

## **Interaction-Driven Organizational Innovation in Public Sector Waste Management: The Role of Partners and Citizens in Bandung City**

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### **Abstract**

This study examines public sector organizational innovation in sustainable waste management in Bandung City, focusing on how interaction between partner and citizen dimensions shapes organizational change. Using a qualitative documentary case study, evidence was drawn from official documents and secondary empirical studies. The findings show that partnerships with environmental communities, waste banks, and private-sector actors have developed more rapidly than citizen participation. Partners contribute organizational resources, technological support, and bridging functions, while citizen participation in household waste segregation and community-based waste management remains limited and uneven. The 2023 waste crisis created opportunities for organizational experimentation by disrupting established arrangements, increasing pressure for alternative coordination, and expanding engagement with non-governmental actors. However, resulting innovations, including flexible emergency coordination and local waste-processing arrangements, remain largely reactive and only partially institutionalized. The study distinguishes formal collaboration from organizational innovation, which is identified through departures from established routines, changes in resource or coordination arrangements, and implementation or testing of new practices. The study extends Chen et al.'s (2020) partner-citizen perspective by conceptualizing interaction quality—through knowledge exchange, reciprocity, learning, adaptation, and joint problem-solving—as a relational mechanism linking actor contributions to organizational innovation and institutionalization.

**Keywords:** Public Sector Organizational Innovation, Interaction-Driven Organizational Innovation, Partner Innovation, Citizen Participation, Sustainable Waste Management.

## **INTRODUCTION**

Public sector organizational innovation has become increasingly important in enabling public sector organizations to address complex societal and environmental challenges that cannot be solved through conventional bureaucratic approaches. In this study, public sector organizational innovation refers to changes in organizational arrangements, coordination practices, resource integration, and ways of working that depart from established routines to create or improve public value. Public sector innovation is used as the broader field, while public service innovation refers to the wider innovation concept and typology developed by Chen et al. (2020). The principal phenomenon investigated here is therefore public sector organizational innovation, with partner and citizen innovation treated as the central dimensions through which organizational capacity is developed. Urban waste management involves interconnected social, environmental, and institutional challenges that require governments to engage external actors, including private organizations, community groups, and citizens; however, the presence of such actors or formal collaborative arrangements does not by itself constitute organizational innovation.

Bandung City represents a critical case of these challenges. In 2023, the city experienced a severe waste governance crisis following the disruption of the Sarimukti Regional Landfill, which had long served as the main disposal site for municipal waste. This crisis was driven by high waste generation, limited local processing capacity, and excessive dependence on regional landfill infrastructure. Data from the National Waste Management Information System (SIPSN) of the Ministry of Environment and Forestry (KLHK) show that Bandung's daily waste generation increased from 1,539.82 tons in 2020 to 1,594.18 tons in 2022, before declining to 1,379.80 tons in 2023 (KLHK, n.d.).

These figures represent annual SIPSN waste-generation estimates and should therefore be distinguished from later operational figures reported by the Bandung City Government. Meanwhile, the city's local processing capacity remained insufficient, resulting in continued dependence on Sarimukti Landfill (Bandung City Environmental Agency, 2023).

The crisis reached its peak on August 19, 2023, when a large-scale fire affected approximately 10 hectares of Sarimukti Landfill. According to the Geological Agency

(2023), high concentrations of methane were detected beneath the waste deposits at several locations in Sarimukti Landfill, exceeding 100% of the Lower Explosive Limit (LEL) and posing an ignition risk. Following the fire, the temporary closure of the landfill disrupted waste transportation and disposal across Bandung, forcing the government to adopt emergency policy responses. These included the declaration and extension of waste emergency status through Mayor's Decrees No. 658.1/Kep.1843-DLH/2023 and No. 658.1/Kep.2403-DLH/2023 (Pemerintah Kota Bandung, 2023a, 2023b), followed by the establishment of the Emergency Waste Management Task Force through Mayor's Decree No. 658.1/Kep.2428-DLH/2023 (Pemerintah Kota Bandung, 2023c). The task force was responsible for coordinating emergency innovations, including the operation of the Gedebage emergency inorganic waste processing site and the acceleration of the Waste-Free Neighborhoods (KBS) program.

However, the crisis revealed that conventional government-centered waste management approaches remain insufficient for addressing complex urban waste problems. Although emergency interventions and infrastructure development were implemented, including support for waste processing facilities and collaboration with external actors, these measures have not fully resolved the structural challenges of waste governance. Emergency fiscal measures were also mobilized to support the crisis response, but these measures primarily addressed immediate disruptions rather than long-term institutional transformation. Accordingly, this study treats the crisis as a context that opened space for organizational change, rather than as the innovation mechanism itself. The mechanism examined is the quality of interaction through which government, partners, and citizens connect resources, knowledge, and practices.

Recent studies emphasize that sustainable waste management increasingly depends on collaborative governance involving cross-sector partnerships and community participation. The partner dimension enables governments to access technological resources, expertise, and organizational capacity from private organizations and community groups, while the citizen dimension strengthens behavioral change and waste reduction at the household level (Chen et al., 2020; Buchheim et al., 2020). In Bandung, private-sector involvement and community waste management groups have contributed to local processing innovations, including the development of waste processing facilities

and technological interventions. However, these initiatives have not been fully matched by citizen participation. Open Data Kota Bandung records 587 waste bank units; however, this figure does not necessarily indicate that all units are actively operational, as some units have no registered customers (Ningsih & Mulyati, 2025). Accordingly, formal partnerships, programs, and institutions are treated as evidence of actor involvement or organizational capacity; they are considered evidence of organizational innovation only when they are accompanied by a demonstrable change in organizational practice or coordination.

This condition highlights an important research gap. Existing studies on public sector innovation and sustainable waste management have largely examined external partnerships and citizen participation as separate dimensions. Less attention has been given to how the interaction between partner and citizen dimensions shapes public sector organizational innovation, particularly in contexts of urban environmental crisis. Understanding this interaction is important because the effectiveness of collaborative waste governance depends not only on the presence of multiple actors, but also on the quality of relationships, coordination mechanisms, and institutional capacity that connect them. The study therefore asks not simply whether collaboration exists, but when collaboration develops into sustained interaction and when that interaction produces a change in organizational practice.

Therefore, this study aims to analyze interaction-driven organizational innovation in public sector organizations for sustainable waste management in Bandung City, focusing on how partner and citizen dimensions interact in shaping changes in organizational practice and governance transformation. The study contributes theoretically by conceptualizing interaction as the relational mechanism through which partner and citizen contributions can be transformed into organizational innovation, while also examining how institutionalization supports or constrains the continuity of such changes.

## **LITERATURE REVIEW**

### **Urban Waste Governance and Sustainability Transitions**

Urban waste management is a critical challenge for sustainable development, particularly in rapidly urbanizing regions experiencing increasing waste volumes. Its complexity is shaped not only by technical and infrastructural constraints but also by

governance dynamics involving multiple actors (Kaza et al., 2018; Rashed, 2026). Consequently, linear approaches focused primarily on waste collection and final disposal are increasingly inadequate for addressing sustainability challenges. Recent literature emphasizes circular economy and governance-based approaches that integrate resource recovery, source-based management, and cross-actor collaboration, highlighting that sustainable waste management depends not only on technical solutions but also on coordinated interactions among government, private actors, and communities (Negrete-Cardoso et al., 2022; Sari & Lodan, 2024). Waste management can therefore be understood as a socio-technical system in which institutional arrangements, actor networks, and social practices interact to shape outcomes (Guerrero et al., 2013).

This shift also reflects the transition from predominantly hierarchical approaches toward more networked forms of governance, in which government increasingly performs a facilitating and coordinating role among actors with different interests, resources, and capacities (Rhodes, 1996). Effective waste governance consequently requires the integration of formal regulatory arrangements, community participation, and cross-sector collaboration (Guerrero et al., 2013). Co-production further strengthens this approach by positioning communities and civil society as active contributors to the provision and improvement of public services rather than solely as recipients (Ostrom, 1996).

The literature thus highlights three interrelated aspects of waste governance: formal regulation, community participation, and cross-sector collaboration. These aspects are used in this study as a synthesis of the waste governance literature and contextual background, rather than as a separate analytical framework. Formal regulation represents the institutional conditions through which government establishes rules, incentives, and coordination mechanisms; community participation reflects the social practices and behavioral engagement required for source-based waste management; while cross-sector collaboration concerns the involvement of private-sector and civil-society actors in providing resources, expertise, and implementation capacity. Their effectiveness depends on their alignment rather than on the strength of any single dimension.

This synthesis also provides a contextual link to the partner and citizen dimensions of public sector innovation identified by Chen et al. (2020). Cross-sector collaboration

corresponds primarily to the partner dimension, through which public organizations develop capacity by engaging external organizations, while community participation relates to the citizen dimension through citizen engagement and co-production. Formal regulation does not constitute a separate innovation dimension in the present study; rather, it represents the institutional and governance context within which partner and citizen interactions take place. This distinction is important because the presence of partners or citizens alone does not necessarily produce effective innovation. Their contributions need to be connected through appropriate institutional arrangements, coordination, and meaningful interaction.

In waste management, technological and infrastructural interventions are therefore unlikely to produce sustainable outcomes without corresponding behavioral change and institutional support at the household and community levels (Geels, 2002). Similarly, community participation is more likely to be sustained when supported by institutional mechanisms such as waste banks and neighborhood-level arrangements, while collaboration with private-sector actors can provide economic and operational incentives for maintaining material recovery systems. The interaction among these elements provides the contextual foundation for examining how partner and citizen dimensions contribute to public sector organizational innovation in sustainable waste management.

### **Public Sector Innovation in Complex Governance Contexts**

Public sector innovation (PSI) is used in this study as the broader field concerned with novel or improved ways of addressing public problems. Chen et al. (2020) conceptualize public service innovation as the development and implementation of novel ideas to create or improve public value within an organizational ecosystem. Their typology distinguishes innovation based on innovation focus and innovation locus, producing six types: mission, policy, management, partner, service, and citizen innovation. The terminology is differentiated here for analytical consistency: public sector innovation denotes the broader field; public service innovation denotes Chen et al.'s wider conceptualization and typology; public sector organizational innovation denotes the principal phenomenon examined in this study; and interaction-driven organizational

innovation denotes the process through which actor contributions become changes in organizational practice.

Among these types, partner and citizen innovation are central analytical dimensions in this study. Partner innovation refers to developing organizational capacity through partnerships and alliances with other organizations, enabling public organizations to access resources, expertise, and capabilities beyond their internal capacity. Citizen innovation involves mechanisms that facilitate citizen engagement, participation, and co-production in public service delivery. In waste management, these dimensions represent complementary contributions: partners may provide technological, organizational, and implementation capacity, while citizens contribute participation, local knowledge, and involvement in service delivery. Chen et al. (2020) further recognize that complex innovation initiatives may involve multiple interdependent innovation types, providing a basis for examining how partner and citizen contributions can become connected within public sector organizational innovation.

However, identifying the presence of partners and citizens does not explain how their interaction contributes to organizational innovation. Therefore, collaborative governance and co-creation are employed as supporting concepts to explain the quality and dynamics of interaction. Collaborative governance highlights how government and non-state actors work across organizational boundaries to address shared problems, while co-creation emphasizes joint contributions to the development and delivery of public value (Voorberg et al., 2015). These concepts shift the analytical focus from the presence of actors toward the processes of knowledge exchange, negotiation, adaptation, learning, and joint problem-solving through which their contributions become connected. Collaboration becomes interaction when actors exchange information and knowledge, respond to one another's contributions, and adapt their actions; interaction becomes organizational innovation when these relational processes produce and implement a departure from established organizational routines, such as a new coordination mechanism, resource configuration, or problem-solving practice.

The emergence of organizational innovation is also shaped by its institutional context. Critical juncture theory provides a complementary explanation for why periods of crisis can create opportunities for organizational and governance change (Capoccia &

Kelemen, 2007). In this study, the 2023 waste crisis is understood as a critical juncture that (1) created an opportunity structure by disrupting established arrangements, (2) increased institutional pressure and incentives for alternative responses, (3) altered relationships by increasing the government's need to engage external actors, and (4) enabled experimentation with new coordination and processing arrangements. The crisis therefore affects the conditions under which interaction can occur, but it does not directly produce interaction-driven organizational innovation. The innovation mechanism remains the quality of interaction among government, partners, and citizens.

Taken together, Chen et al. (2020) provide the principal framework, with partner and citizen innovation as the central analytical dimensions; collaborative governance and co-creation explain the quality of interaction between these dimensions; and critical juncture theory explains the crisis context that creates space for change. This configuration addresses a gap in existing research, which has paid considerable attention to external and collaborative innovation but less attention to how interaction between partner and citizen dimensions shapes public sector organizational innovation under conditions of crisis. Accordingly, this study conceptualizes public sector organizational innovation as an interaction-driven process in which the crisis creates space for change, partner and citizen contributions provide resources and knowledge, the quality of interaction determines whether those contributions are connected and transformed into new organizational practices, and institutionalization determines whether such practices are sustained.

### **Research Gap and Contribution**

The literature identifies two related gaps. First, public sector innovation research tends to examine partner and citizen dimensions as distinct forms of innovation (Chen et al., 2020), leaving limited understanding of how they interact within the same innovation process. This is particularly relevant to waste management, where external partners contribute resources and organizational capabilities, while citizens contribute participation and local knowledge. Second, Waste management research has increasingly emphasized technological, infrastructural, regulatory, and circular-economy solutions, while comparatively less attention has been given to stakeholder relationships, participation, and coordination in shaping sustainable waste management practices

(Guerrero et al., 2013; Awino, 2024). The presence of multiple actors or collaborative arrangements does not necessarily explain how their interactions generate organizational innovation.

To address these gaps, this study uses interaction-driven organizational innovation as a conceptual lens for examining how the quality of interactions among government, partners, and citizens shapes changes in organizational practice. Unlike collaborative innovation, which emphasizes the involvement of multiple actors in generating innovation, interaction-driven organizational innovation focuses on how their interactions influence the development and implementation of organizational change through communication and knowledge exchange, reciprocity and mutual contribution, learning and adaptation, and coordination in problem-solving and decision-making. This formulation does not treat every collaborative program as an innovation. Rather, the study identifies organizational innovation when documentary evidence indicates a departure from prior routines and an implemented or tested change in coordination, resource integration, or organizational practice. Accordingly, the framework of Chen et al. (2020) remains the principal framework, while collaborative governance and co-creation support the analysis of interaction processes and critical juncture theory explains the contextual role of the 2023 crisis.

## **RESEARCH METHODS**

This study employed a qualitative documentary case study to examine public sector organizational innovation in Bandung's waste management, with particular attention to how partner and citizen dimensions interact in shaping organizational change. Bandung was selected as the case because the 2023 waste crisis exposed structural limitations in the existing waste-management system while creating an opportunity for organizational and governance experimentation. The qualitative case study approach enabled the study to examine these changes within their institutional and policy context (Creswell & Poth, 2018; Yin, 2018).

Data consisted of official documentary evidence and secondary empirical data. Official documents included regulations, mayoral decrees, government reports, program documents, administrative records, and official waste-management statistics. Secondary

empirical evidence was drawn primarily from published studies on waste-management practices and citizen participation in Bandung, particularly the survey reported by Irmawartini et al. (2023). Previous empirical studies were also used for contextual and comparative purposes. Sources were selected based on their relevance to the research questions and their capacity to provide evidence concerning the partner dimension, citizen dimension, interaction processes, and institutional barriers.

Data were analysed thematically through documentary analysis and interpretive synthesis, involving familiarisation, coding, categorisation, theme development, and interpretation. The analysis distinguished between formal institutional arrangements and their implementation and compared evidence across different source types to identify converging and contrasting patterns. The coding was conducted interpretively, with categories refined through comparison across source types and repeated examination of converging and contrasting evidence. Analytical sufficiency was assessed when additional documentary or secondary evidence did not materially alter the identified analytical categories. Source triangulation was used to strengthen the credibility and traceability of the findings.

The analysis was guided primarily by Chen et al. (2020), particularly the partner and citizen dimensions of public sector innovation. The partner dimension was examined through external resources, joint programs, technological and organizational support, implementation capacity, and partnership continuity, while the citizen dimension focused on source segregation, waste-bank participation, local program participation, and continuity of participation. Collaborative governance and co-creation were used as supporting concepts to examine four interaction dimensions: communication and knowledge exchange; reciprocity and mutual contribution; learning and adaptation; and coordination, problem-solving, and joint decision-making. Critical juncture theory was used to explain how the 2023 crisis created an opportunity structure for organizational and governance change. To distinguish organizational innovation from routine collaboration or program implementation, documentary evidence was treated as evidence of organizational innovation only when it showed three elements: (1) a departure from an established organizational arrangement or routine; (2) a change in coordination, resource integration, decision-making, or organizational practice; and (3) implementation

or testing of the new arrangement rather than only its formal announcement. Thus, the existence of Kang Pisman, waste banks, partnerships, or other programs was not automatically coded as organizational innovation. The Satgas coordination mechanism and emergency/local processing experiments were considered innovation evidence because the documents indicate changes in coordination and processing arrangements beyond the pre-crisis routine, while their temporary or program-specific character was assessed separately under institutionalization.

## **RESULTS AND DISCUSSION**

### **The 2023 Waste Crisis as a Critical Juncture**

Documentary evidence from government waste-management statistics and policy documents indicates that, before 2023, waste management in Bandung remained largely dependent on a linear model focused on collection, transportation, and final disposal. Official data indicate that the system was constrained by limited local processing capacity and high dependence on the Sarimukti regional landfill. SIPSN data show that Bandung's daily waste generation increased from 1,539.82 tons in 2020 to 1,594.18 tons in 2022, before declining to 1,379.80 tons in 2023 (KLHK, n.d.). These figures are annual SIPSN estimates and should not be directly conflated with the later operational figures reported by the Bandung City Government. This structural imbalance made the system highly vulnerable to disruptions in final disposal capacity.

Government reports and policy records further document that the vulnerability became critical in August 2023 when a fire affected approximately 10 hectares of the Sarimukti landfill. The subsequent closure of the landfill caused 95 temporary waste disposal sites in Bandung to become overloaded, exposing the limitations of a waste management system heavily reliant on downstream disposal. A separate operational snapshot reported by the Bandung City Government in 2025 provides a more recent picture of this structural imbalance: Bandung generated approximately 1,492 tons of waste per day, of which 981 tons could be transported to the Sarimukti landfill, while approximately 250 tons could be processed within the city (Pemerintah Kota Bandung, 2025). These 2025 figures are used only as a subsequent operational snapshot of the

continuing structural capacity gap and are not treated as contemporaneous evidence of the 2023 emergency response.

**Table 1. Logistical Parameters and the Waste Management Gap in Bandung City Based on 2025 Operational Data**

| Management Parameter                        | Actual Volume (Tons/Day) | Percentage (%) | Data Status            |
|---------------------------------------------|--------------------------|----------------|------------------------|
| Total Actual Waste Generated                | 1,492                    | 100            | Reported figure (2025) |
| Waste Transported to Landfill               | 981                      | 65.7           | Reported figure (2025) |
| Residual Waste Requiring In-City Management | 511                      | 34.3           | Author's Calculation   |
| Existing City Processing Capacity           | 250                      | 16.8           | Reported figure (2025) |
| Remaining Processing Gap                    | 261                      | 17.5           | Author's Calculation   |

Source: Ministry of Environment data as reported by the Bandung City Government (2025). Residual waste and remaining processing gap are calculated by the authors.

Based on the 2025 operational figures reported by the Bandung City Government, 1,492 tons of waste were generated daily, while 981 tons could be transported to the Sarimukti landfill. This left approximately 511 tons per day requiring in-city management. With reported in-city processing capacity of approximately 250 tons per day, the remaining processing gap was calculated by the authors as 261 tons per day ( $511 - 250 = 261$ ). Thus, the 261-ton/day figure represents a calculated operational gap based on the 2025 configuration of waste generation, landfill transport capacity, and in-city processing capacity, rather than a direct estimate of the 2023 waste crisis.

Table 1 illustrates the structural gap between Bandung's waste generation, landfill disposal capacity, and local processing capacity based on 2025 operational data. The reported government figures indicate that Bandung generated approximately 1,492 tons of waste per day, of which 981 tons could be transported to the landfill, leaving approximately 511 tons for in-city management. With reported in-city processing capacity of approximately 250 tons per day, the authors calculated a remaining processing gap of 261 tons per day. This calculation highlights the continued mismatch between waste generation, downstream disposal capacity, and in-city processing capacity. Importantly,

this 261-ton/day gap represents the operational situation reported in 2025 and is therefore used as evidence of the persistence of structural capacity constraints rather than as a direct measurement of the 2023 waste crisis.

The documentary evidence also indicates that the limitations of the pre-crisis waste management system were reflected in the regulatory configuration. Bandung City Regional Regulation No. 9 of 2018 on Waste Management combines participatory and enforcement-oriented provisions within a single regulatory framework (Pemerintah Kota Bandung, 2018). On the one hand, Article 49 provides opportunities for communities to contribute proposals, participate in policy formulation, and provide input in waste-related dispute resolution. On the other hand, the regulation establishes administrative monetary sanctions for specified waste-related violations and provides mechanisms for investigation and criminal enforcement.

The provisions documented in Bandung City Regional Regulation No. 9 of 2018 (Pemerintah Kota Bandung, 2018) show that Bandung's waste governance formally recognizes both participation and regulatory compliance. However, the coexistence of participatory and enforcement-oriented mechanisms did not necessarily translate into integrated horizontal governance. The gap between formal participation and its implementation contributed to fragmented collaboration and helps explain the institutional limitations of the pre-crisis waste management system.

**Table 2. Regulatory Orientations within Bandung City's Waste Management Framework**

| <b>Analytical Dimension</b>         | <b>Participatory and Source-Based Orientation</b>                                                                                                                                                 | <b>Enforcement and Compliance Orientation</b>                                       | <b>Implication for Governance Transformation</b>                                                                    |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Citizen and Community Participation | Article 49 provides opportunities for communities to submit proposals, considerations, and suggestions, participate in policy formulation, and provide input in waste-related dispute resolution. | Participation is accompanied by regulatory obligations and compliance requirements. | The regulation formally opens space for citizen involvement while retaining a strong regulatory role for government |
| Source-Based Waste Management       | The regulation establishes responsibilities related to waste reduction, separation, and management at source.                                                                                     | Violations of waste-management requirements can trigger administrative enforcement. | Source-based participation is supported by enforceable regulatory obligations.                                      |

|                                                              |                                                                                                 |                                                                                                                                                                                                  |                                                                                                                                                           |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Enforcement                                                  | Participatory mechanisms provide channels for community involvement in governance.              | Article 51 establishes administrative monetary sanctions for specified                                                                                                                           | Participatory governance coexists with command-and-control enforcement within the same regulatory framework.                                              |
| Implication for Interaction-Driven Organizational Innovation | Government facilitates participation, coordination, and waste-management services.              | The challenge is not the absence of participatory regulation, but how participatory provisions are translated into sustained interaction and co-creation that can support organizational change. | The regulatory structure provides opportunities for collaboration but does not eliminate government authority.                                            |
| Implication for Interaction - Driven Innovation              | Creates institutional space for communities and other actors to contribute to waste governance. | Maintains formal compliance mechanisms that can reinforce government-centered implementation.                                                                                                    | The challenge is not the absence of participatory regulation, but how participatory provisions are translated into sustained interaction and co-creation. |

Source: Author's analysis based on Bandung City Regional Regulation No. 9 of 2018 on Waste Management

Against this background, the documentary evidence of the 2023 emergency response indicates that the waste crisis created pressure for organizational and governance change. Drawing on the critical juncture perspective, the crisis can be understood as an institutional turning point in which external pressure opened opportunities for changes that would have been more difficult under normal circumstances (Capoccia & Kelemen, 2007). The Bandung City Government declared a waste management emergency and established the Emergency Waste Management Task Force (Satgas) through Mayor's Decree No. 658.1/Kep.2428-DLH/2023 (Pemerintah Kota Bandung, 2023c). Rather than relying solely on existing bureaucratic procedures, the Task Force provided a more flexible cross-actor coordination mechanism, facilitating faster decision-making, streamlined administrative procedures, and greater coordination among government units and non-governmental actors. This change is treated as an organizational innovation experiment because it altered the coordination arrangement used to respond to the waste crisis; the crisis itself is treated only as the contextual trigger that made this change possible.

Policy and program document further indicate that the crisis also stimulated governance experimentation beyond immediate operational responses. The findings indicate greater government openness to non-governmental actors in source-based waste management and community behavioral-change initiatives, creating opportunities for more adaptive governance arrangements. The development and testing of local processing arrangements, including the Gedebage emergency inorganic waste processing site, also represented a departure from exclusive reliance on downstream landfill disposal. These initiatives constitute evidence of organizational innovation only to the extent that they changed how waste-processing capacity and coordination were organized or tested; the existence of a program or infrastructure by itself is not treated as innovation. However, the transformation remained at an early stage: the innovations that emerged were largely reactive and had not yet been fully integrated into long-term policy frameworks.

Overall, the documentary evidence reviewed in this study indicates that the 2023 crisis exposed the structural and institutional limitations of Bandung's existing waste management system while opening a window for organizational experimentation. The establishment of the Emergency Waste Management Task Force represented an important response by creating a more flexible coordination mechanism, while local processing experiments introduced alternatives to the established collection-transportation-landfill configuration. At the same time, the evidence does not demonstrate that these experiments had become stable city-wide organizational routines. Their persistence therefore depends on whether temporary arrangements are converted into formal, resourced, and routinely implemented mechanisms. The critical juncture created space for change without determining its direction, quality, or sustainability.

### **Development of the Partner Dimension**

The 2023 waste crisis was followed by a broader involvement of non-governmental actors in Bandung's waste management. This expansion is documented in the development of community-based waste institutions and upstream waste-management initiatives. Official Open Data Kota Bandung records 587 registered waste-bank units, although available evidence indicates that not all registered units were active and some

had no customers. Government program documentation also records that, in May 2023, the Bandung City Government promoted the implementation of Kang Pisman across the city's 1,568 neighborhood units (RW), emphasizing waste reduction, separation, and utilization at the community level. These developments indicate an expansion of organizational capacity beyond formal government agencies and provide empirical support for the partner dimension identified by Chen et al. (2020).

### ***Expansion of External Actors***

Documented evidence indicates that the expansion involved environmental communities, waste-bank managers, neighborhoods organizations, and other non-governmental actors. Their involvement was not limited to formal government programs. For example, previously documented activities show that the Dago Barat Resik Hejo community group (Dabaresih) in Dago had initiated Kang Pisman-related socialization and environmental activities since 2020, illustrating how local community networks could support government waste-management objectives. Previous research on Kang Pisman implementation also indicates that community empowerment involves individual, institutional, and network capacity, although these capacities have not yet been strengthened optimally.

### ***Forms and Contributions of Partners***

Available program documentation and previous research indicate that the contribution of community-based partners was primarily visible in outreach, environmental education, waste sorting, and local implementation. Waste banks provided an organizational mechanism for connecting waste reduction and recycling activities with community-level management, although their effectiveness remained uneven. Government program documentation further indicates that the development of local processing infrastructure also illustrates the emergence of more technology-oriented responses. In late 2023, Gedebage Integrated Waste Processing Facility (TPST Gedebage) was developed and tested with a target capacity of approximately 60 tons of waste per day, using maggotization for organic waste and RDF processing for inorganic waste.

These developments suggest that the partner dimension expanded not simply through the addition of actors, but through the introduction of community, organizational, and technical resources that were not previously concentrated within government agencies. This is consistent with Chen et al. (2020), who conceptualize partner-oriented innovation as involving external actors whose resources and capabilities complement those of public organizations. However, the study distinguishes this partner contribution from organizational innovation itself: partner involvement becomes evidence of organizational innovation only when the external resources are integrated into a changed organizational practice or coordination arrangement. The available evidence supports this interpretation most clearly in the development and testing of local processing arrangements and in the flexible cross-actor coordination introduced during the emergency response.

### ***Limitations of the Partner Dimension***

Despite this expansion, the partner dimension remains uneven and only partly institutionalized. Official records showing 587 waste banks do not imply equivalent operational capacity, as some units have no customers. Previous research on Kang Pisman also identifies limitations in individual, institutional, and network capacity. The available evidence therefore suggests that external actors have expanded the government's implementation capacity, but their involvement remains largely tied to particular programs and local initiatives. Based on the available evidence, no interaction-driven organizational innovation can yet be classified as fully institutionalized at the city-wide level. Formalized elements such as waste-bank and Kang Pisman programs coexist with temporary or program-specific innovations such as emergency Satgas coordination and local processing experiments, indicating partial rather than full institutionalization.

### ***Condition of the Citizen Dimension***

While the development of the partner dimension indicates an increasing involvement of external actors in Bandung's waste governance, the condition of the citizen dimension reveals a different pattern. The manifestation of organizational innovation at the upstream level depends substantially on the extent to which citizens are able to

internalize waste-management practices in their everyday activities. In conventional governance arrangements, communities tend to be positioned primarily as recipients of sanitation services or as subjects of regulation. However, sustainable waste management requires collective behavioral change at the household and community levels (Ostrom, 1996; Guerrero et al., 2013). In Bandung, the available documentary and secondary empirical evidence indicates a persistent gap between formal policy commitments and the actual internalization of waste-management practices among residents

### ***Formal Commitment versus Actual Participation***

The Bandung City Government has introduced a number of policies and programs intended to strengthen citizen involvement in source-based waste management. These include Mayor Regulation No. 88 of 2021 on waste-management governance through the Regional Public Service Agency (BLUD) model and the Kang Pisman program, which promotes the principles of reducing, separating, and utilizing waste. However, the existence of these formal arrangements has not yet translated into consistent behavioral change at the household level. Secondary empirical evidence from Irmawartini et al. (2023) indicates that public participation in source-based waste management remains limited, particularly in household waste segregation, waste-bank participation, and organic waste utilization

The gap between formal policy commitments and actual citizen participation is evident across several indicators of citizen performance. Table 3 summarizes the main indicators of citizen participation and illustrates the extent to which waste-management programs have been translated into household and community practices.

**Table 3. Citizen Dimension Performance in Waste Governance in Bandung City**

| <b>Citizen Performance Indicator</b> | <b>Empirical Finding</b>                                                            | <b>Denominator/Evidence</b>                                |
|--------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------|
| Household Waste Segregation          | 30.2% of respondents reported sorting waste                                         | 301 respondents from 72 urban villages in 30 sub-districts |
| Waste Bank Membership                | 0.7% of respondents were waste-bank customers                                       | Same respondent sample                                     |
| Kang Pisman Implementation           | 17.9% of respondents reported implementing Kang Pisman                              | Same respondent sample                                     |
| Organic Waste Utilization            | 5.6% of respondents reported utilizing organic waste for waste reduction activities | Same respondent sample                                     |

Source: Secondary empirical evidence from Irmawartini, Mulyati, and Pujiono (2023).

The survey reported by Irmawartini et al. (2023) found that household waste segregation was reported by only 30.2% of respondents, while 0.7% were waste-bank customers, 17.9% reported implementing Kang Pisman, and 5.6% reported utilizing organic waste for waste-reduction activities (Irmawartini et al., 2023). This secondary empirical evidence indicates that citizen-oriented waste-management practices had not yet been widely internalized among the surveyed residents. However, participation should not be interpreted solely as a matter of citizen behavior, as it is also shaped by access to services, infrastructure, information, incentives, and local institutional support.

The gap therefore lies not simply in the absence of policy instruments, but in the limited translation of formal commitments into sustained household practices. This gap is shaped by the interaction of behavioral, infrastructural, institutional, and incentive-related conditions.

### ***Participation Remains Uneven***

Beyond its relatively low overall level, citizen participation also varies across neighborhoods. Secondary evidence from Bandung shows substantial differences in the implementation of Kang Pisman. A comparative study of Kebon Pisang and Sukamiskin found overall participation rates of 83.11% and 70.31%, respectively, with differences in waste reduction, separation, and utilization practices (Maulana et al., 2021). These differences indicate that participation is shaped by local conditions rather than being uniformly produced by city-wide programs.

The broader secondary survey evidence reported by Irmawartini et al. (2023) also indicates that participation remains limited at the city level. Among 301 respondents across 72 urban villages in Bandung, only 30.2% reported sorting household waste, 17.9% reported implementing Kang Pisman, 5.6% reported utilizing organic waste, and 0.7% were waste-bank customers. The same survey reported that 27.9% of respondents knew about Kang Pisman, compared with only 17.9% who reported implementing it, indicating a gap between program awareness and household practice.

Taken together, these secondary empirical findings suggest that participation is influenced by local social and institutional conditions, including community capacity,

information, perceived benefits, and access to supporting arrangements. This interpretation is consistent with Alfitri et al. (2026), who emphasize the importance of combining environmental awareness and economic benefits in encouraging household participation. It also supports Guerrero et al. (2013), who argue that sustainable waste management requires effective community involvement in source-based practices. Thus, the unevenness of participation reflects not simply differences in citizen willingness, but the interaction between household behavior and the social, institutional, and infrastructural conditions in which participation takes place.

### ***Citizen Dimension Remains Weakly Institutionalized***

Although citizen involvement has expanded through programs such as Kang Pisman and waste banks, the available documentary and secondary empirical evidence indicates that citizen engagement has not yet become a consistently institutionalized practice. The survey reported by Irmawartini et al. (2023) found that only 17.9% of respondents reported implementing Kang Pisman, 5.6% utilized organic waste, and 0.7% were waste-bank customers. The gap between awareness and practice is also evident in Kang Pisman: while 27.9% of respondents reported knowing the program, only 17.9% reported implementing it at the household level. These figures demonstrate the limited continuity of citizen practices, but they do not by themselves establish the absence of formal institutionalization; rather, they indicate that formal program presence has not been translated uniformly into stable routines.

Institutional presence also does not necessarily indicate sustained participation. Official records indicate that Bandung has 587 registered waste-bank units, but available evidence shows that some registered units have no customers, indicating differences in operational activity and community engagement across units. Thus, the expansion of formal programs and community institutions has not yet translated uniformly into sustained household practices. The distinction is therefore between formalization and institutionalization: registration or program designation indicates formal presence, whereas institutionalization requires repeated implementation, operational continuity, supporting resources, and locally sustained participation.

The depth of participation is also uneven. Secondary comparative evidence from Kebon Pisang and Sukamiskin shows that even within the same city-wide program, participation differs across localities, with overall Kang Pisman participation reaching 83.11% in Kebon Pisang compared with 70.31% in Sukamiskin (Maulana et al., 2021). This suggests that institutionalization depends not only on program availability but also on the capacity of local actors to sustain participation through information, social networks, practical support, and perceived benefits.

From an institutional perspective, citizen engagement becomes institutionalized when repeated participation develops into stable routines, shared practices, and locally supported norms. The documentary and secondary evidence reviewed in this study suggests that this process remains incomplete: formal programs and community institutions are present, but their implementation and participation remain uneven. This is consistent with Geels (2002), who emphasizes that institutional and technological transitions also require changes in established social practices and routines. In relation to interaction-driven organizational innovation, institutionalization is therefore assessed not only by whether a program or institution exists, but by whether the interaction mechanisms supporting citizen participation are repeated, resourced, and embedded in routine governance. The implication is that strengthening citizen participation requires not only expanding programs, but also creating the local conditions that enable those practices to become sustained and collectively maintained.

### **Interaction between Partner and Citizen Dimension**

The preceding findings show that the partner and citizen dimensions developed at different rates after the 2023 crisis. Partner involvement expanded through environmental communities, waste banks, neighborhoods organizations, and other non-governmental actors, while citizen participation remained more limited. Secondary empirical evidence from Bandung, particularly the survey reported by Irmawartini et al. (2023), shows that only 30.2% of 301 respondents reported household waste sorting, 17.9% reported implementing Kang Pisman, 5.6% reported utilizing organic waste, and 0.7% were waste-bank customers. These figures suggest that the expansion of partner-based arrangements was not accompanied by an equivalent level of household participation. Taken together

with the documented development of partner-based arrangements, this secondary evidence provides a basis for reconstructing the interaction between partner capacities and citizen practices. The central issue is therefore how partner resources and capacities are connected with citizen knowledge and practices through interaction.

### ***Bridging Role of Communities***

Environmental communities and waste-bank managers provide an important link between government and citizens. Documentary evidence and previous research on Bandung's community-based waste-management initiatives indicate that their bridging role is evident in community-based waste-management activities that translate government programs into local practices while connecting household participation with organizational resources. The importance of this intermediary role is also reflected in research on Bandung's Kang Pisman program, which identifies collaboration among government, community organizations, waste banks, private-sector actors, and residents.

This role is particularly important because formal program coverage does not automatically produce household participation. The secondary survey evidence reported by Irmawartini et al. (2023) found that only 17.9% of respondents implemented Kang Pisman and only 0.7% were waste-bank customers. Community intermediaries therefore become important in translating formal programs into information, guidance, and locally relevant practices. This supports Ansell and Gash's (2008) argument that collaborative governance depends on interaction among interdependent actors, while extending it by showing that intermediary actors can facilitate connections between actors with different institutional positions.

### ***From Structural Collaboration to Relational Interaction***

The Bandung case distinguishes between the expansion of collaborative structures and the development of meaningful interaction. Collaborative structures have clearly expanded: government programs involve community organizations, waste banks, private-sector actors, and residents. However, secondary empirical evidence from Bandung indicates that formal involvement does not necessarily produce continuous cross-actor interaction. A recent study of collaborative governance in Antapani Tengah,

for example, found that collaboration involved government agencies, neighborhoods officials, community leaders, facilitators, waste-bank managers, private-sector actors, and residents, but face-to-face cross-actor meetings remained infrequent, resulting in uneven shared understanding and commitment. Collaboration becomes interaction when these actors exchange knowledge, respond to one another's contributions, and adapt their practices; it becomes organizational innovation only when such interaction results in an implemented change in organizational practice.

This finding is consistent with the broader Bandung evidence. The survey evidence reported by Irmawartini et al. (2023) shows that, although Kang Pisman has been implemented as a community-based program, only 17.9% of surveyed respondents reported implementing it, compared with 27.9% who reported knowing the program. The difference indicates that the existence of a collaborative program does not by itself ensure that information, resources, and responsibilities are translated into sustained household practice.

Thus, structural collaboration should be distinguished from interaction-driven organizational innovation. Structural collaboration refers to the formal or programmatic involvement of multiple actors, whereas interaction-driven organizational innovation requires actors to exchange knowledge, respond to one another's contributions, adapt practices, and jointly address problems in ways that produce a demonstrable change in organizational arrangements or routines. This distinction is consistent with Chen et al. (2020) and Ansell and Gash (2008), but the documentary and secondary empirical evidence reviewed in this study suggests that the critical issue is not simply the number of actors involved but the continuity and quality of their interaction and whether that interaction is translated into organizational change.

### ***Quality of Interaction***

The quality of interaction can be further examined through four interrelated dimensions: communication and knowledge exchange; reciprocity and mutual contribution; learning and adaptation; and coordination, problem-solving, and joint decision-making. These dimensions are reconstructed analytically from the documentary evidence and secondary empirical studies reviewed in this study rather than from direct

observation or interviews. They are not treated as separate stages of innovation; instead, they are relational mechanisms used to assess whether collaboration develops into interaction and whether interaction is capable of producing organizational change. Evidence of innovation is strongest where these mechanisms are linked to an identifiable change in coordination, resource integration, or organizational practice.

### **1. Communication and knowledge exchange**

The first dimension is communication and knowledge exchange. Documentary and secondary empirical evidence from Bandung indicates that community-based actors provide an important channel for translating waste-management programs into local practices. However, communication does not always result in behavioral adoption. The survey reported by Irmawartini et al. (2023) found that 27.9% of respondents knew about Kang Pisman, while only 17.9% reported implementing it at household level. This gap suggests that information transmission alone is insufficient; communication becomes more meaningful when it is accompanied by local guidance, adaptation, and opportunities for practice. This supports the collaborative governance perspective of Ansell and Gash (2008), in which interaction involves more than one-way information dissemination.

### **2. Reciprocity and mutual contribution**

The second dimension concerns reciprocity and mutual contribution. The Bandung waste-governance arrangement brings together different types of resources: government provides regulatory and organizational capacity, community actors provide local implementation capacity, citizens contribute participation and local knowledge, and private or producer actors can contribute resources and technical capabilities. Previous research on waste-bank members in the Bandung area also identifies producer contribution as an important issue within community-based waste management. However, reciprocity remains incomplete because the distribution of decision-making authority is unequal. The documentary and secondary evidence reviewed here indicates that non-governmental actors are more frequently involved in implementation than in determining strategic priorities. Thus, actors contribute different resources, but these contributions are not yet consistently combined through reciprocal decision-making. This reinforces the collaborative governance argument that interdependence must be

accompanied by meaningful engagement rather than merely functional participation (Ansell & Gash, 2008).

### **3. Learning and adaptation**

The third dimension is learning and adaptation. The crisis created opportunities for experimentation, while community-based initiatives provided spaces for adapting waste-management practices to local conditions. Documented developments in collaborative arrangements around Kang Pisman indicate that waste-management implementation increasingly depends on local actors rather than on uniform administrative delivery. However, the available evidence also indicates that learning remains uneven. Secondary empirical evidence from the Antapani study found that infrequent cross-actor meetings contributed to uneven shared understanding and commitment, limiting the development of continuous collaborative learning. This suggests that learning currently occurs largely through local practices and relationships rather than through a systematic city-wide mechanism. The finding is consistent with the study's broader argument that innovation requires learning and adaptation among interacting actors rather than simply the adoption of new programs.

### **4. Coordination, problem-solving, and joint decision-making**

The fourth dimension concerns coordination, joint problem-solving, and decision-making. The establishment of the Emergency Waste Management Task Force during the 2023 crisis created a more flexible coordination mechanism among government units and external actors. At the local level, collaborative arrangements also involve community organizations, waste banks, private-sector actors, and residents. However, documentary and secondary empirical evidence from Bandung indicates that cross-actor coordination remains uneven. In Antapani Tengah, for example, the secondary study reported that face-to-face meetings among actors were infrequent, contributing to differences in shared understanding and commitment.

More importantly, coordination does not necessarily imply joint decision-making. The evidence reviewed in this study indicates that government continues to retain substantial authority over policy direction and program design, while non-governmental actors are more commonly involved during implementation. Consequently, collaboration may enable actors to coordinate activities without giving them equal influence over

problem definition, priority setting, or solution design. This distinction is important because co-creation requires actors not only to implement solutions but also to participate in shaping them. The documentary and secondary evidence therefore suggests that coordination has developed further than strategic joint decision-making. This asymmetry helps explain why several interaction processes have generated experimentation but have not yet produced fully reciprocal and institutionalized organizational change.

### ***Interaction as the Mechanism of Innovation***

Taken together, the documentary and secondary empirical evidence indicates that public sector organizational innovation is most evident when partner capacities and citizen participation become connected through sustained interaction and this connection changes how the organization coordinates, integrates resources, or solves problems. Partners contribute organizational resources, technical capabilities, and implementation capacity, while citizens contribute local knowledge and behavioral participation. Community and waste-bank actors help connect these contributions by translating programs into local practices and conveying local experiences back to other actors. However, the evidence reviewed also shows that these connections remain uneven: household participation remains limited, cross-actor meetings are not always regular, and strategic decision-making remains largely government-led. The resulting innovation is therefore better characterized as partial and experimental organizational change rather than a fully institutionalized transformation.

The Bandung case therefore suggests that structural collaboration is a necessary but insufficient condition for public sector organizational innovation. Innovation is more likely when actors communicate and exchange knowledge, contribute reciprocally, learn and adapt together, and coordinate problem-solving, and when these interactions result in an implemented change in organizational practice. This extends Chen et al. (2020) by showing that partner and citizen dimensions are not only complementary sources of organizational capacity; their interaction constitutes an important relational mechanism through which those capacities can become organizational innovation. It also reinforces Ansell and Gash (2008) by demonstrating that the quality and continuity of interaction are critical to transforming collaboration into more sustained forms of joint action.

### Barriers to Interaction-Driven Organizational Innovation

Although the interaction between partner and citizen dimensions has generated new forms of collaboration and practice-based organizational experimentation, the documentary and secondary empirical evidence synthesized in this study indicates that interaction-driven organizational innovation in Bandung remains constrained by several structural and institutional barriers. These barriers explain why the expansion of external actors and community participation has not yet developed into a stable, reciprocal, and adaptive organizational arrangement. Based on an analytical synthesis of government policy documents, official records, Irmawartini et al. (2023), previous empirical studies, and the relevant literature, four interrelated barriers are particularly evident: institutional fragmentation, power asymmetry, uneven citizen capacity, and weak institutionalization.

**Table 4. Barriers to Interaction-Driven Organizational Innovation in Bandung's Waste Governance**

| No. | Barrier                     | How It Appears in Bandung                                                                                                                                                                               | Supporting Evidence                                                                                                                                                                                                                                                                                            | Effect on Partner-Citizen Interaction                                                                                                                                                      | Implication for Innovation                                                                                                                                                     |
|-----|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Institutional Fragmentation | Coordination is still organized mainly through separate programs and sector-based initiatives. There is no stable mechanism that continuously connects government, partners, communities, and citizens. | In Antapani Tengah, many actors were involved in Kang Pisman, but face-to-face meetings across actors were still limited. This resulted in differences in shared understanding and commitment. Perda No. 9/2018 also combines community participation with strong government regulatory and enforcement roles. | Interaction tends to remain limited to specific programs rather than becoming continuous and integrated across actors.                                                                     | Resources, knowledge, and experiences from partners and citizens are difficult to combine continuously. Collaboration therefore remains program-based rather than system-wide. |
| 2   | Power Asymmetry             | The government still has a stronger role in setting policy direction and designing programs, while non-governmental actors are more often involved in implementation.                                   | Perda No. 9/2018 gives the government substantial authority in regulation, supervision, investigation, and enforcement. The Emergency Waste Management Task Force was also established by the city government as the main coordination mechanism during the 2023 crisis.                                       | Partners and citizens can contribute resources, knowledge, and implementation capacity, but have more limited influence in defining problems, setting priorities, and designing solutions. | Interaction tends to be instrumental rather than reciprocal. Co-creation is therefore stronger at the operational level than at the strategic level.                           |
| 3   | Uneven Citizen Capacity     | Citizen participation and the capacity of community institutions vary across locations. Household                                                                                                       | A survey of 301 respondents in 72 urban villages and 30 sub-districts found that only 30.2% sorted household waste, 17.9% implemented                                                                                                                                                                          | Partner organizations may provide technology, resources, and                                                                                                                               | A gap remains between partner capacity and citizen practice, making                                                                                                            |

|   |                           |                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                            |                                                                                                                                                                        |
|---|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                           | waste-management practices have not yet become consistent daily routines.                                                                                                            | Kang Pisman, 5.6% used organic waste for waste reduction, and 0.7% were waste-bank customers (Irmawartini et al., 2023). Local studies also show differences in implementation and limitations in supporting facilities.                                                                                                                       | organizational capacity, but citizen participation is not always strong enough to turn these resources into sustained household practices.                                 | innovation difficult to sustain and scale.                                                                                                                             |
| 4 | Weak Institutionalization | Innovations that emerged after the 2023 crisis remain largely reactive, experimental, or program-specific and have not been fully integrated into long-term governance arrangements. | The Emergency Waste Management Task Force was created as a crisis-response mechanism. TPST Gedebage was developed and tested with a target capacity of about 60 tons/day, but was initially still in the trial stage. Later studies continued to identify problems with facilities, waste transportation, public awareness, and waste sorting. | Interaction and innovation remain dependent on crisis momentum, specific programs, available resources, and individual actors rather than stable institutional mechanisms. | Local experiments and learning have not yet been fully converted into stable governance routines, creating a risk of returning to conventional bureaucratic practices. |

Source: Authors' analytical synthesis based on official policy documents and records, Irmawartini et al. (2023), Ansell and Gash (2008), Cinar et al. (2019), Geels (2002), Perda Kota Bandung No. 9/2018, and Bandung City Government policy documents.

The analytical synthesis presented in Table 4 shows that the four barriers are interconnected rather than independent. Rather than representing direct perceptions or accounts obtained from interview participants, these barriers are derived by interpreting patterns across the documentary and secondary empirical evidence reviewed in this study. The evidence demonstrates that the main constraint on interaction-driven organizational innovation is not the absence of actors. Bandung has developed formal participatory arrangements, emergency coordination mechanisms, community-based initiatives, private-sector involvement, and technological experiments. Rather, the more fundamental problem lies in the quality, distribution, and institutional continuity of interactions among these actors. Institutional fragmentation limits continuous coordination; power asymmetry constrains reciprocal participation in decision-making; uneven citizen capacity weakens the connection between partner resources and household practices; and weak institutionalization prevents successful experiments from becoming stable organizational routines. These patterns also clarify the institutionalization finding: formal arrangements exist, but the mechanisms needed to reproduce and sustain interaction-driven organizational change remain uneven.

Taken together, the analytical synthesis indicates that these barriers explain why the presence of multiple actors has not yet consistently produced interaction-driven organizational innovation in Bandung's waste governance. They also help explain why the partner dimension has developed more rapidly than the citizen dimension. While partners have increasingly contributed organizational resources, technical capabilities, and implementation capacity, these contributions have not been consistently connected with sustained citizen participation and household practices. As a result, collaboration has expanded structurally, some interaction-driven experiments have emerged, but the available evidence does not yet support a conclusion that these changes have become stable, city-wide organizational routines.

### **Theoretical Contribution: From Collaborative to Interaction-Driven Organizational Innovation**

This study contributes to the public sector innovation literature by extending the partner-citizen perspective of Chen et al. (2020). Their framework identifies partner and citizen dimensions as important forms of public service innovation within a broader public sector innovation field. The Bandung case confirms the importance of both dimensions, but shows that their presence alone does not automatically generate public sector organizational innovation. Rather, organizational change depends on how the capacities and contributions of partners and citizens are connected through interaction. The principal outcome examined in this study is therefore public sector organizational innovation; interaction-driven organizational innovation names the relational process through which that outcome may emerge. Chen et al. (2020) explain where innovation capacity is located, while collaborative governance and co-creation explain how actors are institutionally engaged and contribute to public value; this study adds an intermediate relational explanation of how these contributions are connected, mutually adjusted, and translated into organizational change, showing that actor capacities and collaborative structures alone are insufficient when interaction is not sufficiently reciprocal, adaptive, and connected to decision-making. The theoretical contribution lies in specifying these relational conditions rather than proposing interaction as a new form of collaboration.

This relational explanation distinguishes interaction-driven organizational innovation from collaborative governance, co-creation, and collaborative innovation. Collaborative governance explains the institutional arrangement for cross-actor collaboration, co-creation emphasizes joint contributions to public value, and collaborative innovation focuses on innovation involving multiple actors. In contrast, interaction-driven organizational innovation focuses on how these contributions are connected, mutually adjusted, and transformed into organizational change. Its conceptual boundary lies in treating interaction not as evidence of collaboration itself, but as the mechanism that is analytically relevant only when reciprocal processes are translated into an identifiable change in organizational practice. Thus, structural collaboration is a necessary but insufficient condition for organizational innovation; what matters is the continuity and quality of interaction and whether interaction produces an identifiable change in organizational practice. This distinction is consistent with the Bandung evidence, where collaborative structures have expanded but meaningful cross-actor interaction and institutional continuity remain uneven.

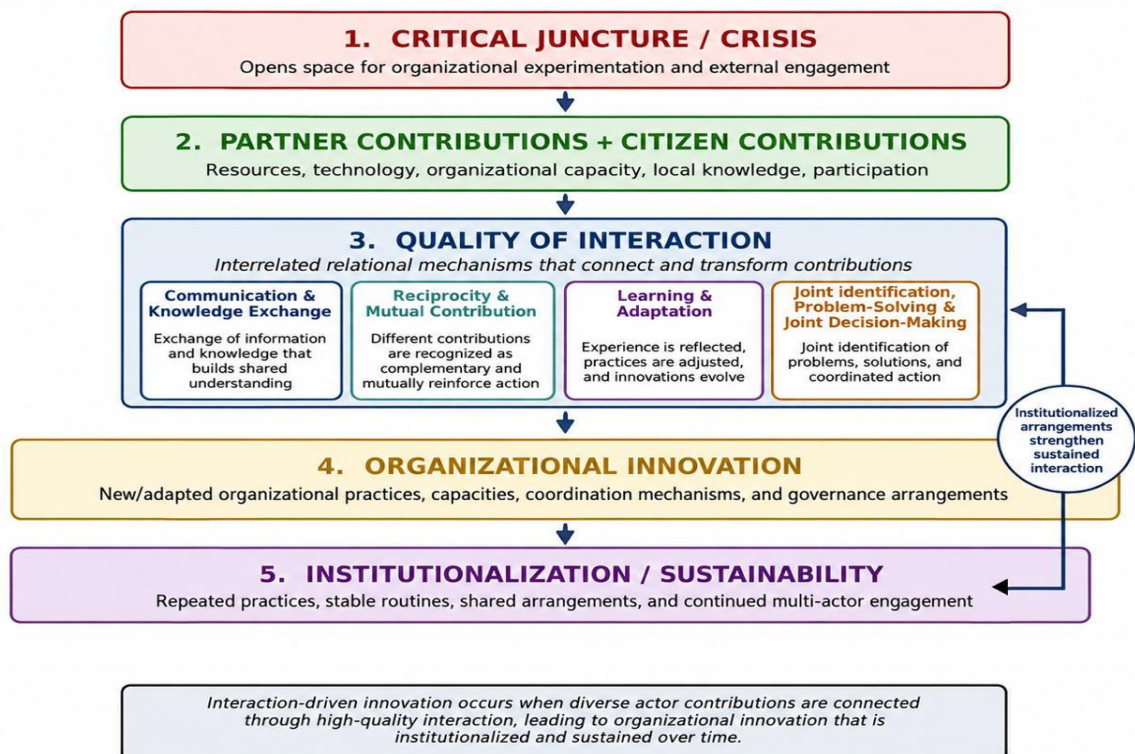
The four dimensions identified in this study—communication and knowledge exchange, reciprocity and mutual contribution, learning and adaptation, and coordination, problem-solving, and joint decision-making—are conceptualized as interrelated relational mechanisms rather than separate stages or types of innovation. They explain how partner resources, citizen knowledge, and participation become connected and translated into organizational change. Communication enables knowledge exchange; reciprocity connects different contributions; learning and adaptation allow practices to be adjusted; while coordination and joint problem-solving connect interaction with organizational action. An interaction process is considered to have produced organizational innovation when these mechanisms are associated with an implemented or tested change in organizational arrangements, rather than merely with participation in an existing program.

The role of environmental communities and waste-bank managers further illustrates this mechanism. These actors bridge government and citizens by translating programs into locally relevant practices while conveying community knowledge and needs to the knowledge exchange, reciprocity, learning, adaptation, and joint problem solving

government. Their contribution is therefore not only the resources they provide, but also their capacity to connect actors across institutional boundaries.

The study also adds a temporal dimension by linking interaction-driven organizational innovation to the 2023 waste crisis as a critical juncture. The crisis opened space and pressure for governance experimentation and greater involvement of non-governmental actors, but did not directly produce innovation; rather, it altered the conditions under which partner and citizen contributions could be connected through interaction. As summarized in Figure 1, the process links crisis-induced opportunity and pressure, actor contributions, interaction quality, organizational change, and institutionalization. The arrows represent a generative rather than linear causal sequence: institutionalization not only sustains organizational change but can also strengthen the capacity for future interaction.

**Figure 1. Conceptual Framework of Interaction-Driven Public Sector Organizational Innovation**



Based on this framework, the study proposes four theoretical propositions: (1) a critical juncture creates opportunities and pressure for public sector organizational

innovation but does not determine its emergence or sustainability; (2) partner and citizen contributions are complementary but insufficient when they remain disconnected; (3) the quality of interaction functions as the relational mechanism through which these contributions can become organizational innovation; and (4) institutionalization determines whether interaction-driven organizational innovation becomes a sustained organizational practice or remains temporary, program-specific, or returns toward government-centered governance. Accordingly, interaction-driven organizational innovation specifies the relational mechanism linking actor contributions and collaboration to public sector organizational change.

## **CONCLUSION**

This study finds that organizational innovation in Bandung's waste management emerged through an interaction-driven process shaped by the 2023 waste crisis. First, the crisis created an opening for collaborative innovation by exposing the limitations of the existing government-centered system and encouraging more flexible coordination and external engagement. However, the resulting innovations remained largely reactive and incompletely institutionalized.

Second, the partner dimension developed more strongly than the citizen dimension. Environmental communities, waste-bank managers, and private-sector actors increasingly contributed resources, technology, organizational capacity, and bridging functions, while citizen participation in source segregation and community-based waste management remained limited and uneven.

Third, innovation remains fragile because interaction between partners and citizens is unequal and weakly institutionalized. The documentary and secondary empirical evidence synthesized in this study indicates that innovation does not result simply from the presence of partners and citizens, but from meaningful interaction involving knowledge exchange, reciprocity, learning, adaptation, and joint problem-solving. The study therefore makes both an empirical and conceptual contribution by extending Chen et al. (2020) from a focus on partner and citizen dimensions toward an interaction-driven understanding of public sector organizational innovation.

This study is subject to several limitations. First, the analysis focuses on a single city case, which limits the extent to which the findings can be generalized to other urban waste-governance contexts. Second, the study relies on documentary and secondary empirical evidence, whose availability and completeness vary across sources and periods. Third, because the study does not collect primary data from actors, it cannot directly capture stakeholders' perceptions, motivations, or experiences. Similarly, the documentary case study cannot directly observe interaction processes as they occur in practice; interaction is instead reconstructed and interpreted from available documentary and secondary evidence. Finally, the available evidence provides limited capacity to assess the long-term outcomes and sustainability of the innovations identified. These limitations suggest that future research could complement documentary analysis with primary empirical investigation and longitudinal assessment of interaction-driven innovation.

Practically, Bandung should institutionalize interaction through a permanent multi-actor governance forum, involve partners and communities in planning and decision-making, develop common performance indicators, strengthen neighborhoods-level capacity, establish transparent incentives, integrate waste-bank data into the city information system, and strengthen monitoring of source segregation and local processing.

## REFERENCES

- Alfitri, A., Afrizal, A., Raharjo, S., Zamzami, L., Nugroho, S. B., & Pham, V. H. T. (2026). Community-centered plastic waste management: Leveraging household participation via waste bank in Padang, Indonesia. *Urbanenvirotech*, 9(1), 1-20. <https://doi.org/10.25105/urbanenvirotech.v9i1.23919>
- Ansell, C., & Gash, A. (2008). Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, 18(4), 543-571. <https://doi.org/10.1093/jopart/mum032>
- Awino, F. B. (2024). Solid waste management in the context of the waste hierarchy and circular economy frameworks: An international critical review. *Integrated Environmental Assessment and Management*, 20(1), 9-22. <https://doi.org/10.1002/ieam.4774>
- Badan Geologi. (2023, September 16). *Pemeriksaan Badan Geologi terhadap kebakaran TPA Sarimukti*. Kementerian Energi dan Sumber Daya Mineral Republik Indonesia.

- 
- Buchheim, L., Krieger, A., & Arndt, S. (2020). Innovation types in public sector organizations: A systematic review of the literature. *Management Review Quarterly*, 70(4), 509-533. <https://doi.org/10.1007/s11301-019-00174-5>
- Capoccia, G., & Kelemen, R. D. (2007). The study of critical junctures: Theory, narrative, and counterfactuals in historical institutionalism. *World Politics*, 59(3), 341-369. <https://doi.org/10.1017/S0043887100020852>
- Chen, J., Walker, R. M., & Sawhney, M. (2020). Public service innovation: A typology. *Public Management Review*, 22(11), 1674-1695. <https://doi.org/10.1080/14719037.2019.1645874>
- Cinar, E., Trott, P., & Simms, C. (2019). A systematic review of barriers to public sector innovation process. *Public Management Review*, 21(2), 264-290. <https://doi.org/10.1080/14719037.2018.1473477>
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.
- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case study. *Research Policy*, 31(8-9), 1257-1274. [https://doi.org/10.1016/S0048-7333\(02\)00062-8](https://doi.org/10.1016/S0048-7333(02)00062-8)
- Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste Management*, 33(1), 220-232. <https://doi.org/10.1016/j.wasman.2012.09.008>
- Irmawartini, I., Mulyati, S. S., & Pujiono, P. (2023). Pengelolaan sampah dari hulu ke hilir di Kota Bandung. *Jurnal Kesehatan Lingkungan Indonesia*, 22(2), 229-236. <https://doi.org/10.14710/jkli.22.2.229-236>
- Kaza, S., Yao, L., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. World Bank. <https://doi.org/10.1596/978-1-4648-1329-0>
- Maulana, D. S., Malik, Y., & Mulyadi, A. (2021). Community participation on the Kangpisman program in Bandung City. *International Journal of Pedagogy of Social Studies*, 6(1), 15-22. <https://doi.org/10.17509/ijposs.v6i1.29383>
- Negrete-Cardoso, M., Rosano-Ortega, G., Álvarez-Aros, E. L., Tavera-Cortés, M. E., Vega-Lebrún, C. A., & Sánchez-Ruiz, F. J. (2022). Circular economy strategy and waste management: A bibliometric analysis in its contribution to sustainable development, toward a post-COVID-19 era. *Environmental Science and Pollution Research*, 29(41), 61729-61746. <https://doi.org/10.1007/s11356-022-18703-3>
- Ningsih, D. L. W., & Mulyati, Y. (2025). Modal sosial masyarakat dalam pengelolaan sampah rumah tangga berbasis komunitas di Kecamatan Panyileukan Kota Bandung. *Responsive: Jurnal Pemikiran dan Penelitian Administrasi, Sosial, Humaniora dan Kebijakan Publik*, 8(3), 558-570. <https://doi.org/10.24198/responsive.v8i3.65537>
- Ostrom, E. (1996). Crossing the interface of co-production, dual accountability, and development. *World Development*, 24(6), 1073-1087. [https://doi.org/10.1016/0305-750X\(96\)00023-X](https://doi.org/10.1016/0305-750X(96)00023-X)
- Pemerintah Kota Bandung. (2025, December 5). *Warga, komunitas, dan media turun tangan atasi sampah*. Pemerintah Kota Bandung.
- Rashed, A. H. (2026). Sustainable solid waste management in the context of environmental governance. *Discover Sustainability*, 7, 148. <https://doi.org/10.1007/s43621-025-02385-1>
-

- Rhodes, R. A. W. (1996). The new governance: Governing without government. *Political Studies*, 44(4), 652-667. <https://doi.org/10.1111/j.1467-9248.1996.tb01747.x>
- Sari, C. F., & Lodan, K. T. (2024). Addressing waste growth challenges through collaborative urban governance and local democratic engagement in Batam City's. *Journal of Contemporary Local Politics*, 3(1), 40-49. <https://doi.org/10.46507/jclp.v3i1.618>
- Voorberg, W. H., Bekkers, V. J. J. M., & Tummers, L. G. (2015). A systematic review of co-creation and co-production: Embarking on the social innovation journey. *Public Management Review*, 17(9), 1333-1357. <https://doi.org/10.1080/14719037.2014.930505>
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

### **Legal documents**

- Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia. (n.d.). *Sistem Informasi Pengelolaan Sampah Nasional (SIPSN): Timbulan sampah*. <https://sipsn.menlhk.go.id/sipsn/public/data/timbulan>
- Pemerintah Kota Bandung. (2018). *Peraturan Daerah Kota Bandung Nomor 9 Tahun 2018 tentang Pengelolaan Sampah*. JDIH Kota Bandung.
- Pemerintah Kota Bandung. (2021). *Peraturan Wali Kota Bandung Nomor 88 Tahun 2021 tentang Pola Tata Kelola Pada Unit Pelaksana Teknis Pengelolaan Sampah Yang Menerapkan Pola Pengelolaan Keuangan Badan Layanan Umum Daerah*. JDIH Kota Bandung.
- Pemerintah Kota Bandung. (2023a). *Keputusan Wali Kota Bandung Nomor 658.1/Kep.1843-DLH/2023 tentang Penetapan Status Tanggap Darurat Bencana Sampah Kota Bandung*. JDIH Kota Bandung.
- Pemerintah Kota Bandung. (2023b). *Keputusan Wali Kota Bandung Nomor 658.1/Kep.2403-DLH/2023 tentang Penetapan Perpanjangan Status Tanggap Darurat Bencana Sampah Kota Bandung*. JDIH Kota Bandung.
- Pemerintah Kota Bandung. (2023c). *Keputusan Wali Kota Bandung Nomor 658.1/Kep.2428-DLH/2023 tentang Satuan Tugas Penanganan Darurat Bencana Sampah Kota Bandung*. JDIH Kota Bandung.