

Assessing the Impact of Collaborative Governance on Urban Waste Management Effectiveness: Evidence from Bandung City, Indonesia

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ABSTRACT

Background and Objective: Rapid urbanization has escalated waste management challenges in metropolitan areas like Bandung City, Indonesia. Addressing this requires synergy among stakeholders. This study aims to assess the impact of Collaborative Governance dimensions specifically Face-to-Face Dialogue, Trust Building, Commitment to the Process, Shared Understanding, and Intermediate Outcomes on the effectiveness of waste management programs in Bandung City, West Java Province. **Methods:** A quantitative research approach was utilized, involving a sample of 350 respondents derived from relevant stakeholders, including government agencies, private sectors, and the community. Data were collected using structured questionnaires and analyzed using Multiple Linear Regression via SPSS to determine the significance of each collaborative dimension. **Results:** The regression analysis revealed that Collaborative Governance significantly affects program effectiveness. Trust Building emerged as the strongest predictor ($\beta = .431$, $t = 8.764$, $p < .001$), followed by Shared Understanding ($\beta = .241$, $p < .001$), Commitment to the Process ($\beta = .205$, $p < .001$), and Face-to-Face Dialogue ($\beta = .170$, $p < .001$). However, Intermediate Outcome did not show a statistically significant effect on program effectiveness ($\beta = -.039$, $t = -.714$, $p = .475$). **Conclusion:** Trust Building is the most crucial element in fostering effective collaborative waste management in Bandung City. Policymakers should prioritize transparency, equitable power-sharing, and consistent relationship-building among stakeholders. The insignificance of intermediate outcomes suggests a need to re-evaluate short-term milestones to ensure they translate into long-term program effectiveness.

Keywords: Collaborative Governance, Waste Management, Program Effectiveness, Trust Building, Public Administration.

INTRODUCTION

Urban solid waste management has evolved into one of the most complex and pressing global challenges, particularly for developing nations experiencing rapid economic transitions. As urbanization accelerates, population density increases, and consumption patterns shift dramatically, the volume of daily waste generated worldwide has surged to unprecedented levels (1,2). This escalation transforms waste management from a basic municipal sanitation task into a multifaceted "wicked problem" that intersects with environmental sustainability, public health, and urban planning. Addressing this issue requires comprehensive and multi-dimensional approaches, making sustainable solid waste management a core agenda in the pursuit of global sustainable development.

In Indonesia, the solid waste crisis has reached a critical threshold, especially in densely populated metropolitan areas across Java Island. Recent studies indicate a continuous upward trend in urban waste production, heavily dominated by hard-to-degrade materials like plastics, which severely strains existing infrastructure (3). Bandung City, the capital of West Java Province, is at the epicenter of this crisis. The city generates thousands of tons of municipal solid waste daily, frequently exceeding the capacity of its primary final disposal sites. Recent infrastructural overloads and the urgent need for cross-regional cooperation in handling Bandung's waste highlight a systemic vulnerability that demands immediate and innovative policy interventions (4–6).

Historically, waste management policies in Indonesia have relied heavily on a rigid, government-centric bureaucratic approach. However, this centralized, command-and-control model often fails to accommodate the complexities of modern local governance and the increasingly decentralized nature of urban society (7). As

highlighted in contemporary studies of Indonesian public administration, regional governments face significant structural barriers, including budget constraints, limited operational capacity, and overlapping sectoral jurisdictions (8,9). Consequently, it has become evident that traditional bureaucratic mechanisms alone are insufficient to resolve the compounding waste crisis, necessitating a departure from unilateral government action (10).

To overcome these systemic bureaucratic limitations, there is an urgent need for a paradigm shift toward collaborative governance. This modern administrative approach emphasizes the creation of synergies between the state apparatus, private sector entities, non-governmental organizations, and local communities (11). By transitioning from a hierarchical model to a network governance structure, responsibilities and resources are distributed more equitably among stakeholders. Collaborative governance is highly relevant for environmental policy because it transforms waste management from a mere administrative burden borne solely by the government into a shared societal responsibility, thereby fostering more inclusive and resilient public services (12).

Theoretically, the success of collaborative governance relies on the dynamic interaction of several specific institutional and relational variables. Ansell and Gash (2008) (13) developed a foundational framework identifying the core dimensions essential for a robust collaborative process: Face-to-Face Dialogue, Trust Building, Commitment to the Process, Shared Understanding, and Intermediate Outcomes. Together, these dimensions facilitate consensus-oriented decision-making. When properly cultivated, they ensure that diverse and sometimes conflicting stakeholders remain engaged, align their objectives, and maintain accountability throughout the lifecycle of public policy implementation (14,15).

Despite the robust theoretical consensus praising the virtues of collaborative governance, there remains a significant empirical gap in the literature regarding its quantitative impact in the Global South. Most existing research tends to explore collaborative environmental management through qualitative lenses, focusing on narrative case studies or general institutional descriptions (16,17). There is a scarcity of quantitative studies that rigorously measure the direct, isolated impact of each collaborative dimension such as how much trust or shared understanding individually contributes on the actual effectiveness of municipal programs. This gap makes it difficult to ascertain which specific collaborative factors are truly decisive in determining policy success.

The core problem underlying this study is the persistent inconsistency between the formation of collaborative initiatives in Bandung City and the actual realization of effective waste reduction. While the local government frequently initiates multi-stakeholder forums and programs (such as community waste banks and public-private recycling partnerships), the effectiveness of these interventions varies drastically (6). Determining exactly which dimension of the collaborative process acts as the strongest catalyst for program success is urgently needed. Without this specific empirical knowledge, policymakers risk wasting limited resources and time on superficial administrative collaborations that look good on paper but fail to yield tangible ecological improvements.

Therefore, the primary objective of this article is to quantitatively assess the impact of Collaborative Governance dimensions on the effectiveness of waste management programs in Bandung City, West Java Province. Theoretically, this study aims to contribute to the global public administration literature by empirically validating the Ansell and Gash framework within the unique socio-political context of a developing nation's decentralized local government. Practically, the findings are expected to provide regional stakeholders, city planners, and policymakers with actionable, evidence-based recommendations. By identifying the most influential drivers of collaboration, the government can optimize resource allocation and foster a cleaner, more sustainable urban environment.

METHODS

This study adopted a quantitative explanatory research design to systematically test the hypotheses regarding the causal relationship between Collaborative Governance dimensions (independent variables) and Program Effectiveness (dependent variable). The study population comprised key stakeholders actively involved in the waste management sector across Bandung City, encompassing local government officials (such as those from the Environment Agency), private sector representatives, NGO members, and active community leaders. A total

of 350 respondents were selected utilizing a purposive sampling technique. The primary inclusion criterion was that respondents must have direct and substantive involvement in collaborative waste management initiatives or forums. This deliberate sampling ensures that the data collected are highly relevant, accurate, and reflective of the actual collaborative dynamics on the ground.

Primary data were systematically gathered using a structured, self-administered questionnaire distributed to the selected stakeholders. Responses were measured using a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The independent variables were operationalized based on Ansell and Gash's (2008) collaborative process dimensions and tailored to the local environmental context: Face-to-Face Dialogue (X1), Trust Building (X2), Commitment to the Process (X3), Shared Understanding (X4), and Intermediate Outcome (X5). The dependent variable, Program Effectiveness (Y), was measured based on indicators of target achievement, resource efficiency, and overall environmental impact in municipal waste reduction.

Prior to the main analysis, the collected survey data were rigorously tested for construct validity and internal consistency reliability. Following the fulfillment of classical statistical assumptions including normality, multicollinearity, and heteroscedasticity tests a Multiple Linear Regression analysis was conducted using SPSS software. This method was chosen to simultaneously and partially measure the magnitude, direction, and significance of the relationships between the five collaborative dimensions and program effectiveness. The statistical significance level for hypothesis testing was set at $\alpha = 0.05$, providing a robust threshold for determining the actual impact of each dimension.

RESULTS

The primary objective of the data analysis phase was to empirically evaluate the impact of the five collaborative governance dimensions on the effectiveness of waste management programs in Bandung City. Following the rigorous screening of 350 valid responses and confirming that all classical statistical assumptions including normality, linearity, and the absence of multicollinearity were adequately met, a Multiple Linear Regression analysis was performed. This advanced statistical approach allowed the researchers to simultaneously and partially measure how much variance in program effectiveness could be accurately explained by the independent variables derived from the collaborative governance framework.

To determine the collective impact of the collaborative governance dimensions, an Analysis of Variance (ANOVA) was conducted as part of the regression procedure. The simultaneous test (F-test) yielded an F-value of 301.5 (df1=5, df2=344) with a significance level of .000 ($p < .001$). This highly significant statistical result emphatically indicates that Face-to-Face Dialogue, Trust Building, Commitment to the Process, Shared Understanding, and Intermediate Outcomes collectively possess a substantial and significant influence on the dependent variable. It empirically confirms the baseline hypothesis that collaborative governance, functioning as a holistic administrative system, is a valid and strong predictor of overall program effectiveness.

Moving beyond the simultaneous impact, it is crucial to observe the partial or individual effect of each independent variable to understand their specific contributions to the program's success. These partial effects are derived from the t-test results and the unstandardized coefficients produced by the SPSS output. Based on the statistical data, the multiple linear regression equation is formulated as $Y = -22.378 + 1.138(X1) + 2.216(X2) + 1.441(X3) + 1.180(X4) - 0.231(X5)$. The constant value of -22.378 mathematically implies the baseline state of program effectiveness when all collaborative dimensions are hypothetically absent or valued at zero. The detailed coefficient values, standard errors, and their respective significance levels are systematically presented in Table 1 below.

To observe the partial effect of each variable, the t-test results and coefficient values are presented in Table 1.

Table 1. Results of Multiple Linear Regression Analysis

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	-22.378	3.346		-6.687	.000

Face to Face Dialogue	1.138	.316	.170	3.602	.000
Trust Building	2.216	.253	.431	8.764	.000
Commitment to the Process	1.441	.249	.205	5.800	.000
Shared Understanding	1.180	.219	.241	5.382	.000
Intermediate Outcome	-.231	.323	-.039	-.714	.475
Dependent Variable: Efektivitas Program (Program Effectiveness)					

Based on the empirical data presented in Table 1, the first dimension, Face-to-Face Dialogue (X1), exhibits a positive and statistically significant partial effect on program effectiveness. This is evidenced by a t-value of 3.602, which is higher than the critical t-table limit, alongside a significance level of .000 ($p < .05$). The unstandardized coefficient of 1.138 indicates that any incremental improvement in facilitating direct, transparent, and face-to-face communication among stakeholders will proportionally enhance the overall success rate of the waste management initiatives in the city.

The most striking finding from the partial statistical test pertains to Trust Building (X2). The regression analysis unequivocally reveals that Trust Building is the most dominant and robust predictor among all the tested collaborative dimensions. It recorded the highest t-value at 8.764 and the largest Standardized Coefficient (Beta) of .431, with a significance level of .000 ($p < .001$). This statistical dominance highlights that fostering mutual trust, institutional reliability, and transparency among the government, private sector, and community actors serves as the most critical foundation for achieving measurable programmatic success.

Furthermore, Commitment to the Process (X3) also demonstrates a solid, positive, and significant relationship with program effectiveness. The statistical output shows a high t-value of 5.800 and a significance level of .000 ($p < .05$), alongside a Standardized Beta value of .205. This empirically confirms the hypothesis that when stakeholders demonstrate a high degree of organizational dedication and are willing to invest their time, financial resources, and institutional support into the collaborative network, the resulting environmental programs are significantly more likely to meet their intended operational targets.

Similarly, Shared Understanding (X4) acts as a highly significant catalyst for program success, positioning itself as the second-strongest predictor within the regression model. With a Standardized Beta value of .241, a t-value of 5.382, and a significance of .000 ($p < .05$), the quantitative data strongly supports the premise that aligning the diverse stakeholders' visions, missions, and problem definitions is essential. A unified understanding of the complexities surrounding the waste crisis ensures that collaborative actions are cohesive and strategically directed toward the same measurable outcomes.

In stark contrast to the other four collaborative dimensions, the analysis of Intermediate Outcome (X5) yielded an unexpected and deviant statistical result. The t-test for this specific variable produced a negative t-value of -.714 with a significance level of .475. Because the significance value ($p > .05$) far exceeds the standard 0.05 threshold of error, it is statistically concluded that Intermediate Outcomes do not possess a significant partial effect on overall program effectiveness. Furthermore, the negative unstandardized coefficient (-.231) suggests an inverse, albeit insignificant, statistical trend, indicating that the mere presence of short-term programmatic milestones does not automatically translate into long-term waste management effectiveness within this specific empirical context.

DISCUSSION

The findings of this study confirm that collaborative governance is a vital determinant of public program effectiveness, seamlessly aligning with the theoretical frameworks proposed by prominent governance scholars (13,14). The empirical evidence derived from Bandung City's waste management initiatives demonstrates that moving away from a unilateral bureaucratic model toward a network-based collaborative approach yields measurable operational improvements. By dissecting the collaborative process, this study provides granular insights into how specific relational and institutional dimensions individually drive or hinder public policy success in highly decentralized settings (10).

The most striking finding is the paramount role of Trust Building, which emerged as the strongest predictor of waste management program effectiveness. In complex networks involving rigid government bureaucracies, profit-driven private entities, and diverse local communities, a historical residue of skepticism often exists. Trust acts as the fundamental, invisible glue that mitigates these tensions, reduces transaction costs, and facilitates transparent knowledge sharing (15). When stakeholders genuinely believe in the integrity, competence, and reliability of their collaborative partners, they are significantly more likely to pool essential resources and implement waste reduction initiatives effectively at the grassroots level (4,5).

Furthermore, the significant positive impact of Face-to-Face Dialogue highlights the absolute necessity of establishing direct and inclusive communication channels. In the context of Bandung's environmental management, continuous and structured dialogue ensures that marginalized voices such as local waste pickers and small community-based organizations are adequately heard, actively preventing the domination of powerful state or corporate actors (11). This direct, interpersonal interaction serves as the critical first step in breaking down deep-rooted bureaucratic silos and allowing stakeholders to negotiate operational trade-offs openly and honestly.

Closely linked to the dialogic process is the dimension of Shared Understanding, which functions as a vital cognitive catalyst for program success. The quantitative data strongly supports the premise that aligning the diverse, and sometimes conflicting, stakeholders' visions and problem definitions is essential. When all participating parties recognize that urban waste is not merely the government's burden but a collective societal responsibility, they develop a unified mission. This shared cognitive framework prevents fragmented, overlapping interventions and strategically directs all collaborative efforts toward the exact same measurable ecological outcomes.

This shared vision subsequently fosters a stronger Commitment to the Process, another dimension proven to significantly stabilize and enhance program effectiveness. Commitment reflects the stakeholders' deep organizational dedication and their tangible willingness to continuously invest time, financial capital, and institutional support into the collaborative network. A high level of commitment prevents key actors from prematurely withdrawing when inevitable operational challenges arise such as budget deficits or logistical bottlenecks thus establishing a robust and resilient modern governance practice capable of sustaining long-term environmental strategies (8,9).

Finally, a unique and paradoxical finding of this study is the statistical insignificance of Intermediate Outcomes. In classical collaboration theory, achieving small, quick wins (intermediate outcomes) is supposed to build crucial momentum and reinforce mutual trust for broader programmatic goals. However, in the context of Bandung's waste management and dynamic local governance, these short-term milestones did not significantly drive overall, long-term effectiveness (7). This deviation could be strongly attributed to "project-based" mentalities, where stakeholders focus heavily on achieving temporary, symbolic milestones (e.g., launching a ceremonial waste bank) but systematically fail to integrate these small wins into the permanent, systemic operational framework required for actual, large-scale waste reduction.

CONCLUSION

This study empirically validates the fundamental premise that Collaborative Governance acts as a significant catalyst in enhancing the effectiveness of waste management programs in Bandung City. The comprehensive regression analysis confirms that a networked, multi-stakeholder approach is far superior to traditional, unilateral bureaucratic management in addressing complex urban environmental crises. Among the constituent dimensions of this collaborative model, Trust Building emerged unequivocally as the most critical and dominant driver of programmatic success, followed closely by Shared Understanding, Commitment to the Process, and Face-to-Face Dialogue. These findings highlight that the foundational strength of any environmental public policy in a decentralized setting lies not merely in its structural design, but heavily in the quality of the relational dynamics among its diverse participants.

The implications of these findings are highly relevant for modern public administration and local governance strategies. Because Trust Building is the paramount factor, regional policymakers and government officials must

intentionally design collaborative forums that prioritize radical transparency, equitable power distribution, and consistent, long-term relationship engagement, rather than treating collaboration as a mere administrative formality. Government agencies must act as reliable facilitators rather than dominant controllers, thereby encouraging private entities and grassroots communities to actively pool resources and share actionable knowledge without skepticism.

Furthermore, the notable insignificance of Intermediate Outcomes serves as a critical cautionary insight for future policy design. It suggests an urgent need for policymakers to re-evaluate how short-term programmatic milestones are established and managed within the waste sector. Local governments must consciously avoid the trap of "project-based" myopia, where temporary, ceremonial achievements are celebrated but fail to integrate into systemic, sustainable waste reduction mechanisms. Future initiatives should strictly ensure that all intermediate targets are directly and inextricably linked to long-term ecological and administrative goals, guaranteeing that early collaborative momentum genuinely translates into enduring environmental impact.

DECLARATIONS

Ethical Approval: This research involved human subjects (respondents). Ethical clearance and approval were obtained from the relevant academic and regional research boards prior to data collection. All participants provided informed consent. **Conflict of Interest:** The authors declare that there is no conflict of interest regarding the publication of this paper. **Data Availability:** The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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