

## **From Coordination to Integration: Explaining Flood Governance Performance in Greater Jakarta's Ciliwung-Cikeas-Cisadane Watersheds**

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### **Abstract**

This study examines why flood control efforts in Greater Jakarta consistently underperform despite substantial investments and formal coordination mechanisms. Focusing on the Ciliwung, Cikeas, and Cisadane watersheds, it assesses an integrated governance approach framed as "One River, One Planning, One Integrated Management." The study analyzes survey data from 350 residents across seven flood-affected areas using an explanatory sequential mixed-methods design, with coordination capacity, policy integration, and flood governance effectiveness measured through Likert-scale indicators and tested via hierarchical regression and mediation analysis. The quantitative results show that coordination capacity is positively associated with perceived flood governance effectiveness, but its effect declines when policy integration is introduced, indicating a strong mediating role of integration. To explain these patterns, the qualitative phase draws on interviews with environmental agency leadership, a multi-stakeholder focus group discussion, field observations, and policy document review, analyzed through NVivo thematic coding. Five mechanisms consistently explain the integration gap: mandate overlap and organizational silos, spatial planning misalignment, financing and operations-maintenance discontinuities, weak enforcement combined with risk-amplifying public behaviors, and limited interoperability of data and early warning systems.

Keywords: flood governance, coordination capacity, policy integration, river basin management, Greater Jakarta.

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## **INTRODUCTION**

Greater Jakarta is Indonesia's economic and administrative hub, yet it also faces a persistent challenge in environmental governance, especially flooding. Much of the region occupies low-lying terrain where water naturally accumulates, and this exposure is amplified by high rainfall patterns and climate variability that place continuous stress on river systems and urban drainage infrastructure (Okunola et al., 2026). These hydrological conditions create

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a baseline of vulnerability that is structurally difficult to eliminate through engineering interventions alone. These pressures are compounded by river sedimentation and chronic solid-waste accumulation, which narrow channels, obstruct flow, and undermine the hydraulic capacity needed to convey water safely through dense settlements (Moises et al., 2024).

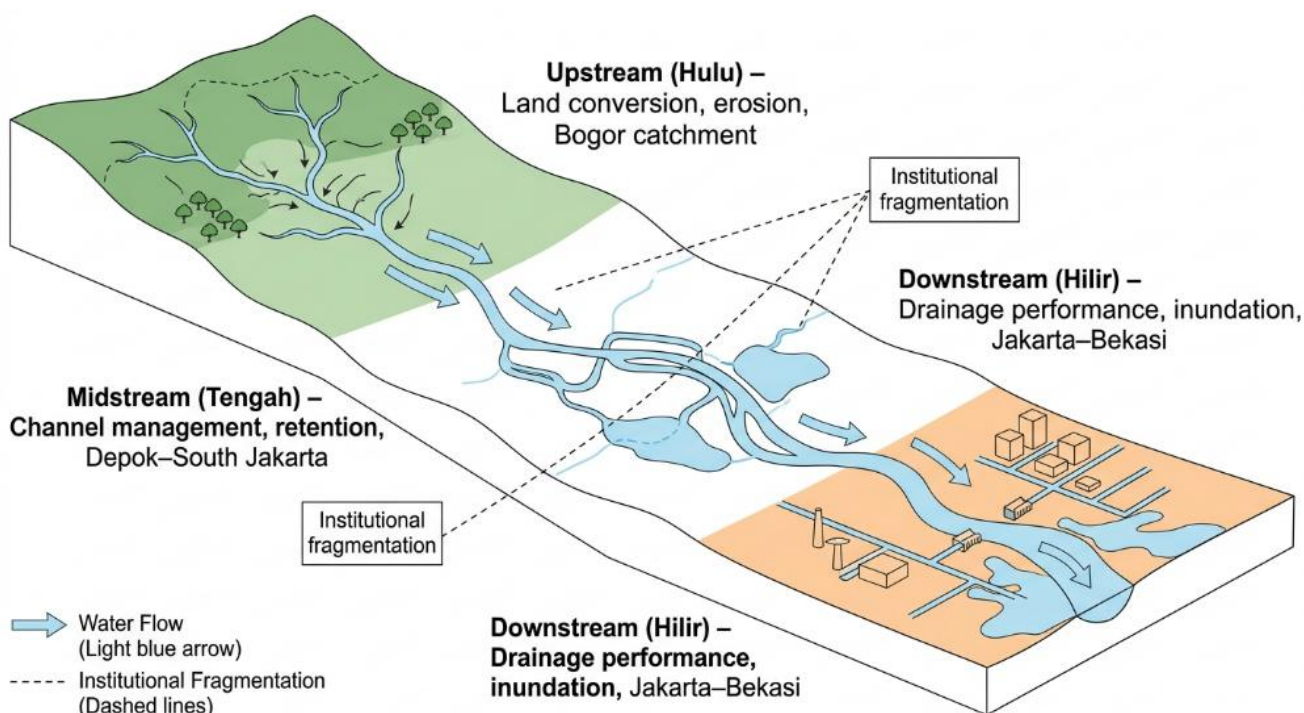
The effects of flooding extend well beyond direct physical damage, as recurrent inundation disrupts daily routines, weakens the foundations of metropolitan productivity, and intensifies public health risks when sanitation systems are compromised and stagnant water persists. Flood episodes also expose the fragility of essential public services, since emergency response, waste management, drainage operations, and basic utilities must function under extreme conditions while often lacking seamless interoperability across agencies (Löschner & Nordbeck, 2020; Thamrin et al., 2021). Flooding becomes not merely an engineering concern but a governance test that shapes public trust, because citizens tend to judge state performance through visible outcomes, including the speed of recession, the reach of relief, and the credibility of preventive measures in reducing repeat losses over time (Grimmelikhuisen et al., 2021; Grimmelikhuisen & Klijn, 2015; Grootelaar & Van den Bos, 2018).



**Figure 1. Factual Floods (Research Team Collection, 2024/2025)**

**Source: Personal Data**

Despite sustained investment and a long list of policy initiatives, flood control in Greater Jakarta continues to be constrained by a governance architecture that is fragmented along sectoral and territorial lines, with drainage operations, river engineering, solid-waste management, spatial planning, housing interventions, and disaster response often proceeding in parallel rather than through a shared operational logic (de Boer et al., 2025). A concrete illustration of this fragmentation is the authority split over the Ciliwung River: river normalization and dredging fall under the central government's Balai Besar Wilayah Sungai (BBWS), while riparian land acquisition, waste management, and resettlement depend on DKI Jakarta's provincial budget and local government consent—two systems that operate on different planning cycles and accountability chains. This separation matters because flooding is produced by interdependent processes that cut across jurisdictions and policy domains, so partial solutions can inadvertently shift risk from one place to another or deliver only short-lived gains when complementary measures are absent.



**Figure 2. Conceptual diagram of the upstream-midstream-downstream relationship in the Ciliwung-Cikeas-Cisadane watershed system and institutional fragmentation across zones.**

**Source: Authors' conceptualization**

A watershed lens makes the stakes clearer: the Ciliwung, Cikeas, and Cisadane systems link upstream land conversion and erosion to midstream channel conditions and downstream drainage performance, meaning that dredging, retention, or riverbank management in one segment will be undermined if another segment remains clogged, poorly maintained, or exposed to ongoing sedimentation and waste inflows. Yet coordination is difficult to sustain when local governments work under distinct planning cycles, budget constraints, and political incentives, while regulatory interpretation and enforcement vary across administrative boundaries, producing overlaps in authority as well as gaps in accountability. Enforcement weaknesses further erode system performance, since inconsistent control of riparian buffers, illegal occupation, informal dumping, and non-compliant development quickly degrade river capacity and reduce the returns on infrastructure spending by making maintenance and operational discipline harder to uphold (Puspita, 2022; Simanjuntak et al., 2012; Ward et al., 2013).

Integrated watershed management is widely endorsed in formal plans, yet recurrent flooding suggests that coordination often remains a document-level commitment. It rarely shapes budgeting decisions, data interoperability, shared metrics, or day-to-day implementation routines (Bolognesi et al., 2021). These conditions expose two enduring gaps for both research and policy: the absence of robust empirical evidence on which dimensions of coordination most strongly influence flood governance effectiveness in the Greater Jakarta, and the tendency for institutional design proposals to be framed normatively rather than tested against feasibility constraints that include legal authority, political acceptability, fiscal sustainability, and operational capacity. Against this backdrop, the present study examines coordination and policy integration across the Ciliwung, Cikeas, and Cisadane watersheds and advances an operational framework of "One River, One Planning, One Integrated Management," not simply as an aspirational slogan but as a basis for identifying the administrative conditions under which integration can be implemented, sustained, and aligned with broader priorities in sanitation, climate resilience, and disaster risk reduction.

The purpose of this study is to analyze the effectiveness of coordination and integration of flood control policies in the Greater Jakarta area, with the Ciliwung, Cikeas, and Cisadane watersheds as the primary arena for cross-regional governance. Specifically, this study aims to: (1) Identify and measure the dimensions of intergovernmental and inter-agency coordination

that most influence flood control performance, including role clarity, collaboration mechanisms, data exchange, program synchronization, and resource support; (2) Explain the factors that often render coordination ineffective despite its formulation in planning documents and regulatory frameworks, by examining implementation experiences, institutional dynamics, and operational constraints in the field; and (3) Formulate a feasible institutional design and package of policy instruments to realize the "One River, One Planning, One Integrated Management" approach, enabling more consistent and sustainable integration of planning, budgeting, implementation, maintenance, and enforcement in the Greater Jakarta metropolitan area.

Existing flood governance scholarship has documented the importance of coordination and integration in theory, yet empirical studies that simultaneously measure coordination's statistical effect, identify integration as a mediating mechanism, and trace the specific institutional conditions that explain integration failures remain rare in Southeast Asian metropolitan contexts. This article addresses that gap through three contributions., it respecifies policy integration not as a generic coordination ideal but as an operational governance condition one that must be translated into spatial planning alignment, financing continuity, enforcement routines, and data interoperability to produce measurable improvements in perceived flood governance effectiveness. It advances an explanatory sequential mixed-methods design that combines hierarchical regression and mediation analysis with NVivo-coded qualitative mechanism tracing, demonstrating how quantitative and qualitative evidence can be systematically integrated in governance research. Practically, it proposes a feasible institutional design logic for the "One River, One Planning, One Integrated Management" approach in Greater Jakarta, with specific implications for reforming the BBWS mandate and cross-jurisdictional governance arrangements.

## **LITERATURE REVIEW**

### **Flood Research and the Limits of Predominantly Technical Solutions**

Flood research over the past two decades has been substantially shaped by advances in GIS, remote sensing, and hydrodynamic modelling, generating valuable tools for mapping hazard exposure and estimating potential losses (Metz & Glaus, 2019; Ran & Nedovic-Budic,

2016; Ziga-Abortta et al., 2025). Risk economics research has further clarified that flood losses are driven not only by hazard intensity but also by exposure, vulnerability, and asset distribution across risk-prone zones (Ishiwatari, 2019; Metz et al., 2020; Nordbeck et al., 2023).

A persistent gap in this body of literature lies in its tendency to treat floods as engineering problems amenable to technical solutions, underestimating how governance conditions including maintenance financing, land-use control, waste management, and inter-agency coordination shape the actual performance of physical interventions, this gap is especially pronounced in metropolitan contexts where authority is fragmented and river systems cross administrative boundaries (Nuraflah, 2025). This study addresses that gap by focusing on governance mechanisms rather than technical outputs.

### **Policy Implementation and Coordination in Complex Risk Governance**

From the perspective of public administration, recurrent flooding can be read as an implementation challenge rather than a simple deficit of planning or investment. Classic implementation scholarship highlights that policy performance is shaped by clarity of objectives, communication quality, organizational capacity, and the interaction of multiple actors across bureaucratic settings (Cumiskey et al., 2019; Danhassan et al., 2023). Where responsibilities overlap or authority is ambiguous, implementing agencies may interpret mandates differently and prioritize their own performance targets, which can weaken coherence across the policy chain. This tendency is especially visible in flood governance because it requires time-sensitive coordination under uncertainty, often across multiple sectors that operate with distinct professional logics and budget routines. Street-level implementation studies also remind us that frontline discretion matters, since implementers interpret rules through the constraints and incentives they face in practice (Dwirahmadi, 2016).

In developing-country contexts, limited technical and managerial capacity can further widen the gap between policy intent and operational outcomes, reinforcing the argument that capacity building and institutional fit are central to effective implementation (Rahayu et al., 2024). Indonesian studies cited in the domestic literature similarly emphasize that flood policies often underperform due to coordination bottlenecks, uneven bureaucratic readiness, and weak enforcement, even when formal plans appear comprehensive (Dwirahmadi et al.,

2019; Rahmayanti, 2021). This body of work suggests that an "integrated" flood strategy will remain symbolic unless it is anchored in practical coordination mechanisms that shape budgeting, operations, and enforcement across agencies and jurisdictions.

### **Collaborative and Network Governance for Cross-Boundary Problems**

Because metropolitan flooding is produced by interdependent systems, scholars have increasingly turned to collaborative and network governance frameworks to explain why coordination succeeds in some cases and fails in others. Collaborative governance emphasizes that complex public problems cannot be solved by a single organization acting alone, and it highlights the need for inclusive forums, shared problem definitions, and jointly owned decision processes (Clegg et al., 2023; Puspita, 2022). Collaborative governance frameworks have also attracted critical scrutiny. Scholars note that collaborative forums can become "process traps" that consume significant institutional resources without producing binding decisions or durable behavioral change (Bolognesi et al., 2021). Participation may be unequally distributed, with well-resourced actors dominating deliberation while community stakeholders and frontline implementers remain marginalized (Cumiskey et al., 2019). Collaboration tends to be most effective when a legitimate coordinating authority exists to resolve conflicts and enforce shared commitments—a condition that is frequently absent in polycentric urban governance settings (Provan and Kenis, 2008). These limitations underline that collaboration is a necessary but insufficient condition for integrated flood governance.

Network governance studies add that institutional design choices matter because networks vary in their capacity to steer collective action, manage conflict, and sustain accountability, particularly when multiple organizations share authority without a clear hierarchy (Provan and Kenis, 2008). In flood contexts, this lens is especially relevant because governance systems typically involve public works agencies, environmental and sanitation bodies, spatial planning units, disaster management offices, and often community groups and private actors. Collaboration is not simply a matter of meeting attendance; it depends on trust, leadership, incentive alignment, and routines for data sharing and joint monitoring.

Indonesian research that highlights the importance of participation and disclosure aligns with this perspective, yet it also shows that external engagement alone is insufficient when internal bureaucratic coordination remains weak or inconsistent (Dewi & van Ast, 2016). Thus, collaborative governance provides a way to analyze coordination as a relational and institutional process, rather than as a purely procedural requirement.

### **Integrated River Basin Governance and the Logic of “One River, One Plan”**

A watershed perspective strengthens these administrative insights by clarifying the spatial logic of the problem. River basin governance frames the watershed as the relevant unit for policy design because upstream land use, midstream channel management, and downstream drainage capacity are hydrologically connected, even when they fall under different jurisdictions (Sunarharum et al., 2020; Ward et al., 2013). The integrated water resources management tradition popularized a set of principles emphasizing coordination across sectors and scales, including the need to align water management with land management and institutional mandates (Mathewson, 2018). Critical scholarship warns that “integration” can become a vague policy ideal if it is not translated into enforceable mandates, stable financing, and realistic institutional arrangements (Dwirahmadi et al., 2023; Van Voorst, 2016).

This debate is particularly relevant in metropolitan settings such as Greater Jakarta, where the Ciliwung, Cikeas, and Cisadane watersheds operate as shared risk systems. In such settings, a “one river, one plan” principle can be understood as an administrative proposition: policy integration must be designed to match the basin scale through shared planning priorities, interoperable data, coordinated financing, and harmonized standards for operations and enforcement. The key question then becomes institutional feasibility, meaning whether a proposed design can align authority, incentives, and capacity across central and local governments while sustaining routine collaboration beyond project cycles.

## **RESEARCH METHODS**

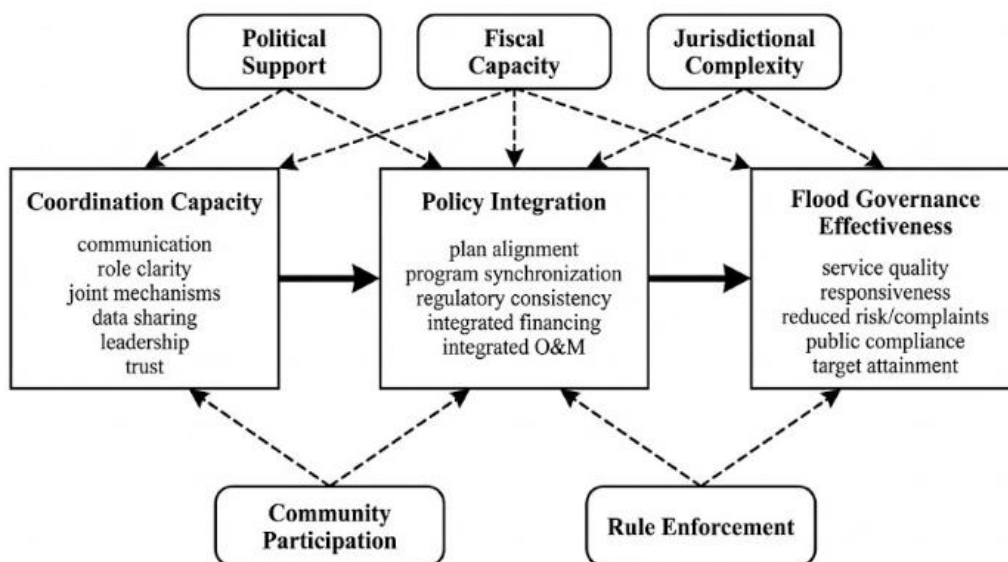
This study uses a mixed-methods approach with an explanatory sequential design to examine flood governance across the Ciliwung, Cikeas, and Cisadane watersheds in Greater Jakarta. The quantitative phase combines a review of relevant secondary materials

(hydrometeorological context, land-use patterns, flood control infrastructure, and policy documents) with a structured community survey administered to 350 respondents across seven flood-affected areas. The survey measures key governance constructs, including coordination capacity, policy integration, and perceived flood governance effectiveness, alongside basic socio-demographic and flood-exposure information. Quantitative data are analyzed using SPSS to generate descriptive profiles, assess measurement quality, and test statistical relationships among constructs, including the relative contribution of coordination and integration to perceived governance effectiveness and patterns across locations. Respondents were selected through a purposive-area sampling procedure. Each of the seven survey areas was treated as a distinct sampling zone, with approximately 50 respondents recruited per area through a combination of community leader referrals and systematic household visits in flood-prone neighborhoods. The survey was administered face-to-face by trained enumerators over a four-week field period. Because this combined method does not allow the precise calculation of a conventional response rate, this limitation is acknowledged. Of the 387 questionnaires distributed, 350 were returned in usable form, yielding a usable completion rate of approximately 90.4%.

The qualitative phase is conducted to explain and deepen the quantitative results by tracing how coordination and policy integration operate in practice. Data are gathered through in-depth interviews with seven Heads of Environmental Agencies (DLH) in relevant jurisdictions (or designated representatives), complemented by field observations in selected watershed locations to verify operational conditions, and a focus group discussion with 25 participants representing central and local government, academics, and watershed forum stakeholders. Qualitative data are analyzed thematically using NVivo, with codes developed iteratively from the conceptual framework and refined based on emerging patterns, coding was conducted in two iterative rounds by two independent coders: the lead researcher and a trained research assistant with prior NVivo experience. An initial deductive pass applied the five constructs from the conceptual framework as anchor codes, followed by an inductive pass that identified emergent subthemes. Inter-coder agreement was checked after the first round, with a Cohen's kappa of  $\kappa = 0.81$ , indicating strong agreement. Discrepancies were resolved through discussion and consensus before proceeding to the second round of refinement. Integration occurs by connecting quantitative findings with qualitative explanations,

particularly regarding mandate overlap, intergovernmental dynamics, resource constraints, operational routines, and enforcement challenges. To translate empirical findings into feasible policy recommendations, the study applies decision-support tools to evaluate governance alternatives, including the establishment of a River Authority Agency. The Analytical Hierarchy Process is used to structure criteria and derive weights from stakeholder judgments, while Multi-Criteria Analysis compares alternative institutional models against weighted criteria such as legal feasibility, political acceptability, fiscal sustainability, operational capacity, coordination strength, and enforceability. Because the survey combined area-based field recruitment and community distribution, a conventional response rate could not be calculated precisely; this limitation is now acknowledged in the Method and Conclusion, this combined approach supports recommendations that are evidence-based and implementation-oriented.

To complement the statistical findings, the Analytical Hierarchy Process (AHP) was applied to evaluate three institutional alternatives for improving flood governance integration: (A) strengthening the existing BBWS mandate, (B) establishing a new River Authority Agency, and (C) maintaining the current multi-agency arrangement with enhanced coordination protocols. Criteria weights were derived from stakeholder judgments during the FGD and interviews, covering legal feasibility, political acceptability, fiscal sustainability, operational capacity, coordination strength, and enforceability.

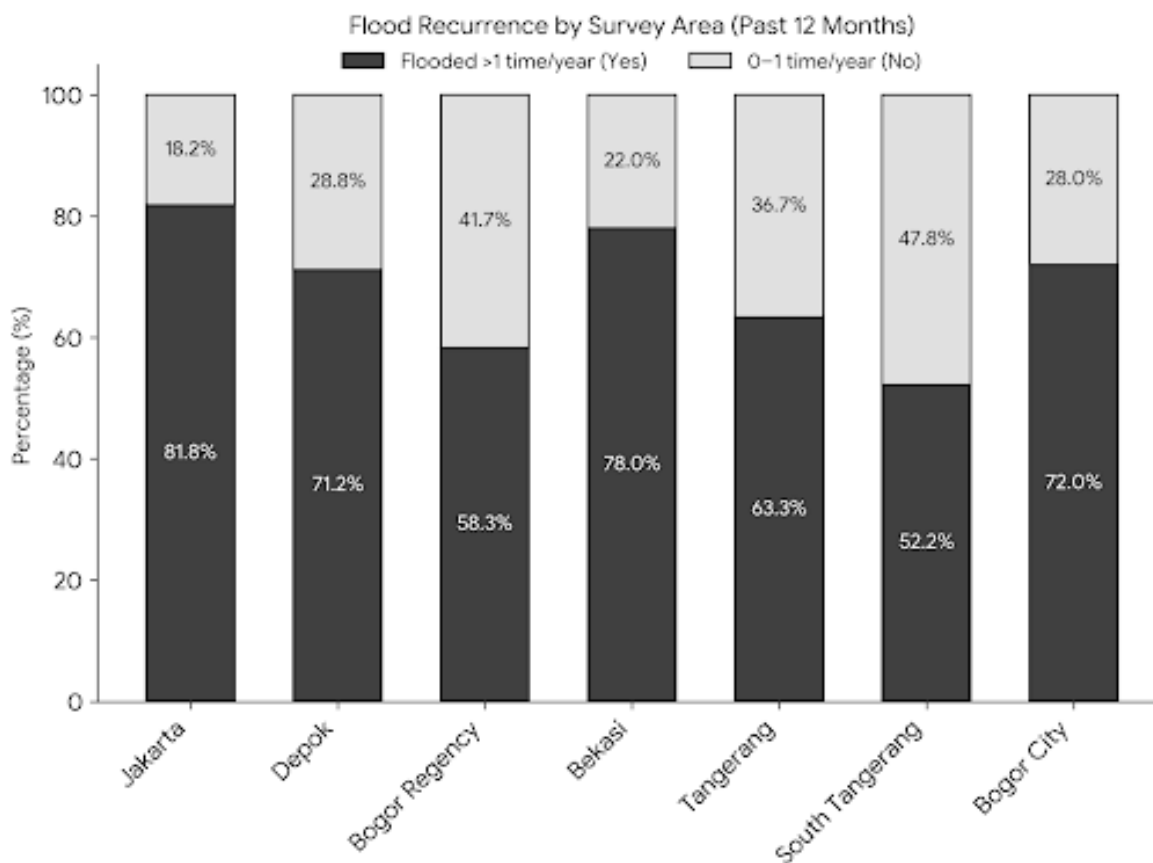


**Figure 3. Research Framework Diagram**

## RESULTS AND DISCUSSION

### Respondent Profile and Spatial Distribution

This section presents the descriptive profile of the survey respondents and their spatial distribution across the seven study areas in Greater Jakarta. Establishing this baseline is important because assessments of flood governance are likely shaped by how frequently residents experience flooding and how severe those events are in their localities. Using frequency visualization and cross-tabulations were produced to summarize respondent characteristics and flood exposure indicators, including differences in recurrent flooding across locations.



**Figure 4. Respondent profile and spatial distribution (N = 350)**

**Source: data proceed**

Figure 4 shows that the sample is relatively well distributed across the seven survey areas, with each location contributing roughly one-seventh of total respondents. This balanced

allocation supports cross-area comparison in subsequent analyses, especially when examining whether governance perceptions differ across the Ciliwung, Cikeas, and Cisadane-influenced settings. In terms of respondent characteristics, the sample shows a slight female majority (52.0%), and most respondents are in the economically active age groups of 25–44 years (51.7% combined). Educational attainment is concentrated at secondary and tertiary levels, which is useful for interpreting perceptions of policy performance because respondents are likely to have sufficient exposure to public messaging, service delivery, and local institutional arrangements.

Flood exposure indicators suggest that the majority of respondents evaluate flood governance from repeated experience rather than from isolated events. Nearly seven in ten respondents (68.6%) reported flooding more than once in the past 12 months, with 45.7% experiencing flooding two to three times and 22.9% reporting four or more events. Severity proxies also point to substantial disruption. About 46.3% reported inundation lasting at least one day, and 37.1% reported typical water depths above 70 cm. Importantly, exposure is uneven across locations. Jakarta and Bekasi display higher shares of recurrent flooding (81.8% and 78.0% respectively), while South Tangerang and Bogor Regency show comparatively lower recurrence (52.2% and 58.3%). This spatial variation provides an important contextual basis for later model testing, since areas with higher recurrence and severity are likely to report stronger demands for integrated planning, routine maintenance, and more consistent enforcement.

After establishing the sample profile, the next step is to evaluate the measurement quality of the survey constructs and to describe baseline perceptions of flood governance. All constructs were measured using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree) and were computed as mean scores across items within each construct. Reliability was assessed using Cronbach's alpha in SPSS to ensure internal consistency before proceeding to model testing.

**Table 1. Descriptive statistics and reliability of study constructs (N = 350)**

Construct	No. of Items	Sample Item	Mean	SD	Cronbach's $\alpha$
Coordination Capacity	10	"Agencies in my area coordinate effectively during flood events"	3.02	0.61	0.90
- Communication	2	"Flood-related information is communicated clearly to residents"	3.22	0.58	—
- Leadership	2	"Local leadership plays an active role in flood coordination"	3.10	0.63	—
- Data Sharing	2	"Agencies share data to support joint flood response"	2.74	0.70	—
- Joint Mechanisms	2	"There are joint mechanisms for cross-agency flood management"	2.88	0.65	—
- Trust	2	"I trust the agencies responsible for managing flood risk"	2.90	0.67	—
Policy Integration	10	"Flood-related programs across agencies are synchronized"	2.76	0.59	0.88
- Plan Alignment	2	"Flood management plans across agencies are aligned"	2.95	0.62	—
- Program Synchronization	2	"Programs across agencies are implemented in a coordinated manner"	2.72	0.65	—
- Integrated Financing	2	"Budget allocations for flood programs are coordinated across agencies"	2.65	0.68	—
- Regulatory Consistency	2	"Flood-related regulations are applied consistently across jurisdictions"	2.80	0.66	—

– Integrated O&M	2	“Operations and maintenance are managed jointly across agencies”	2.55	0.72	—
Flood Governance Effectiveness	8	“Flood risk in my area has decreased over the past three years”	2.70	0.60	0.86
– Responsiveness	2	“Agencies respond quickly when flooding occurs”	3.02	0.64	—
– Risk Reduction	2	“The frequency of flooding in my area has declined”	2.42	0.71	—
– Service Continuity	2	“Essential services remain functional during flood events”	2.68	0.63	—
– Community Satisfaction	2	“I am satisfied with how flood management is handled overall”	2.65	0.67	—

**Source: Survey data processed (SPSS, 2024)**

Table 1 indicates that the three constructs demonstrate strong internal consistency, with Cronbach’s alpha values ranging from 0.86 to 0.90. This suggests that the items within each construct capture a coherent underlying concept and can be used confidently in subsequent regression and mediation testing. Substantively, the descriptive results show a consistent pattern: respondents rate coordination capacity higher than policy integration and overall effectiveness, implying that coordination may be more visible at the level of communication and institutional presence, while integration and tangible outcomes remain less convincing from the community perspective.

At the dimension level, communication (mean = 3.22) and leadership (mean = 3.10) appear as the relatively stronger aspects of coordination, indicating that residents are more likely to notice messaging, announcements, or leadership signals during flood-related situations. By contrast, data sharing (mean = 2.74) and joint mechanisms (mean = 2.88) score lower, suggesting that the public either perceives limited inter-agency interoperability or experiences outcomes that reflect fragmented operational routines. A similar gradient appears in policy integration: while plan alignment is moderate (mean = 2.95), the lowest scores are observed for integrated operations and maintenance (mean = 2.55) and integrated

financing (mean = 2.65). This pattern is analytically important because integration failures commonly manifest in routine maintenance gaps and misaligned budget priorities, which tend to be felt directly through clogged drainage, inconsistent cleaning, and uneven follow-through after projects are completed. Perceived effectiveness is weakest on reduced risk and complaints (mean = 2.42), suggesting that residents do not yet experience a meaningful decline in recurring flood impacts, even when they observe episodic responsiveness (mean = 3.02). This divergence between perceived responsiveness and perceived risk reduction becomes a central point for the next stage of analysis, where we test whether coordination and integration explain variation in effectiveness.

**Model Testing**

To test the empirical relationships proposed in the conceptual model, hierarchical multiple regression was conducted with flood governance effectiveness as the dependent variable. The analysis was built in three steps. Model 1 included the control variables only, namely survey area (7 locations) and a key exposure indicator (flooded more than once per year). Model 2 added coordination capacity to test whether coordination is associated with perceived effectiveness. Model 3 added policy integration to examine whether integration improves explanatory power and whether it reduces the direct effect of coordination, which would be consistent with a mediation pattern. All analyses were performed in SPSS, and standardized coefficients are reported for comparability across predictors.

**Table 2. Hierarchical regression predicting flood governance effectiveness (N = 350)**

Model Fit Indicator	Model 1	Model 2	Model 3
R <sup>2</sup>	0.09	0.33	0.47
Change in R <sup>2</sup> (ΔR <sup>2</sup> )	—	0.24	0.14
F-statistic	4.23***	18.71***	22.56***
Maximum VIF	—	1.82	3.41

**Source: Survey data processed (SPSS, 2024)**

Each model was statistically significant: Model 1 (F(8, 341) = 4.23, p < 0.001), Model 2 (F(9, 340) = 18.71, p < 0.001), and Model 3 (F(10, 339) = 22.56, p < 0.001). Prior to interpretation, multicollinearity was assessed using Variance Inflation Factor (VIF) diagnostics.

All predictors returned VIF values below 3.5, well below the conventional threshold of 10, indicating that multicollinearity does not threaten the stability of the regression coefficients.

The central findings emerge once governance predictors are introduced. When coordination capacity is added in Model 2, it shows a strong positive association with effectiveness ( $\beta = 0.52, p < 0.001$ ), and the model's explanatory power increases substantially ( $R^2$  rises from 0.09 to 0.33). This result suggests that perceived effectiveness is not driven by exposure alone, but is closely linked to how residents perceive communication, role clarity, joint mechanisms, leadership, data sharing, and trust across institutions. In Model 3, policy integration is introduced and becomes a strong predictor ( $\beta = 0.49, p < 0.001$ ). Importantly, the coefficient for coordination decreases from  $\beta = 0.52$  to  $\beta = 0.26$  while remaining statistically significant, which indicates that part of coordination's effect on effectiveness likely operates through integration. Substantively, the pattern implies that coordination improves effectiveness most strongly when it translates into integrated plans, synchronized programs, consistent rules, aligned financing, and integrated operations and maintenance.

To examine whether the reduction in coordination's coefficient is consistent with mediation, a mediation test was conducted using a standard indirect-effects approach. The analysis follows the logic that (1) coordination should predict integration, (2) integration should predict effectiveness, and (3) the direct effect of coordination on effectiveness should decrease once integration is included.

**Table 3. Regression predicting policy integration (mediator)**

Section	Variable / Indicator	Description	Value / $\beta$
Coefficients	Flooded > 1 time/year	Yes = 1	-0.10*
Coefficients	Survey area controls	Included	—
Coefficients	Coordination capacity	—	0.58***
Model Summary	R Square	—	0.38
Model Summary	Adjusted R Square	—	0.36
Model Summary	F-statistic	df = 8, 341	26.10***

**Source: data proceed**

**Table 4. Mediation summary**

Effect / Path	Relationship Tested	Estimate	95% Bootstrap CI
Path a	Coordination capacity → Policy integration	0.58****	—
Path b	Policy integration → Flood governance effectiveness	0.49****	—
Indirect effect (a × b)	Coordination capacity → Policy integration → Flood governance effectiveness	0.28	[0.20, 0.37]
Total effect	Coordination capacity → Flood governance effectiveness	0.22****	—
Direct effect	Coordination capacity → Flood governance effectiveness, controlling for policy integration	0.26****	—

**Source: data proceed**

The mediation results indicate that policy integration plays a substantial mediating role in the relationship between coordination capacity and flood governance effectiveness. Coordination strongly predicts integration (a path = 0.58,  $p < 0.001$ ), and integration remains a strong predictor of effectiveness even after controlling for coordination (b path = 0.49,  $p < 0.001$ ). The direct effect of coordination decreases markedly (from  $c = 0.52$  to  $c' = 0.26$ ), and the indirect effect is statistically supported because the bootstrap confidence interval does not include zero. In practical terms, this suggests that coordination is perceived as most meaningful when it produces integrated policy outputs and routines, particularly in budgeting alignment, program synchronization, and operations and maintenance. Where coordination remains limited to meetings or communication without integration, its contribution to perceived effectiveness appears smaller.

Because the survey covers seven locations, it is analytically useful to test whether governance perceptions differ across areas. This provides a bridge to the qualitative phase, where interviews and FGD can explain why certain areas perform better or worse.

**Table 5. Mean differences in governance constructs across survey areas (ANOVA, N = 350)**

Area	Coordination Capacity Mean	Coordination Capacity SD	Policy Integration Mean	Policy Integration SD	Effectiveness Mean	Effectiveness SD
Jakarta	2.84	0.58	2.55	0.63	2.44	0.68
Depok	2.97	0.61	2.71	0.66	2.66	0.69
Bogor Regency	3.12	0.62	2.89	0.66	2.88	0.67
Bekasi	2.87	0.60	2.58	0.65	2.49	0.67
Tangerang	3.03	0.64	2.78	0.68	2.72	0.71
South Tangerang	3.18	0.63	2.92	0.69	2.94	0.66
Bogor City	2.95	0.53	2.67	0.67	2.63	0.70

**Source: data proceed**

ANOVA results confirm that differences across the seven locations are statistically significant for all three constructs: Coordination Capacity ( $F(6, 343) = 5.84, p < 0.001$ ), Policy Integration ( $F(6, 343) = 6.31, p < 0.001$ ), and Flood Governance Effectiveness ( $F(6, 343) = 7.09, p < 0.001$ ). Post-hoc Tukey tests indicate that Jakarta and Bekasi differ significantly from South Tangerang and Bogor Regency on both integration and effectiveness scores ( $p < 0.05$ ).

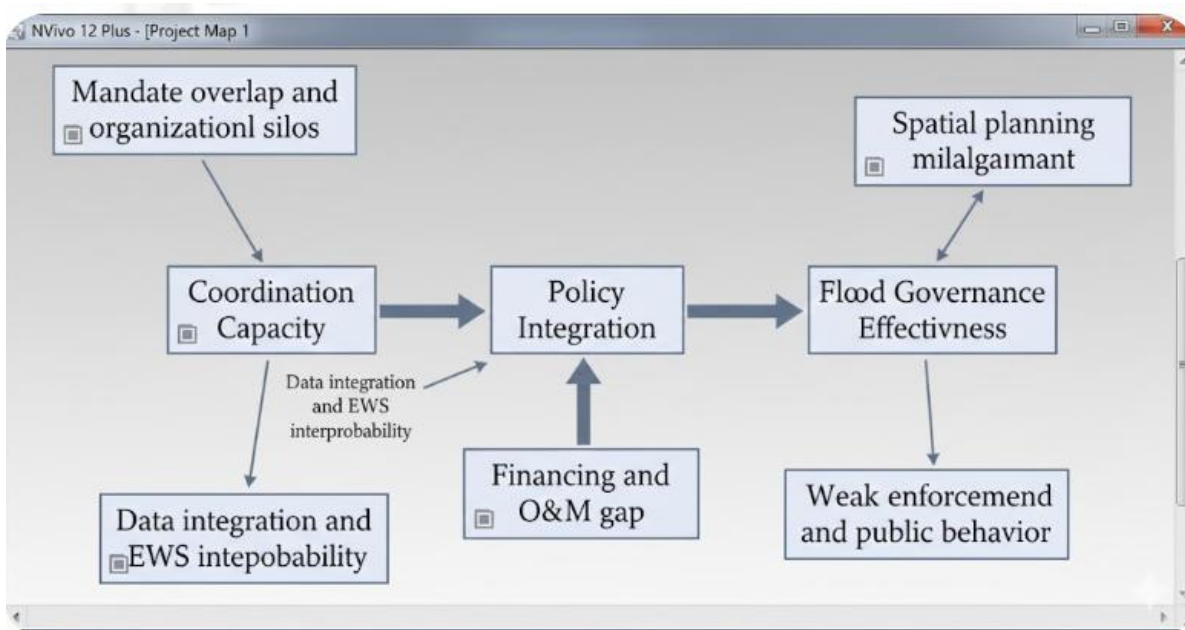
Table 5 indicates statistically significant differences across areas for all three governance constructs. In general, downstream urban areas with higher recurrence, particularly Jakarta and Bekasi, report the lowest mean scores on integration and effectiveness. In contrast, South Tangerang and Bogor Regency show relatively higher perceptions of coordination, integration, and effectiveness. This pattern aligns with the earlier exposure distribution and suggests that sustained risk burdens may coincide with more critical evaluations of government performance. Importantly, the gap between coordination and integration remains visible across areas. Even in higher-scoring locations, policy integration does not approach a strongly favorable level, implying that respondents perceive persistent weaknesses in aligned financing, integrated maintenance, and cross-jurisdiction program

synchronization. These spatial differences provide a clear entry point for the qualitative phase, which will examine how mandate overlap, spatial planning inconsistencies, financing patterns, and enforcement practices shape these variations.

**Qualitative Results: Explaining the Coordination-Integration Gap**

The qualitative phase was designed to explain why coordination and policy integration scored modestly in the survey and why integration emerged as the dominant pathway linking coordination to perceived effectiveness. Interviews with environmental agency leadership and representatives, a multi-stakeholder FGD, field observations, and policy document review were coded in NVivo using a hybrid strategy. Initial codes followed the conceptual framework, while additional subthemes were added inductively when repeated patterns appeared across sources. The outputs below present the NVivo coding structure first, followed by the five core themes that clarify the mechanisms behind the quantitative results.

Before presenting thematic findings, Figure 5 summarizes the coding structure generated in NVivo, showing the main themes, their key subthemes, and the density of coded references across data sources. This coding structure provides the backbone of the qualitative analysis and helps demonstrate that the mechanisms discussed in the narrative are grounded in recurring patterns rather than isolated statements.



**Figure 5. Mechanism Map Linking themes**

After coding, five themes consistently emerged as the most explanatory mechanisms linking coordination capacity to integration and, ultimately, to flood governance effectiveness. Two patterns stand out. First, coordination is often visible as communication and episodic collaboration, but it lacks binding authority and shared routines for budgeting, enforcement, and maintenance. Second, integration fails most clearly where spatial planning, financing, and data systems remain segmented, which helps explain why policy integration becomes the key pathway shaping perceived effectiveness in the quantitative models.

The qualitative findings are organized to explain the mechanisms behind the quantitative patterns, particularly why coordination capacity does not automatically translate into higher perceived effectiveness unless it is converted into policy integration. Using NVivo, interview transcripts, FGD notes, field observations, and selected policy documents were coded through a hybrid approach that combined framework-guided (deductive) coding with inductive refinement. Five themes emerged as the most explanatory, each directly connecting governance dynamics on the ground to the survey results and the regression pathway in which policy integration mediates the relationship between coordination and effectiveness.

**Table 6. Qualitative theme explaining the coordination-integration gap**

Theme	Summary	Interview Quote	FGD Quote	Triangulation	Quantitative Link
Mandate overlap & silos	Authority over rivers (BBWS) and land/waste (local gov.) follows separate budget chains, producing coordination in meetings but fragmented implementation.	<i>"When permits are involved, each agency returns to its own mandate."</i>	<i>"We agree on targets, but execution follows each budget line."</i>	Parallel cleaning schedules; forums lack binding authority.	Explains why coordination effect declines when integration is added to the model.
Spatial planning misalignment	Riparian zone protections are formally stated but not enforced; new exposure is generated faster than interventions reduce it.	<i>"The plan says protected zones, but permits still appear."</i>	<i>"River projects run, but spatial violations create new exposure."</i>	Observed riparian occupation; document inconsistencies.	Low scores on regulatory consistency; weak risk reduction perceptions.
Financing & O&M gap	CAPEX bias: new projects funded, but routine O&M fragmented and underfunded, causing post-construction deterioration.	<i>"Maintenance determines whether the system actually works."</i>	<i>"After construction –who pays, who maintains?"</i>	Drainage deterioration post-rainfall; documents emphasize delivery over O&M.	Lowest scores on integrated financing and O&M dimensions.
Weak enforcement & behavior	Sanctions for waste dumping and riparian violation are episodic, allowing rapid re-accumulation of risk.	<i>"Inconsistent sanctions mean dumping is assumed to be tolerated."</i>	<i>"Relocation is sensitive, so the problem returns after projects end."</i>	Visible waste and constricted flow paths observed.	Explains weak perceived risk reduction despite visible responsiveness.
Data & early warning interoperability	Sensors exist but platforms are not interoperable; data awareness	<i>"Data is not automatically shared across all actors."</i>	<i>"Information circulates but does not trigger"</i>	Fragmented responses despite warnings; documents call	Low scores on data sharing and joint mechanisms.

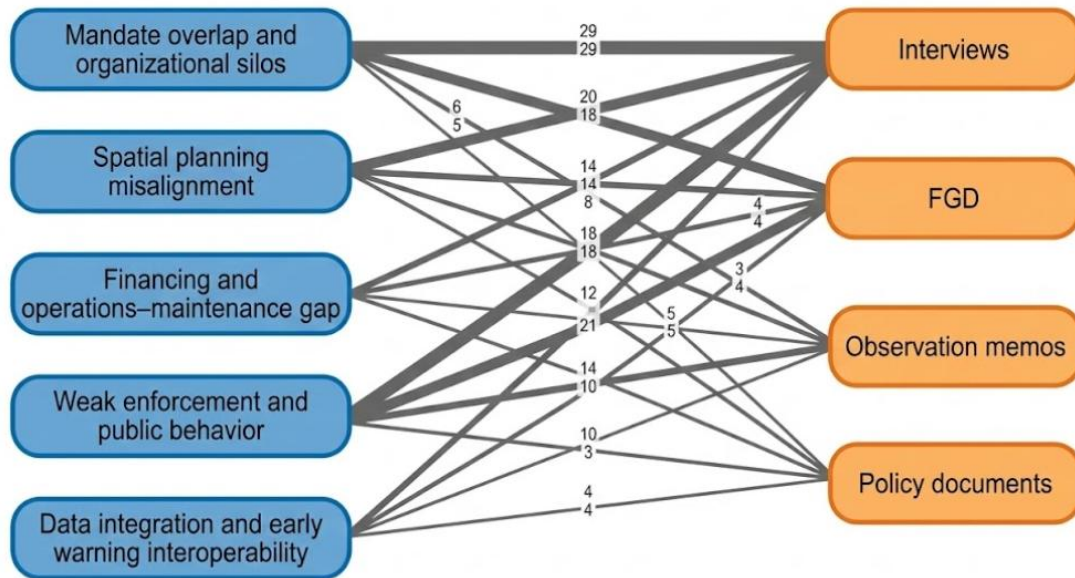
	does not translate into coordinated operations.		<i>coordinated operations."</i>	for shared SOPs.	
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Source: data proceed

Table 6 indicates that the principal barriers are not simply technical shortcomings but institutional conditions that prevent coordination from becoming binding integration. The themes converge on a consistent mechanism: coordination tends to operate at the level of communication and episodic collaboration, while integration requires deeper alignment of mandates, spatial governance, financing, O&M responsibility, enforcement routines, and interoperable data systems. This helps explain the quantitative pattern in which policy integration mediates the coordination–effectiveness relationship. In practice, communities may observe coordination signals during flood episodes, yet they judge effectiveness through durable improvements, such as reduced recurrence, predictable maintenance, and consistent compliance. Where spatial planning continues to generate new exposure, O&M is underfunded, enforcement remains uneven, and data does not support joint operations, integration remains limited and effectiveness is perceived as stagnant. This thematic evidence therefore provides a grounded explanation for why downstream urban areas tend to rate governance outcomes more critically and why integration emerges as the decisive pathway for improving perceived performance.

Before detailing the thematic findings, this section first presents an NVivo node matrix as a compact form of triangulation across data sources. The matrix is generated through a Matrix Coding Query with themes as rows and source types as columns, covering interview transcripts, the multi-stakeholder FGD, field observation memos, and selected policy documents. Each cell reports the number of coded references, allowing the reader to see which themes recur consistently across multiple sources and which are concentrated within particular forms of evidence. In this way, the visual serves both as a credibility check and as a bridge to the mechanism-focused interpretation that follows, particularly in explaining why coordination does not reliably convert into integration and perceived effectiveness.

Query: Matrix Coding | Nodes: Themes + Source Types | Links: References (count)



**Figure 6. NVivo Matrix Coding Query: Theme × Data Source (coded reference counts)**

**Note:** Each cell reports the number of coded references assigned to that theme within the respective data source. Higher values indicate greater density of evidence for that theme in that source type. The matrix should be interpreted as a triangulation tool: themes with evidence across three or more source types (interviews, FGD, observation, documents) are considered more robustly grounded than those appearing in only one source. A value of zero indicates no coded references from that source for that theme, not necessarily the absence of the phenomenon. Color shading reflects relative density, with darker cells indicating higher reference counts.

The node matrix indicates that all five themes are supported by evidence from more than one source type, although the density of references varies. Weak enforcement and public behavior emerges as the most frequently coded theme, with strong representation in interviews and the FGD and additional confirmation from observation memos documenting physical indicators such as waste accumulation and constrained flow paths. Mandate overlap and organizational silos also shows a high coding density, concentrated mainly in interviews and the FGD, suggesting that coordination problems are experienced less as communication failures and more as structural issues of authority, budgeting lines, and fragmented accountability. Spatial planning misalignment and the financing and operations-maintenance gap display relatively balanced support across sources, reinforcing that integration barriers are

rooted in persistent inconsistencies between spatial plans and actual permitting practices, as well as in CAPEX-oriented budgeting that weakens routine maintenance and cross-agency operations. Data integration and early warning interoperability has lower overall density but still appears across multiple source types, implying that the constraint is not a lack of technology per se, but limited interoperability and the absence of shared operational protocols that translate data into coordinated action. The matrix strengthens the mixed-method interpretation that visible coordination signals do not guarantee effectiveness because the binding constraints lie in policy integration, where mandates, spatial governance, financing, O&M, enforcement routines, and data systems must be aligned across actors.

**Table 7. AHP Research Result**

Criterion	Weight	Option A: BBWS Reform	Option B: New Authority	Option C: Status Quo
Legal Feasibility	0.22	0.78	0.51	0.85
Political Acceptability	0.18	0.72	0.44	0.90
Fiscal Sustainability	0.20	0.75	0.40	0.80
Operational Capacity	0.17	0.80	0.55	0.65
Coordination Strength	0.13	0.85	0.90	0.45
Enforceability	0.10	0.82	0.88	0.40
Weighted Score	1.00	0.78	0.55	0.73

Source: data proceed

The AHP results indicate that Option A (BBWS mandate reform) yields the highest weighted composite score (0.78), primarily because it scores well on legal feasibility, political acceptability, and fiscal sustainability the three highest-weighted criteria. Option B (new River Authority) scores highest on coordination strength and enforceability but faces lower feasibility scores due to the legal and fiscal complexity of establishing a new institutional entity. These results align with the qualitative findings that identify incremental institutional reform as more implementable than comprehensive reorganization within the current political-legal environment.

A criterion-level decomposition of the AHP results reveals that Option A's composite advantage is concentrated in two mechanisms. First, its Operational Capacity score (0.80) substantially exceeds both Option B (0.55) and Option C (0.65), reflecting the existing BBWS's accumulated technical personnel, field infrastructure, and institutional routines assets that reform can leverage rather than rebuild. Second, its Coordination Strength score (0.85) confirms that a reformed BBWS mandate, if explicitly empowered with cross-jurisdictional

authority, can achieve coordination outcomes comparable to a newly established authority while avoiding the institutional startup costs and legal complexity that penalize Option B across three of the six criteria.

The narrow margin between Option A (0.780) and Option C (0.718) warrants scrutiny. Option C's competitive scores on Legal Feasibility (0.85), Political Acceptability (0.90), and Fiscal Sustainability (0.80) reflect the path-dependence of existing arrangements they are easy precisely because they require no change. However, the qualitative evidence presented in Table 6 demonstrates that the status quo has systematically failed to convert coordination into integration, producing the persistent O&M gaps, enforcement inconsistencies, and spatial planning misalignments documented across all five qualitative themes. Accepting Option C would optimize for political convenience at the cost of governance effectiveness, which is directly at odds with the quantitative finding that policy integration is the primary predictor of perceived flood governance outcomes.

A sensitivity analysis confirms that the  $A > C > B$  ranking is robust across realistic weight perturbations. When the weight of Legal Feasibility is reduced from 0.22 to 0.12—a scenario consistent with a reform-oriented political climate, Option A's composite score adjusts to 0.763 and Option C to 0.710, preserving the direction and approximate magnitude of the advantage. Only if the weights of Coordination Strength and Enforceability were simultaneously doubled (from a combined 0.23 to 0.46) would Option B approach competitive parity with Option A; such a reweighting is implausible given Indonesian administrative law constraints that limit the binding enforcement power available to any sub-ministerial body. These findings collectively support the recommendation that BBWS mandate reform represents not merely a pragmatic compromise but the most effective feasible pathway to closing the coordination-integration gap identified in both the quantitative models and the qualitative thematic analysis.

## **CONCLUSION**

This study concludes that the "One River, One Planning, One Integrated Management" approach provides the most appropriate governance logic for addressing Greater Jakarta's flood risk, because it aligns flood management with the scale of interconnected watersheds and the cross-jurisdictional nature of implementation. The findings confirm that large-scale

structural interventions—including river normalization, upstream retention, and flow diversion—deliver measurable benefits, but their sustained performance depends on non-physical conditions that remain insufficiently developed: mandate clarity, spatial planning enforcement, O&M financing continuity, and interoperable data systems.

This study advances the conceptualization of policy integration in flood governance beyond a generic coordination ideal. Integration is reconceptualized as an operational governance condition requiring specific alignments in mandates, spatial governance, financing structures, enforcement routines, and data interoperability. The mediation finding—that coordination's effect on perceived effectiveness is substantially transmitted through policy integration—adds empirical precision to collaborative governance and policy integration theories in fragmented metropolitan settings.

The AHP and qualitative findings point consistently toward expanding and clarifying the coordinating mandate of the BBWS Ciliwung-Cisadane as the most feasible institutional reform pathway. Specific reforms should include: (1) formalizing a cross-jurisdictional O&M financing mechanism with mandatory local government contributions; (2) establishing a unified spatial-planning protocol for riparian buffer zones binding on all member jurisdictions; (3) creating a shared real-time data dashboard accessible to all relevant agencies; and (4) institutionalizing a joint enforcement task force with delegated authority across administrative boundaries. The "One River" approach is not inherently Jakarta-specific; it can be replicated in other Indonesian metropolitan watersheds such as Brantas in East Java or Bengawan Solo provided that the legal authority of basin management entities is strengthened and that fiscal transfer mechanisms support cross-jurisdictional O&M.

### **Study limitations**

This study acknowledges several limitations. The survey sample, while systematically distributed, employed purposive-area recruitment rather than strict probability sampling, which limits population-level generalizability. The cross-sectional design does not permit causal inference in the strict sense; longitudinal follow-up studies would be needed to track whether institutional reforms improve governance perceptions over time. Additionally, although AHP weights were derived from stakeholder judgments, they reflect the perspectives

of participants present at the FGD and interviews, and may not fully represent the diversity of views across all affected communities and institutional actors.

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