover changes has significantly exacerbated major flood events in the region (Meliani et al., 2025). These findings indicate that policy effectiveness is strongly dependent on the alignment between ecological carrying capacity and spatial development trajectories. Without rigorous land-use monitoring and enforcement, regulatory frameworks risk remaining symbolic rather than transformative.

From a policy implementation perspective, the analytical framework developed by Mazmanian and Sabatier (1989) highlights clarity of objectives, resource adequacy, inter-organizational communication, and implementer commitment as central determinants of success. In Bekasi, coordination across governmental agencies remains constrained by overlapping mandates and sectoral fragmentation (Sudarmono & Hidayat, 2023). Such fragmentation weakens integrated watershed-based planning and reduces institutional responsiveness to systemic flood risks. Similar governance patterns have been observed across Asian metropolitan regions facing urban flood challenges (Roy & Ghosh, 2020). Therefore, policy effectiveness is intrinsically linked to governance coherence and institutional integration. Strengthening vertical and horizontal coordination mechanisms becomes essential for translating spatial regulations into measurable risk reduction outcomes.

The NVivo-based thematic analysis conducted in this study identifies the relative urgency of key determinants influencing spatial and environmental policy effectiveness in flood mitigation. The thematic distribution is presented below:

Table 1. Thematic Urgency Distribution of Spatial and Environmental Policy Implementation in Flood Mitigation, Bekasi City

Policy and Implementation Themes	Urgency Score
Policies and Regulations	85
Institutional Capacity	78
Coordination and Collaboration	82

Resources and Infrastructure	74

The table demonstrates that regulatory aspects receive the highest urgency score, indicating their central role in shaping mitigation effectiveness. Nevertheless, regulatory strength alone remains insufficient without adequate institutional capacity and coordinated governance structures. Methodologically, systematic qualitative analysis following the procedures of Miles, Huberman, and Saldaña (2014) ensures transparency and analytical rigor in identifying dominant themes. The qualitative design, as emphasized by Creswell and Creswell (2018), enables in-depth exploration of complex institutional dynamics. Thus, spatial policy effectiveness emerges as a multidimensional construct shaped by legal, institutional, and infrastructural factors.

Structural interventions such as river normalization have not yielded optimal outcomes due to limited financial resources and weak inter-agency coordination (Fathurrahman & Sulastri, 2020). This finding underscores the inadequacy of purely structural approaches when not accompanied by governance reform and integrated planning. Spatial vulnerability assessments in tropical wetland cities demonstrate that effective mitigation strategies require synergy between hazard mapping and spatial regulation enforcement (Giofandi et al., 2026). Furthermore, empirical analysis of the March 2025 flood event highlights the need for realism-based mitigation strategies that combine structural and non-structural measures (Suherman et al., 2025). These studies collectively affirm that spatial policy effectiveness depends on both technical precision and institutional adaptability. Therefore, regulatory refinement must be complemented by institutional strengthening and data-driven planning.

Integrating green-blue infrastructure into urban spatial planning represents a strategic pathway toward long-term flood resilience. Urban resilience frameworks in Southeast Asia emphasize ecosystem-based adaptation and ecological restoration as critical components of climate-responsive cities (UN-Habitat, 2024). The World Bank (2023) similarly underscores the necessity of integrating spatial policies with risk-informed governance and technological information systems. River-basin-based planning initiatives further advocate a unified and integrated management approach to achieve sustainable flood control (Salam et al., 2025). Such integration balances engineered solutions with ecological water absorption functions and landscape restoration. Consequently, effective spatial policy implementation requires transformative rather than incremental adjustments.

Metropolitan governance dynamics significantly influence the effectiveness of spatial and environmental policies. The Jabodetabek region exhibits overlapping administrative authorities that complicate cross-regional flood management (Sudarmono & Hidayat, 2023). Resilient flood governance literature emphasizes multi-level coordination and collaborative leadership as prerequisites for systemic risk management (Driessen et al., 2016). In addition, clarifying the division of public and private responsibilities enhances accountability in climate adaptation processes (Mees et al., 2018). These perspectives highlight the necessity of harmonized intergovernmental frameworks. Without metropolitan-scale integration, localized spatial policies may fail to address upstream-downstream hydrological interdependencies.

Social dimensions also influence the translation of spatial policies into effective mitigation outcomes. Community participation in urban flood mitigation remains constrained by limited disaster literacy and uneven risk awareness (Nurhidayati &

Rahmawati, 2021). Socio-environmental revitalization strategies demonstrate that participatory engagement strengthens local adaptive capacity (Pamungkas et al., 2025). When communities are actively involved in planning and monitoring processes, spatial policies gain practical legitimacy. Therefore, integrating community-based approaches into spatial governance enhances sustainability. Policy effectiveness ultimately depends on the synergy between institutional frameworks and social capital.

Technological integration constitutes another crucial dimension of effective policy implementation. The development of early warning systems and integrated monitoring technologies improves preparedness and rapid response capabilities (Wibowo et al., 2025). Risk-informed governance approaches emphasize evidence-based decision-making supported by spatial data platforms (World Bank, 2023). Such integration facilitates real-time coordination among agencies and enhances transparency. Furthermore, it reduces fragmentation in data management across departments. Hence, technological modernization reinforces the operational dimension of spatial and environmental policies.

The effectiveness of spatial and environmental policy implementation in Bekasi City remains constrained by governance fragmentation, limited enforcement, and insufficient integration of risk-based planning. Although regulatory frameworks are formally established, their transformative potential has yet to be fully realized. Strengthening institutional coordination, integrating green-blue infrastructure, and enhancing data-driven governance are essential strategic directions. The findings align with contemporary flood governance scholarship emphasizing adaptive, collaborative, and ecosystem-based approaches. Therefore, spatial policy reform represents a foundational prerequisite for enhancing urban flood resilience in rapidly urbanizing metropolitan contexts.

Collaborative Governance and Institutional Capacity in Urban Flood Risk Management

Collaborative governance constitutes a fundamental pillar in strengthening urban flood risk management in Bekasi City. Contemporary flood governance theory emphasizes that resilience emerges from integrated, multi-actor institutional arrangements rather than isolated sectoral interventions (Driessen et al., 2016). In metropolitan contexts, interdependencies between upstream and downstream jurisdictions further complicate governance coordination (Sudarmono & Hidayat, 2023). Regional flood risk management frameworks in Southeast Asia advocate policy coherence and intergovernmental collaboration as core principles (World Bank, 2023). Thus, the success of mitigation strategies depends heavily on governance integration across administrative boundaries. Fragmented authority structures significantly undermine systemic risk management effectiveness.

Institutional capacity remains a critical determinant of policy implementation outcomes. According to Mazmanian and Sabatier (1989), resource adequacy and implementer commitment shape the trajectory of public policy effectiveness. In Bekasi, limitations in technical expertise related to hydrological modeling, spatial data analysis, and early warning systems constrain institutional performance. Target mapping assessments reveal gaps between policy design and operational execution (Rhianazala et al., 2026). These capacity deficits reduce the ability to anticipate and manage complex hydrometeorological risks. Consequently, sustained institutional strengthening initiatives are indispensable.

Community engagement reinforces collaborative governance by bridging institutional strategies with local adaptive practices. Empirical findings indicate that disaster literacy levels remain uneven across flood-prone communities in Bekasi (Nurhidayati & Rahmawati, 2021). Climate adaptation literature emphasizes shared responsibilities between state and non-state actors to enhance resilience (Mees et al., 2018). Without participatory integration, mitigation efforts risk being overly centralized and reactive. Community-based adaptive drainage systems demonstrate the value of grassroots involvement in reducing flood vulnerability (Salim et al., 2025). Therefore, inclusive governance frameworks contribute to both legitimacy and effectiveness.

The NVivo thematic distribution highlights governance-related priorities as follows:

Table 2. Thematic Urgency Distribution of Collaborative Governance and Institutional Capacity in Flood Mitigation, Bekasi City

Governance and Participation Them	Urgency Score
Community Participation	69
Challenges and Barriers	62
Recommendations for Improvement	88

The high urgency score assigned to policy reform recommendations indicates strong stakeholder demand for governance restructuring. Systematic qualitative analysis enhances the reliability of these thematic findings (Miles et al., 2014). Research design rigor, including triangulation and validation procedures, strengthens interpretive consistency (Creswell & Creswell, 2018). The distribution illustrates that while participation and challenges are moderate concerns, strategic reform remains the highest priority. Thus, governance transformation emerges as a central agenda in flood mitigation enhancement.

Structural barriers such as fiscal constraints and land-use conflicts continue to impede collaborative governance effectiveness. Budget allocations remain predominantly oriented toward emergency response rather than preventive mitigation (Fathurrahman & Sulastri, 2020). Urban resilience assessments across Southeast Asia reveal similar patterns of institutional fragmentation and resource limitations (UN-Habitat, 2024). Adaptive governance models advocate flexible coordination mechanisms capable of addressing evolving risks (Roy & Ghosh, 2020). Therefore, financial reorientation toward preventive investment is essential. Strengthening budget integration within risk-based planning frameworks can enhance long-term sustainability.

Green-blue infrastructure initiatives provide opportunities for cross-sectoral collaboration and ecological integration. Integrated river basin management approaches emphasize unified planning across jurisdictions (Salam et al., 2025). Socio-environmental revitalization strategies further highlight the co-benefits of ecological restoration and community empowerment (Pamungkas et al., 2025). By combining structural interventions with ecosystem-based adaptation, governance becomes more holistic. Such integration enhances absorptive and adaptive capacities within urban systems. Consequently, collaborative governance must incorporate ecological innovation alongside institutional reform.

Technological advancement strengthens collaborative coordination and transparency in flood risk management. The development of integrated early warning

systems significantly improves preparedness and inter-agency communication (Wibowo et al., 2025). Risk-informed governance models underscore the importance of shared data platforms and real-time information exchange (World Bank, 2023). These systems facilitate evidence-based decision-making and reduce duplication of responsibilities. Effective technology integration enhances both operational efficiency and accountability. Therefore, digital infrastructure becomes a strategic asset in collaborative governance.

Climate variability intensifies the urgency of coordinated flood risk management. Global assessments confirm increasing hydrometeorological hazards due to climate change (United Nations Office for Disaster Risk Reduction, 2023). Empirical analysis of rainfall extremes and land cover dynamics in Bekasi further substantiates this risk escalation (Meliani et al., 2025). Governance responses must therefore be anticipatory rather than reactive. Multi-level coordination enables more comprehensive climate adaptation strategies. Without integrated governance, mitigation efforts remain fragmented and insufficient.

Policy reform requires harmonization of metropolitan authorities and formalized coordination mechanisms. Governance challenges within the Jabodetabek region underscore the necessity of clearer institutional mandates (Sudarmono & Hidayat, 2023). Resilient flood governance frameworks advocate collaborative leadership and institutional learning processes (Driessen et al., 2016). Monitoring and evaluation mechanisms based on performance indicators further strengthen accountability. Such reforms must be accompanied by political commitment and sustained stakeholder engagement. Hence, governance restructuring is both a technical and political endeavor.

Collaborative governance and institutional capacity enhancement represent decisive factors in strengthening flood mitigation effectiveness in Bekasi City. The prominence of reform-oriented themes demonstrates the urgency of systemic transformation. Integrating spatial planning, institutional strengthening, technological innovation, and community participation constitutes a comprehensive mitigation strategy. Without adaptive and inclusive governance, structural interventions alone will remain insufficient. Therefore, collaborative, risk-informed, and data-driven governance models provide the most viable pathway toward sustainable urban flood resilience.

Conclusion

This study concludes that the effectiveness of flood mitigation policies in Bekasi City remains constrained by structural fragmentation, institutional limitations, and weak cross-sectoral coordination. The NVivo-based thematic analysis identifies seven interrelated determinants shaping policy performance, namely policies and regulations, institutional capacity, coordination and collaboration, resources and infrastructure, community participation, challenges and barriers, and recommendations for improvement. Among these, regulatory consistency and enforcement, together with institutional capacity for cross-sectoral coordination, emerge as the most decisive factors influencing implementation outcomes. Persistent issues such as overlapping authority, limited financial and technical resources, and fragmented communication systems continue to undermine integrated flood risk governance. These findings indicate that flood mitigation challenges in Bekasi are not merely technical in nature but fundamentally governance-related.

To enhance policy effectiveness, this study recommends strengthening regulatory harmonization across spatial planning instruments, improving institutional capacity through continuous technical training and risk-based data utilization, integrating

cross-institutional disaster information systems, advancing green-blue infrastructure development, and expanding community participation through structured educational and collaborative mechanisms. Effective flood mitigation therefore requires a transition from reactive, infrastructure-centered approaches toward inclusive, adaptive, and data-driven governance models. By situating urban flood mitigation within a comprehensive policy implementation framework, this research contributes both theoretically to the literature on public policy and disaster governance and empirically to the development of resilient urban strategies in Indonesia and other rapidly urbanizing contexts.

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