IRHAMNA
International Research of Sustainability Management, Business, & Administration
Volume 1, Number 1, 2025 pp. xx-xx
E-ISSN : XXXX-XXX

Conditional Co-production in Household Waste Separation: Comparing Two Urban Neighbourhoods in Indonesia

Dina[1*], Dewi Loka Wardiya Ningsih[1], Kanitsorn Terdpaopong[2]

1 Program Studi Ilmu Administrasi Negara, Fakultas Ilmu Sosial dan Ilmu Politik, Universitas Al-Ghifari, Bandung, Indonesia
2 Faculty of Accountancy, Rangsit University, Pathum Thani, Thailand

1 dina.shusein@unfari.ac.id
2 kanitsorn@rsu.ac.th

Article History

Received :
Revised :
Accepted :

ABSTRACT

Indonesian waste policy relies on households to separate and treat waste at source, yet results differ sharply between neighbourhoods governed by the same rules. This article asks why. It evaluates a municipal waste regulation in a densely populated sub-district of Bandung using Dunn's six criteria of effectiveness, efficiency, adequacy, equity, responsiveness, and appropriateness, and compares two neighbourhood units (rukun warga, RW) that share the same regulation and programmes but show opposite outcomes. Data come from structured interviews with officials of the city environment agency and the sub-district and with the heads of both neighbourhoods, together with observation and documents. Only responsiveness was met. About 80 percent of waste was hauled to landfill, above the 70 percent handling target, which signals that reduction at source lagged. The waste budget was below 5 percent of the city budget, fee revenue reached about IDR 11 billion against a target of IDR 40 billion, and coercive fines had no implementing rule. The successful neighbourhood had a complete downstream chain of a community-run recycling facility, separate collection, cadres who reprimand non-sorters, and income from compost and maggots; the other received 223 composting buckets for about 2,000 households without training, storage, or outlets. We propose the concept of conditional co-production: households contribute separation only when the complementary inputs that make it meaningful already exist. A collection fee framed as the price of a service can also crowd out the duty to sort. The comparison covers two neighbourhoods and relies on implementers' accounts.

Keywords: Co-production; Source Separation; Household Waste; Policy Evaluation; Local Government

Available Online: https://doi.org/10.38043/irhamna.v7i2.3799

This is an open access article licensed under a Creative Commons Attribution-ShareAlike 4.0 International License

INTRODUCTION

Cities in low- and middle-income countries face rising volumes of municipal solid waste while still depending heavily on collection and landfill disposal (Kaza et al., 2018). Policy responses increasingly shift part of the work upstream, asking households to separate and treat waste at source so that only residue reaches landfill. This shift is also part of the Sustainable Development Goals, which call for reducing the adverse environmental impact of cities, with special attention to municipal waste, and for substantially reducing waste generation through prevention, reduction, recycling, and reuse (United Nations, 2015). Indonesia has adopted this approach explicitly. Law No. 18 of 2008 on Waste Management defines waste as a potential resource and makes government responsible for sound waste management, and Presidential Regulation No. 97 of 2017 set national targets for 2025 of 30 percent

* Corresponding Author: Dina: dina.shusein@unfari.ac.id

waste reduction and 70 percent waste handling. Reduction at source therefore became a formal performance goal alongside conventional collection and disposal.

Source separation, however, cannot be decreed. It depends on millions of daily household decisions and on whether separated waste is actually collected, treated, and used. Comparative work on solid waste systems shows that performance depends not only on physical infrastructure but also on governance features, including user inclusivity, financial sustainability, and sound institutions (Wilson et al., 2012). Research on household participation in Indonesia points in the same direction. A survey of 300 households in Surabaya found that facilities supporting sorting, recycling, and composting mattered more for participation than households' socio-economic characteristics (Dhokhikah et al., 2015). Community waste banks have also been described as a form of community-based environmental governance linking residents, government, and the private sector (Wijayanti & Suryani, 2015).

Indonesian evaluations of local waste policy, by contrast, tend to list criteria that are met or not met and to attribute failure to low public awareness, weak sanctions, and insufficient facilities (Hildawati, 2018; Lestari & Kamaruddin, 2023; Novalita et al., 2018). Although these studies document shortcomings, less attention has been paid to why neighbourhoods that share the same regulation, budget, and programmes produce very different results. Awareness becomes a residual explanation rather than something to be explained.

This article addresses that gap by comparing two neighbourhoods in one sub-district of Bandung, a large Indonesian city. One neighbourhood runs its own recycling facility and has sustained source separation since 2016. The other, under the same rules, saw its collection point overflow after the regional landfill fire of August 2023. We ask three questions: (1) how does the municipal waste policy perform against Dunn's six evaluation criteria; (2) what obstacles do implementers report; and (3) what explains the divergent outcomes of the two neighbourhoods? We argue that household source separation is best understood as conditional co-production. Residents contribute their part only when the state or the community has already supplied the complementary downstream inputs, and a fee framed as the price of collection can weaken the willingness to sort.

The article makes two contributions. Empirically, it offers a within-sub-district comparison that holds the formal policy constant and isolates the conditions associated with success. Conceptually, it connects policy evaluation criteria with co-production theory and motivation crowding, showing how process criteria can be met while outcome criteria fail. The article proceeds with the literature, the methods and policy context, the results and discussion, and the conclusions and directions for future research.

LITERATURE REVIEW

Policy Evaluation Criteria

Dunn (2017) treats evaluation as the production of information about the value of policy outcomes and proposes six criteria. *Effectiveness* asks whether a valued outcome has been achieved. *Efficiency* asks how much effort or cost was required to achieve it. *Adequacy* asks how far the outcome resolves the problem. *Equity* asks whether costs and benefits are distributed fairly among groups. *Responsiveness* asks whether outcomes satisfy the needs, preferences, or values of target groups. *Appropriateness* asks whether the objectives themselves are worthwhile and whether the assumptions behind them hold. The framework is widely used in Indonesian evaluations of waste policy (Hildawati, 2018; Novalita et al., 2018), usually through the Indonesian translation (Dunn, 2003).

A recurrent weakness of such applications is that each criterion is scored separately. The criteria are interdependent, however. A failure of effectiveness may originate in inadequate resources, and an inequitable distribution may explain why a policy succeeds only in some places. This article uses Dunn's criteria as an evaluative scaffold and then examines the relationships between them.

Source Separation as Co-production

Co-production refers to the joint contribution of public agencies and citizens to the production of public services. Ostrom (1996) argued that co-production can create synergy between state and society, but only when the inputs of the two parties are complementary, each contributing something the other cannot easily supply. Brandsen and Honingh (2016) distinguish types of co-production according to citizens' involvement in design and implementation and the proximity of their contribution to the core service, while Nabatchi et al. (2017) classify co-production by who participates (individuals, groups, or collectives), when (commissioning, design, delivery, or assessment), and what is produced. A systematic

review found that the co-production literature is dominated by qualitative case studies identifying influential factors, with little attention to outcomes (Voorberg et al., 2015).

Household source separation fits these definitions closely. Residents supply labour, space, and attention at the point of generation; public agencies or community organisations supply separate collection, treatment, and markets for recovered materials. If the downstream inputs are missing, the household's contribution produces no public value: separated waste is mixed again during collection, or compost has no outlet. Reviews of household separation behaviour accordingly emphasise that social factors and supporting arrangements shape separation performance in urban areas (Knickmeyer, 2020). The complementarity condition in Ostrom's account suggests an expectation for this study: neighbourhoods with complete downstream chains should sustain separation, while those without them should not, regardless of formal policy.

Fees, Fines, and Motivation

Waste policy also uses prices and penalties. Collection fees finance the service, and sanctions are meant to deter non-compliance. Motivation crowding theory holds that external interventions such as payments or penalties can displace intrinsic motivation when people perceive them as controlling or as redefining the nature of the exchange (Frey & Jegen, 2001). In a well-known field experiment, introducing a fine for late pick-up at day-care centres increased lateness, because parents came to treat the fine as a price for extra time (Gneezy & Rustichini, 2000). By analogy, a waste collection fee may be interpreted not as a contribution to a shared system but as a payment that releases the household from any further duty. This mechanism offers an alternative to the common explanation of non-separation as a simple lack of awareness.

MATERIALS AND METHODS

Policy and Study Context

Under Law No. 23 of 2014 on Regional Government, environmental affairs, including waste, are an obligatory function of local government that is not classed as a basic service. The classification matters because, unlike education and health, waste management has no mandatory share of the local budget. The city studied regulates waste through Bandung City Regulation No. 9 of 2018 on Waste Management. Article 3 states that waste management aims to create a city free of waste in support of environmental sustainability, to improve public health and environmental quality, and to turn waste into a resource. Article 5 requires the city government to ensure the planning, organisation, implementation, and supervision of waste management from upstream to downstream. The regulation provides for a coercive fine (*uang paksa*) against violators. A municipal Waste Management Master Plan was later issued through Mayor Regulation No. 74 of 2021.

The city promoted several programmes. Kang Pisman, an acronym for "reduce, separate, and use waste", is a general campaign for source separation. Loséda places a perforated pipe in soil or a pot to compost kitchen waste. Kang Empos composts organic household waste in a bucket lined with a sack. Magotisasi breeds black soldier fly larvae (maggots) to consume organic waste. Pressure on the system increased when the regional Sarimukti landfill caught fire on 19 August 2023 (Pradana, 2023), after which many collection points in the city overflowed.

Design and Case Selection

The study used a qualitative, descriptive evaluation design with an embedded comparison. The setting is Batununggal sub-district (*kecamatan*) in Bandung City, West Java, a dense residential area of eight urban villages (*kelurahan*). It was selected because a reduce, reuse, and recycle facility (TPS 3R) in one of its villages overflowed after the 2023 landfill fire. Within the sub-district, the study compared RW 12 of Maleer village, identified by the sub-district official as the only neighbourhood that had succeeded, with RW 11 of Gumuruh village, served by the overflowing facility. The comparison approximates a most-similar case design (Seawright & Gerring, 2008). Both neighbourhoods are subject to the same regulation, programmes, municipal agencies, and sub-district administration, but they differ in outcome. This design allows the analysis to focus on the local conditions associated with the difference.

Informants and Data Collection

Data were collected between October 2023 and February 2024. Structured interviews, based on a guide organised around Dunn's six criteria, took place between late December 2023 and January 2024. Informants were selected purposively to represent the municipal agency, the sub-district, and the two neighbourhoods (Table 1). The interviews were recorded, and informants took part voluntarily after being told the purpose of the study. Non-participant observation was carried out in both neighbourhoods, and

documents included laws and regulations, sub-district statistics, and official websites. Informants are identified by codes.

Table 1. Informants

Code	Position	Role in the study
I1	Environmental impact analyst, Waste and Hazardous Waste Control Section, City Environment and Cleanliness Agency	Main informant
I2	Head of Economy, Development and Environment Section, sub-district office	Key informant
I3	Head of RW 11, Gumuruh	Supplementary informant
I4	Head of RW 12, Maleer	Supplementary informant

Source: research data, 2024.

Analysis and Trustworthiness

Analysis followed the interactive model of Miles et al. (2014), comprising data condensation, data display, and conclusion drawing and verification. Each criterion was judged as met or not met by comparing informant accounts and observations with the objectives in Article 3 of the city regulation. The comparison of the two neighbourhoods was then used to identify conditions associated with success. Credibility was addressed through source triangulation, comparing accounts from the agency, the sub-district, and the two neighbourhood heads, and by cross-checking neighbourhood claims with the sub-district office. Interviews were conducted in Indonesian, and the quotations below were translated by the authors.

RESULTS AND DISCUSSION

The results follow Dunn's criteria, then the obstacles and responses reported by implementers. The discussion interprets the findings in light of co-production and motivation crowding.

Setting

The sub-district covers about 527 ha. In 2022 it had 544 neighbourhood associations (RT), 82 RW, 33,147 households, and 107,277 residents (53,682 male and 53,595 female), plus 6,077 non-permanent residents. It contained 12 temporary waste collection sites and 1,535 public facilities, including 660 small grocery stalls, 590 food stalls, 134 places of worship, and 6 markets. Table 2 compares the two villages.

Table 2. Population of the two study villages, 2022

Area	RT	RW	Households	Residents	Non-permanent residents
Gumuruh village	85	11	6,584	17,854	621
Maleer village	71	12	3,827	11,820	2,559
Sub-district (8 villages)	544	82	33,147	107,277	6,077

Source: Batununggal sub-district statistics, 2022.

Gumuruh is the most populous village in the sub-district. According to I3, RW 11 comprises 10 RT with about 2,000 households and is the most densely settled part of the village.

Effectiveness: Handling above Target as a Sign of Failure

The agency defines performance through two complementary targets. I1 explained:

> *"[...] if the handling target for a given year is 70 percent, then the reduction target is 30 percent, so that 100 percent of waste is managed. In future the handling target is projected to fall and the*

reduction target to rise. In essence, the activity is to intensify separation and treatment as close as possible to the source, so that waste can be managed by its source itself." (I1)

Actual handling exceeded its target, which the agency regarded as a problem rather than a success:

"[...] at present, waste handling, in the sense of waste transported to the landfill, has exceeded the 70 percent target, even reaching 80 percent. But of course we do not want it that way, with mixed waste taken straight to the landfill, because the landfill fills up and its lifetime becomes short. We want only residue to be transported to the landfill." (I1)

At the sub-district level, I2 reported that only one neighbourhood had succeeded, RW 12 in Maleer, where a TPS 3R collected and managed all residents' waste and residents earned money from the compost produced. The head of RW 12 described the chain:

"First I educated families and residents, together with the women cadres, about waste, so that organic and inorganic waste is separated. Then the organic waste is taken directly to the TPS and weighed to know how many quintals per day, at least two quintals per day. At the TPS the organic waste can be used as maggot feed. The inorganic waste has already been sorted; for example, mineral water bottles are used as a bacteria medium and the rest is sold to collectors." (I4)

In RW 11, by contrast, the programmes were not running:

"Not yet, because public awareness about waste is still lacking and compliance with waste regulations is low. The Kang Pisman programme did not run well even though the RW instructed it, and lastly, for the Kang Empos programme, the bucket assistance was not sufficient." (I3)

Enforcement fell short of the regulation. According to I1, the coercive fine could not be applied because no implementing rule specified who receives the money and through what procedure. Officials used social sanctions instead. Through cooperation with the army in a river clean-up programme, people caught dumping waste in rivers were required to clean the river and sign a stamped statement. At sub-district level:

"[...] the sanction has not reached coercive money or fines, only social sanctions, a reprimand by the sub-district head and holding the electronic ID card. Well, perhaps that has not yet had a deterrent effect. That is homework for us." (I2)

In RW 12, the waste of residents who did not comply was not collected; in RW 11, violators were made to do push-ups. Effectiveness was therefore not met.

Efficiency and Adequacy: A Stimulus Budget without Downstream Capacity

Waste management has no mandatory budget share. I1 noted that in Bandung the waste budget was still below 5 percent of the city budget, and that the system depended on service fee revenue that fell far below its target:

"[...] the potential from residents who are obliged to pay is certainly large, but compliance in paying is still low. For example, the target was once 40 billion, but only 11 billion was received, while the waste management share had already been included in that 40 billion budget. The money did not exist, so you could call it insufficient, and we can only manage with what we have." (I1)

During the waste emergency, the city allocated funds to every village for the Kang Empos and Magotisasi programmes. I2 considered this sufficient as a stimulus scaled to population. Both neighbourhood heads, however, reported that no government budget reached the RW level; they received only equipment. RW 11 depended on residents' fees, which not everyone paid, so the RW itself covered shortfalls in the fees it had to remit to the village. RW 12 began managing organic and inorganic waste in 2016 and began receiving an incentive from the environment agency in 2019. In both neighbourhoods residents paid IDR 2,000 per collection, which financed collectors' wages and transport to the landfill. RW 11 had 11 collectors for 10 RT, and RW 12 had 12. During the emergency, transport from collection points to the landfill was reduced to once and then twice a week. By 2024 it had returned to daily, but waste generation, dominated by household waste, remained high.

On adequacy, I1 compared Indonesia with Japan, where residents were educated for ten years until they separated up to 15 types of waste, and described Indonesian residents as "used to being served, they already know but do not want to know". The head of RW 12 judged reduction in the neighbourhood sufficient because the agency now collected only residue every two days. The head of RW 11 explained why separation could not work household by household:

"It can be solved if residents are aware of waste. The Kang Pisman programme has been socialised but does not run, because if done individually it is difficult, unless there is a storage place, then

> *land and also collectors who go around to pick up the organic waste. If all that were available, as the RW I could easily instruct residents to run the programme." (I3)*

Efficiency and adequacy were not met. Resources were limited to stimulus equipment, no funds reached the RW, and the flow of separated waste had no defined destination.

Equity, Responsiveness, and Appropriateness

The sub-district official regarded distribution as fair because the number of Kang Empos buckets for each village was calculated as a percentage of its population. Maggot breeding, which requires specialised care and workers, had reached only a few neighbourhoods. RW 12, whose residents already separated waste, had little need for buckets. RW 11 received buckets out of proportion to its size and without training:

> *"Some time ago our RW was given assistance for the Kang Empos programme, but there was no simulation from the sub-district or the village to come down to residents. [...] Only 223 buckets were given, while RW 11 has about 2,000 households in 10 RT, so it feels insufficient and will cause jealousy among residents." (I3)*

A cross-check with the sub-district office indicated that the village had carried out outreach, including door-to-door visits, but probably not in every RW. Equity was not met.

Responsiveness was the only criterion met. Every level of government maintained complaint channels. The agency used the national complaint application LAPOR and reported that about 70 percent of the reports it received concerned waste. The sub-district received complaints through Instagram, its website, and walk-in visits, and used residents' social media reports to identify violators. In RW 12, residents raised concerns with waste collectors, who passed them to the RW head; in RW 11, residents contacted the head directly or by WhatsApp.

On appropriateness, I2 judged that the sub-district had not yet reached its goal of a waste-free area, noting that with eight villages and dozens of RW, making even one area waste-free remained unfinished work, and that only one RW in Maleer had succeeded in implementing Kang Pisman. The two neighbourhood heads gave opposite assessments. The head of RW 12 considered the policy appropriate because only residue was collected every two days and residents benefited from compost sales, sales of inorganic waste, and maggots used as animal feed; the head hoped that a maggot facility would be

completed to process the organic waste of the whole village, potentially one tonne per day. The head of RW 11 considered it inappropriate:

> *"Not appropriate, because the provision of facilities is not adequate. If facilities existed, we could train unemployed young people here to process waste. Land that could have been used for waste facilities was instead used for a park that is less functional." (I3)*

Appropriateness was not met. Table 3 contrasts the two neighbourhoods, and Table 4 summarises the evaluation.

Table 3. Contrasting the two neighbourhoods

Dimension	RW 12, Maleer	RW 11, Gumuruh
Facility	Community-run TPS 3R	Overflowing TPS 3R; land used for a park
Start	2016; agency incentive since 2019	Kang Pisman not running
Separation	Organic waste taken to TPS, at least 2 quintals per day	Not running; 223 buckets for about 2,000 households
Collectors	12	11 for 10 RT
Transport to landfill	Residue only, every two days	Mixed waste
Economic return	Compost and inorganics sold; maggots as feed	No outlet for processed products
Enforcement	Cadres reprimand, then RW head; non-compliant waste not collected	Appeals; push-ups
Training and planning	Village-level technical waste plan prepared with agency support	No simulation or training

Source: interviews with I2, I3, and I4.

Table 4. Evaluation against Dunn's criteria

Criterion	Result	Main evidence
Effectiveness	Not met	About 80 percent hauled to landfill; one RW successful; coercive fine not applied
Efficiency	Not met	Budget below 5 percent of city budget; fee revenue IDR 11 billion of 40 billion target; no RW budget
Adequacy	Not met	No storage, land, or collectors for separated waste
Equity	Not met	Stimulus equipment did not reach all residents; maggot breeding in few RWs
Responsiveness	Met	LAPOR (about 70 percent of complaints about waste), social media, website, direct channels
Appropriateness	Not met	Only one RW judged successful in the sub-district

Source: research data, 2024.

Obstacles and Responses

I1 identified three obstacles: enthusiasm that fades once mentoring ends; difficulty recruiting local collectors, combined with collectors who mix waste that residents have already separated; and residents' sense that they have "already paid":

> *"[...] collectors have their own will, for example collection that should be separated is mixed again even though residents have separated the waste. We want to facilitate incentives for collectors so that they become the spearhead supervising separation from the home, secondary separation.*

Third, the public: the mindset of people who feel they have already paid and want it done quickly, so awareness of waste is low." (I1)

I2 described the same mindset in terms of the fee:

"[...] Many people think it is better to pay so that waste can be collected by the collectors. They would rather pay than have to separate, because they think waste management programmes such as Kang Pisman, Loseda, and Kang Empos are too complicated." (I2)

In RW 12 the remaining problem was that about 10 percent of residents still took their waste directly to markets or other dumping points. The head of RW 11 pointed to the missing downstream infrastructure:

"[...] if there is separation from the village, then where should we store it so that it can be separated [...]. Then there is no serious training from the government at the RW level, which hampers waste management in the RW. And the products of waste processing must be given an outlet so that people are motivated to manage waste." (I3)

Responses included socialisation of the regulation and master plan, equipment provided as a stimulus, collaboration with the city food security and agriculture agency so that compost could be used in an urban farming programme (Buruan Saé), and technical assistance in preparing village-level technical waste plans, including for Maleer. These plans map facility needs, community participation, communal container locations, and collection routes and schedules. I1 summarised the logic:

"[...] When people have started to become aware of waste, we must be able to create a system so that this awareness can be maintained. We also support processing centres: when people have separated, when upstream is running, then downstream must be ready." (I1)

The sub-district led by example, eliminating bottled water and boxed meals at meetings. In RW 12, enforcement was graduated: residents found not separating were visited and reprimanded by the women cadres, and if that failed, by the RW head personally. In RW 11, the head personally cleaned drains every Sunday to set an example and built new culverts with assistance to reduce flooding.

When Exceeding a Target Signals Failure

The effectiveness finding contains a paradox. Read alone, handling at 80 percent against a 70 percent target looks like success. Within the logic of Presidential Regulation No. 97 of 2017, however, handling and reduction are two shares of the same waste stream, so handling above target means that reduction at source fell short and mixed waste continued to flow to landfill. The 2023 landfill fire showed the fragility of this dependence: when disposal capacity failed, collection points in dense neighbourhoods overflowed. For evaluation practice, this suggests that Dunn's effectiveness criterion should be applied to the structure of indicators rather than to single indicators. A target exceeded on one dimension may indicate failure on the policy's underlying objective.

Conditional Co-production

The comparison shows that awareness alone does not explain the difference between the neighbourhoods. Both were subject to the same regulation, agencies, and programmes. What differed was the downstream chain. RW 12 had a facility, collectors who took organic waste separately, treatment into compost and maggot feed, buyers for recovered products, and cadres who reprimanded non-sorters. RW 11 received buckets but had no storage, no training, and no outlet. The head of RW 11 put the mechanism plainly: separation "does not run, because if done individually it is difficult". Household separation is not a free-standing individual act; it becomes meaningful only when others collect, treat, and absorb its output. This reading agrees with Dhokhikah et al. (2015), who found facilities to matter more than household characteristics, and with the emphasis on supporting arrangements in Knickmeyer's (2020) review.

We call this pattern conditional co-production. It extends Ostrom's (1996) complementarity argument from the level of synergy to the level of participation itself. Citizens' contribution does not merely produce better results when complementary inputs exist; it tends to appear only when those inputs exist. I1's report that collectors re-mixed separated waste shows what happens when the condition is unmet: the household's effort is wasted, and the motivation to repeat it declines. The agency's own formula, that downstream must be ready once upstream is running, is consistent with this interpretation, but in practice the sequence ran the other way, with upstream campaigns and equipment preceding downstream capacity. In the terms of Nabatchi et al. (2017), the successful case is a collective form of co-production at the delivery stage, organised by the neighbourhood, whereas the policy design assumed individual co-production by each household. The finding also responds to the observation by Voorberg et al. (2015)

that co-production research rarely examines outcomes, since here the presence of co-production is associated with a visible difference in what is sent to landfill.

Enforcement in RW 12 operated through community control rather than formal sanctions. Cadres reprimanded non-sorters, the RW head followed up, and non-compliant waste was not collected. This arrangement works because the community controls the service on which residents depend. A sanction such as push-ups in RW 11 is unconnected to any service. Community control can partly substitute for the missing coercive fine, but only where the community owns the service chain, as community waste banks have also shown elsewhere in Indonesia (Wijayanti & Suryani, 2015).

The Fee as a Price

Implementing officials reported that residents felt they had "already paid" and would "rather pay than separate". The fee is designed to finance collection, but residents appear to treat it as the price of a service that releases them from the duty to separate. This interpretation is consistent with motivation crowding theory (Frey & Jegen, 2001) and with the logic of Gneezy and Rustichini's (2000) finding that a fine can be read as a price. In Brandsen and Honingh's (2016) terms, the fee repositions residents from co-producers to customers. A policy that asks households to separate while charging them to collect mixed waste sends conflicting signals. Low fee compliance compounds the problem: revenue of about IDR 11 billion against a target of IDR 40 billion left the agency managing "with what we have", and the RW 11 head covered shortfalls from the neighbourhood's own funds. The interpretation does not deny the role of awareness; it suggests that awareness is shaped by the incentive design of the policy. Because residents were not interviewed directly, it remains an inference from implementers' accounts.

Responsiveness without Capacity and Equality without Equity

Responsiveness was the only criterion met, yet about 70 percent of LAPOR complaints concerned waste. The figure shows both responsive channels and a large volume of unresolved problems. Complaint channels do not by themselves produce effectiveness, adequacy, or equity when the capacity to act on complaints is limited by a budget below 5 percent and stimulus-level equipment. Process-oriented criteria can thus be met while outcome-oriented criteria fail, an interdependence that separate scoring of Dunn's (2017) criteria tends to hide.

The sub-district regarded population-proportional distribution as fair, but the comparison shows how formal equality can produce substantive inequity. RW 12, already organised, had little need for buckets, while RW 11, the densest and least equipped, received 223 buckets for about 2,000 households and no training. Proportional allocation ignored differences in capacity, and in dense settlements without land, individual composting is impractical. What such areas need is communal storage and separate collection. This echoes the finding from Dumai that delegating waste tasks to sub-districts without guidance and facilities weakens implementation (Hildawati, 2018), and the broader observation that waste system performance rests on governance as much as on hardware (Wilson et al., 2012).

Policy Implications

Five implications follow. Separation campaigns should follow, or at least accompany, the construction of downstream chains at neighbourhood level, namely storage, separate collection, treatment, and outlets; village-level technical waste plans, such as the one prepared for Maleer, can be used to map these needs elsewhere. The agency's plan to give collectors incentives as supervisors of secondary separation should be implemented so that separated waste is not re-mixed. The city should issue an implementing rule for coercive fines covering complaint procedures, payment, recipients, and use of funds. Allocation of equipment and support should reflect neighbourhood capacity and need, with priority for dense areas without land. Finally, fee design could be linked to separation, for example through separate collection of sorted waste, so that payment is not read as a substitute for sorting. Taken together, these measures would move the city closer to its waste reduction target and to the sustainable consumption and urban environment goals it has committed to.

CONCLUSION

Against Dunn's six criteria, the waste policy in the sub-district studied met only responsiveness. Effectiveness, efficiency, adequacy, equity, and appropriateness were not met. Waste hauled to landfill exceeded the handling target, which means that reduction at source lagged; the budget was limited and non-mandatory; fee revenue fell far short of target; coercive fines had no implementing rule; and only one neighbourhood was judged successful.

The comparison of two neighbourhoods under the same policy shows that success depended less on residents' awareness than on a downstream chain that gives separation a destination. We call

this conditional co-production. Source-separation policies are likely to be more effective when governments secure storage, separate collection, and outlets for recovered products at neighbourhood level before expanding household campaigns, and when fees and sanctions are designed to encourage sorting rather than to replace it.

SUGGESTION FOR FUTURE RESEARCH

The study relied on four informants, all of them implementers. Ordinary residents and collectors were not formally interviewed, so the perspective of non-separating households and the motivation crowding interpretation are inferred from implementers' accounts. Future research should interview residents in both separating and non-separating neighbourhoods, and collectors, to test directly whether the collection fee is understood as a substitute for sorting.

Judgements on each criterion rest mainly on interviews and observation. Figures such as the 80 percent handling rate, the budget share, fee revenue, and the share of complaints about waste are informants' statements. Neighbourhood-level data on waste generation, separation rates, and budget realisation would allow the comparison to be measured rather than described. Finally, the comparison covers two neighbourhoods in one sub-district. The concept of conditional co-production should be tested across more neighbourhoods and cities, for instance by examining whether the arrival of separate collection or a recycling facility in a neighbourhood is followed by a rise in household separation.

CO-AUTHOR CONTRIBUTION

The authors declare no conflict of interest in this article. All authors contributed to the conception and design of the study, the analysis and interpretation of the data, and the writing and revision of the manuscript, and all authors approved the final version.

ACKNOWLEDGEMENTS

The authors thank the officials of the Bandung City Environment and Cleanliness Agency, the Batununggal sub-district office, and the heads of the two neighbourhoods who took part in the study. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit

sectors. The authors used a generative AI tool to assist with restructuring and language editing. All data, analyses, and references were checked by the authors, who take full responsibility for the content.

Brandsen, T., & Honingh, M. (2016). Distinguishing different types of coproduction: A conceptual analysis based on the classical definitions. *Public Administration Review*, *76*(3), 427–435. https://doi.org/10.1111/puar.12465

Dhokhikah, Y., Trihadiningrum, Y., & Sunaryo, S. (2015). Community participation in household solid waste reduction in Surabaya, Indonesia. *Resources, Conservation and Recycling*, *102*, 153–162. https://doi.org/10.1016/j.resconrec.2015.06.013

Dunn, W. N. (2003). *Pengantar analisis kebijakan publik* [Introduction to public policy analysis] (2nd ed.). Gadjah Mada University Press.

Dunn, W. N. (2017). *Public policy analysis: An integrated approach* (6th ed.). Routledge. https://doi.org/10.4324/9781315181226

Frey, B. S., & Jegen, R. (2001). Motivation crowding theory. *Journal of Economic Surveys*, *15*(5), 589–611. https://doi.org/10.1111/1467-6419.00150

Gneezy, U., & Rustichini, A. (2000). A fine is a price. *The Journal of Legal Studies*, *29*(1), 1–17. https://doi.org/10.1086/468061

Hildawati. (2018). Evaluasi kebijakan pengelolaan sampah pada kecamatan di Kota Dumai [Evaluation of waste management policy in sub-districts of Dumai City]. *PUBLIKA: Jurnal Ilmu Administrasi Publik*, *4*(2), 332–348. https://doi.org/10.25299/jiap.2018.vol4(2).3602

Kaza, S., Yao, L. C., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. World Bank. http://hdl.handle.net/10986/30317

Knickmeyer, D. (2020). Social factors influencing household waste separation: A literature review on good practices to improve the recycling performance of urban areas. *Journal of Cleaner Production*, *245*, 118605. https://doi.org/10.1016/j.jclepro.2019.118605

Lestari, S., & Kamaruddin. (2023). Evaluasi implementasi kebijakan pengelolaan sampah di Kecamatan Binawidya Kota Pekanbaru [Evaluation of waste management policy implementation in Binawidya sub-district, Pekanbaru]. *Jurnal Ekonomi dan Ilmu Sosial (JEIS)*, *2*(1), 75–82.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). Sage.

Nabatchi, T., Sancino, A., & Sicilia, M. (2017). Varieties of participation in public services: The who, when, and what of coproduction. *Public Administration Review*, *77*(5), 766–776. https://doi.org/10.1111/puar.12765

Novalita, P., Heriyanto, M., & Muchid. (2018). Evaluasi kebijakan pengelolaan sampah [Evaluation of waste management policy]. *Jurnal Ilmu Administrasi Negara (JIANA)*, *16*(1), 450–455. https://doi.org/10.46730/jiana.v16i1.6148

Ostrom, E. (1996). Crossing the great divide: Coproduction, synergy, and development. *World Development*, *24*(6), 1073–1087. https://doi.org/10.1016/0305-750X(96)00023-X

Peraturan Daerah Kota Bandung Nomor 9 Tahun 2018 tentang Pengelolaan Sampah [Bandung City Regulation No. 9 of 2018 on Waste Management]. Lembaran Daerah Kota Bandung Tahun 2018 Nomor 9.

Peraturan Presiden Republik Indonesia Nomor 97 Tahun 2017 tentang Kebijakan dan Strategi Nasional Pengelolaan Sampah Rumah Tangga dan Sampah Sejenis Sampah Rumah Tangga [Presidential

Regulation No. 97 of 2017 on the National Policy and Strategy for Household Waste Management]. (2017). https://peraturan.go.id/files/ps97-2017.pdf

Peraturan Wali Kota Bandung Nomor 74 Tahun 2021 tentang Rencana Induk Pengelolaan Sampah [Bandung Mayor Regulation No. 74 of 2021 on the Waste Management Master Plan]. (2021). https://jdih.bandung.go.id/media/11902

Pradana, W. (2023, September 8). Kapan TPA Sarimukti beroperasi normal lagi? [When will Sarimukti landfill operate normally again?]. *detikJabar*. https://www.detik.com/jabar/berita/d-6920066/kapan-tpa-sarimukti-beroperasi-normal-lagi

Seawright, J., & Gerring, J. (2008). Case selection techniques in case study research: A menu of qualitative and quantitative options. *Political Research Quarterly*, *61*(2), 294–308. https://doi.org/10.1177/1065912907313077

Undang-Undang Republik Indonesia Nomor 18 Tahun 2008 tentang Pengelolaan Sampah [Law No. 18 of 2008 on Waste Management]. (2008).

Undang-Undang Republik Indonesia Nomor 23 Tahun 2014 tentang Pemerintahan Daerah [Law No. 23 of 2014 on Regional Government]. (2014).

United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development* (A/RES/70/1). United Nations General Assembly.

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

Wijayanti, D. R., & Suryani, S. (2015). Waste bank as community-based environmental governance: A lesson learned from Surabaya. *Procedia: Social and Behavioral Sciences*, *184*, 171–179. https://doi.org/10.1016/j.sbspro.2015.05.077

Wilson, D. C., Rodic, L., Scheinberg, A., Velis, C. A., & Alabaster, G. (2012). Comparative analysis of solid waste management in 20 cities. *Waste Management & Research*, *30*(3), 237–254. https://doi.org/10.1177/0734242X12437569