

From Sorting Campaign to Cost Accountability: Implementation Barriers in Balikpapan's Household Waste Segregation Education Program

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ABSTRACT : Balikpapan's household waste separation education program offers a promising upstream strategy, yet it has not generated solid evidence showing that it is cost-effective. This article revisits Yanthi Lumban Gaol's thesis on Waste Cost Management in Balikpapan through the lens of implementation barriers. Employing a qualitative diagnostic case-study approach, the analysis uses thesis-based sources, including interviews, observations, program documents, monitoring records, and budget reports. Results show that the gap does not stem from one weakness in community education alone. The issue develops through linked barriers, such as activity-based reporting, divided responsibilities among government actors, facilitators, cadres, and households, incomplete baseline data, unequal facility access, and inconsistent household routines. Informants reported practical constraints, including the absence of containers, remote bank sampah facilities, and financial reports that documented activities rather than cost effects. This paper maintains that the present situation reflects possible cost-effectiveness rather than confirmed fiscal efficiency. Cost-accountable implementation would need distinct cost codes, activity cost pools, connected operational and financial data, and regular comparisons between intervention and non-intervention areas.

KEYWORDS - *Activity-Based Costing, cost accountability, implementation barriers, public sector management accounting, waste segregation education*

I. INTRODUCTION

Balikpapan faces two interconnected waste-related challenges. One concern is environmental, as household and urban activities continue to increase pressure on waste collection, transportation, treatment, and final disposal systems. Another concern is financial, because each extra kilogram entering the municipal waste system requires vehicles, fuel, labor hours, equipment, and landfill space. Thesis data used in this paper show that waste generation in 2024 reached 197,352.80 tons, equivalent to around 540.69 tons per day. The same source also reports that the average daily waste inflow to TPA Manggar was 387.85 tons, approaching the operational reference capacity of roughly 420 tons per day. [1], [2], [3].

Source segregation and public expenditure are connected in practical terms, not merely in theory. Mixing organic waste, recyclable materials, residual waste, and household hazardous waste at the household level makes downstream handling heavier, less clean, and more difficult. Recyclables decline in value, organic waste becomes more complicated to process, residual waste volumes rise, and collection workers must repeat more tasks. Management accounting views mixed waste as a set of cost drivers, including tonnage, ritase, fuel use, labor hours, equipment utilization, and landfill pressure. [1].

Balikpapan's 2025 household waste segregation education program was developed to address the issue from the upstream stage. The initiative brought together Pusat Pengendalian Lingkungan Hidup Kalimantan, Dinas Lingkungan Hidup Kota Balikpapan, Yayasan PEDULI, PKK cadres, and participating households. The program began with a Training of Trainers activity on 21 August 2025, prepared 89 cadres, and subsequently reached around 10 RT, 240 dasawisma, and approximately 2,400 households throughout a ten-week assistance period. [1], [4]. These details are important because the program functioned as a structured community intervention rather than a simple awareness-poster campaign.

The challenge appears once the activity has ended. The thesis indicates that the program was able to report training, monitoring, and household responses, but it still could not demonstrate the extent to which these activities lowered municipal waste-service costs. [1]. This study adopts the supervisor's recommendation to examine the case through the lens of implementation barriers. The central question asks why a program that seems environmentally reasonable still struggles to become cost-accountable?

This paper offers two contributions to public sector management accounting. First, it positions household waste education as an element of the municipal service cost structure, rather than simply viewing it as a behavior-change campaign. Second, it proposes a diagnostic model that explains how administrative, institutional, data-related, material, and behavioral barriers can shift a potentially cost-saving program into a situation where cost-effectiveness remains unverified.

II. LITERATURE REVIEW

2.1 Waste Cost Management and Activity-Level Costing

Municipal Waste Cost Management can be understood from two related perspectives. Waste means physical material that the city must collect, process, and dispose of. Service waste also includes preventable work within the municipal service chain, such as repeated sorting, inefficient routes, low vehicle load factors, unnecessary landfill operations, and untracked fuel or labor use. Activity-Based Costing (ABC) supports government agencies in grouping these activities into cost pools, while cost-to-serve analysis allows comparisons across areas with different service characteristics [5], [6].

Waste service logic is simple, although the data needed to evaluate it is quite demanding. Better neighborhood segregation may reduce residual waste, improve the quality of recyclable materials, and gradually reshape collection routines. These outcomes can be measured only when the government maintains usable detailed records on unit costs, route information, tonnage, labor hours, fuel consumption, and landfill operating costs [6], [7], [8]. Efficiency remains only a managerial perception rather than accounting-based evidence when these details are unavailable.

Global indicators point to the same policy direction. The Waste Wise Cities Tool and SDG 11.6.1 encourage cities to monitor collection, treatment, and controlled disposal, while international solid-waste studies caution that urban waste will keep increasing unless upstream prevention and data-driven decision-making are strengthened. [9], [10]. Balikpapan therefore needs program evaluation to shift from counting activities to measuring changes in cost drivers.

2.2 Behavioral and Material Dimensions of Sorting Practice

Household waste sorting is not usually maintained through information sharing alone. Research on recycling and waste separation indicates that household routines are shaped by social norms, feedback, role modeling, repeated practice, and people's sense of capability [11], [12], [13]. Social practice theory further argues that a practice becomes lasting only when material conditions, practical competence, and shared meaning support each other [14]. Here, material conditions include bins, labels, collection routes, bank sampah access, and processing facilities. Competence refers to the ability to understand and apply proper sorting methods. Meaning describes the social value assigned to waste sorting.

Indonesian studies align with this perspective. Public participation is shaped by education, prior experience, facility convenience, and support at the community level [15], [16]. Evidence from systematic reviews further shows that integrated interventions are more effective than one-way information campaigns [17]. Such studies are relevant to this article because they demonstrate that inadequate facilities and unstable routines are not merely secondary concerns. These conditions function as implementation barriers that directly affect cost-accountability.

2.3 Implementation Barrier and Cost-Accountability Gap

Implementation barriers arise when a program's practical design is too weak to generate the evidence expected from it. Cost-effectiveness claims require a clear link between program activities, resources used, operational shifts, and cost changes. Public cost-estimation guidance also stresses baseline data, traceability, and documentation as requirements for credible costing [18], [19], [20].

Indonesian waste policy research highlights similar challenges: regulatory alignment, operational capacity, inter-institutional coordination, and local commitment determine whether waste programs can move beyond formal implementation. [21], [22]. This paper does not present the barrier as a lack of intention. The issue is understood as a missing evidence chain linking household behavior to public cost.

III. RESEARCH METHODOLOGY

This article applies a qualitative diagnostic case-study design. The selected case is Balikpapan City's household waste segregation education program. This design is suitable because the analysis examines how and why implementation barriers emerge within an actual program context [18], [19]. This analysis is diagnostic because it moves beyond repeating program achievements and examines the conditions that keep the program from becoming cost-accountable. This paper relies on a secondary re-analysis of Yanthi Lumban Gaol's thesis. The thesis drew on interviews, observations, program documents, monitoring records, KAK/RAB materials, and DPPA budget documents from the Environmental Agency. [1]. The informants included representatives from DLH, UPTD TPA Manggar, PKK cadres, household participants, Pusdal LH Kalimantan, and Yayasan

PEDULI. This paper does not claim to conduct any additional fieldwork. Rather, the evidence from the thesis is rearranged to focus on the issue of implementation barriers.

Table 1. Data Materials and Analytical Use

Data material	Content in the thesis case	Use in this article
Interviews	Narratives from DLH, UPTD TPA Manggar, cadres, households, Pusal LH, and Yayasan PEDULI.	Identify how each actor explains barriers, everyday routines, and gaps in cost-related information.
Observation	H Observations related to households, communities, TPS areas, and TPA operations.	Examine whether waste-sorting practices were supported by material conditions and service routines..
Program documents	Records of training, assistance, monitoring, and reporting activities.	Trace whether activity reports were linked to outcome measures and cost indicators.
Budget and operational materials	DPPA context, waste volume data, monitoring records, and cost-driver logic.	Evaluate whether operational changes could be converted into unit-cost evidence.

Source: processed by the author from thesis materials [1].

The analysis followed four sequential stages. The first stage involved selecting thesis statements and findings related to facilities, assistance, motivation, data, coordination, and cost implications. The second stage organized the material into five barrier categories: administrative, institutional, data-governance, material-infrastructure, and behavioral. The third stage examined each barrier based on the requirements of ABC and cost-to-serve analysis. The fourth stage produced a conceptual model explaining how these barriers create a cost-accountability gap.

IV. FINDINGS AND DISCUSSION

4.1 Administrative Barrier: Activity Reporting Without Cost Translation

The initial barrier is administrative. Program accountability in the thesis remains most evident at the activity level, covering training, socialization, mentoring, monitoring, and reporting [1]. This form of reporting is required, yet it remains insufficient to demonstrate cost-effectiveness. Reports may indicate that cadres were trained and households received assistance, but they do not automatically reveal the cost per assisted household, the cost per kilogram of reduced residual waste, or the downstream costs that were avoided.

A DLH informant makes this limitation clear through the statement: “Selama ini laporan kami hanya berisi kegiatan, bukan dampak finansial. Padahal untuk advokasi anggaran, itu penting” [1]. The quotation matters because it reveals that financial awareness already exists within the institution. The issue is not the absence of concern among actors regarding financial accountability. The main constraint lies in the current reporting format, which has not yet required the program to present its results in cost-based terms.

This condition makes the program prone to being viewed as a social activity rather than a form of public investment. APBD discussions require stronger evidence than attendance records and socialization reports, such as avoided ritase, reduced fuel consumption, lower residual waste tonnage, or postponed landfill pressure.

4.2 Institutional Barrier: Many Actors, Different Reporting Logics

The second barrier concerns institutional coordination. The program brought together government agencies, an implementing partner, cadres, and households. This multi-actor structure helps the program reach communities, but it also produces different reporting patterns. DLH requires administrative and operational information. UPTD TPA Manggar observes tonnage and landfill workload. Cadres monitor household practices. Yayasan PEDULI and Pusal LH concentrate on program delivery and monitoring [1], [4]. These perspectives are valid, yet they do not merge automatically into one integrated system.

The thesis also reported a field problem in which socialization did not always move from the kelurahan level to the RT and household level. One informant explained that socialization often ended at kelurahan meetings, meaning the message did not fully reach residents [1]. This situation is not merely a communication problem. Cost-accountability also depends on an intact data chain, since household practices cannot be tracked consistently from the source to TPS or TPA when communication is fragmented.

The lack of a shared cost indicator also makes coordination weaker. Each actor may report familiar information, such as attendance, household participation, waste volume, bank sampah activity, and budget realization, but this only creates separate pieces of evidence. A common mechanism is still needed to link these pieces into clear cost evidence.

4.3 Data-Governance Barrier: No Baseline, No Unit Cost, No ROI

Data governance represents the third barrier. The thesis repeatedly emphasizes that cost analysis was limited because disaggregated activity-level cost data were not available [1]. The existing budget documents explain program and operational expenditures, but they do not clearly separate education, assistance, collection, transport, sorting, fuel, labor, equipment, and landfill operation costs by intervention area.

One informant described the problem directly: “Kami hanya punya data anggaran belanja, tidak sampai ke analisis biaya per aktivitas. Jadi sulit mengukur seberapa besar kontribusi edukasi terhadap efisiensi” [1]. This statement points to the main accounting weakness. ABC depends on cost pools and cost drivers, whereas the available system mainly presents broad budget categories. ROI and cost-effectiveness cannot be measured reliably when baseline figures for cost per ton, cost per ritase, cost per route, and cost per household are not established before the program starts.

The thesis also identifies inconsistencies between field notes and official reports. Monitoring records may indicate lower measured waste at intervention locations, but budget documents do not show the related cost reduction [1]. This condition allows environmental improvement to be described, although fiscal improvement still cannot be audited.

4.4 Material-Infrastructure Barrier: Sorting Is Asked for, but Not Always Supported

Material infrastructure forms the fourth barrier. The program requires households to separate waste, yet this practice relies on containers, labels, storage areas, collection schedules, bank sampah access, and separated downstream handling. The thesis notes that households often intended to sort their waste but did not have separate containers. A cadre explained, “Banyak warga yang ingin memilah, tapi mereka tidak punya wadah terpisah. Akhirnya ya campur lagi” [1].

A household-level comment presents the same practical concern: “Bank sampah ada, tapi jauh. Jadi warga malas bawa ke sana, lebih mudah buang ke TPS” [1]. These statements make the cost problem more tangible. Households may understand the message, yet they can still return to mixed disposal when the closest disposal option is easier than the recycling route. Under these conditions, education has limited capacity to change the downstream cost structure.

The thesis also reports that separated transport was not yet fully provided to support sorted waste [1]. This condition reduces the credibility of cost-effectiveness claims. Households may sort waste, but the city may only gain awareness rather than sufficient operational change to lower transport and landfill cost drivers when collection and transport systems recombine the waste.

4.5 Behavioral Barrier: Motivation Exists, but Routine Is Uneven

Continuity of household behavior forms the fifth barrier. The thesis indicates that resident motivation was not evenly distributed across the community. Some residents responded to bank sampah incentives, neighborhood competitions, and cadre reminders, while others sorted waste only when a clear stimulus was present [1]. A household informant described this pattern directly: “Yang rajin ya itu-itu saja. Kalau ada lomba atau hadiah, baru banyak yang ikut” [1].

This finding aligns with behavioral studies, which show that one-way information is less effective than repeated feedback, role modeling, social norms, and practical support [11], [12], [13], [17]. Balikpapan’s cadres played an important role because they turned formal program messages into everyday household practices. Their support, however, could not reach all locations with the same intensity. Locations with weaker assistance also showed less stable sorting behavior.

Behavioral inconsistency is important for cost-accounting purposes. Waste-service managers cannot redesign routes, fuel planning, truck allocation, or landfill operations when household routines remain uncertain. Residual tonnage that decreases in one week and increases again the next will make operational managers reluctant to adjust services. Motivation is therefore not separate from cost management, because it influences the reliability of cost drivers.

4.6 The Result: Potential Cost-Effectiveness, Not Yet Proven Cost-Effectiveness

Combined, the five barriers create what this paper refers to as a cost-accountability gap. The program carries a logical basis for efficiency. Consistent household sorting may reduce residual waste, redirect recyclable materials to bank sampah, improve collection efficiency, lower fuel consumption, and ease pressure on landfill capacity. These indications remain important, but they still need stronger cost evidence [1].

The same thesis avoids making a direct claim of actual financial efficiency because activity-level cost data are not yet available [1]. This careful position should also be maintained in the article. The strongest conclusion is that Balikpapan shows potential cost-effectiveness rather than proven cost-effectiveness. This distinction prevents the paper from making excessive claims and strengthens the policy recommendation. The next program cycle needs to include cost-accountability tools from the outset.

Table 2. Diagnostic Matrix of Implementation Barriers

Barrier category	Evidence from the Balikpapan case	Cost-accountability implication
Administrative	Reports focus on activities and outputs, while financial effects are not reported on a regular	Cost per household, cost per kilogram reduced, and avoided costs still cannot

	basis.	be demonstrated.
Institutional	DLH, UPTD, Pusal LH, Yayasan PEDULI, cadres, and households apply different reporting approaches.	Operational, behavioral, and financial data remain separated across actors.
Data governance	Budget information is presented in aggregate form, while baseline unit costs and ROI/ABC analysis are not yet available.	Efficiency claims remain possible, but they cannot yet be audited.
Material infrastructure	Separate bins, bank sampah access, and separated logistics are not evenly available.	Sorting behavior may fail to alter downstream cost pools.
Behavioral continuity	Participation relies on incentives, reminders, competitions, and local discipline.	Cost-driver patterns remain unstable, making service redesign difficult.

Source: developed by the author from thesis re-analysis [1].

V. CONCEPTUAL MODEL

Drawing on the findings, the conceptual model is reframed as an evidence-chain model rather than a mere list of barriers. Program inputs include education, cadre assistance, monitoring, facilities, and budget support. These inputs are expected to shape household sorting practices and then lower downstream cost drivers. Administrative, institutional, data-governance, material-infrastructure, and behavioral barriers, however, disrupt this chain.

Figure 1 shows that these barriers create a cost-accountability gap. Environmental outputs can be reported within this gap, but financial efficiency cannot yet be audited because program activities, operational changes, and activity-level costs remain disconnected. Accounting enablers are therefore positioned as the next program requirement, including separate cost codes, activity cost pools, baseline unit costs, integrated operational-financial data, and comparisons between assisted and non-assisted areas. Future implementation can move from potential cost-effectiveness to measurable cost evidence when these requirements are established.

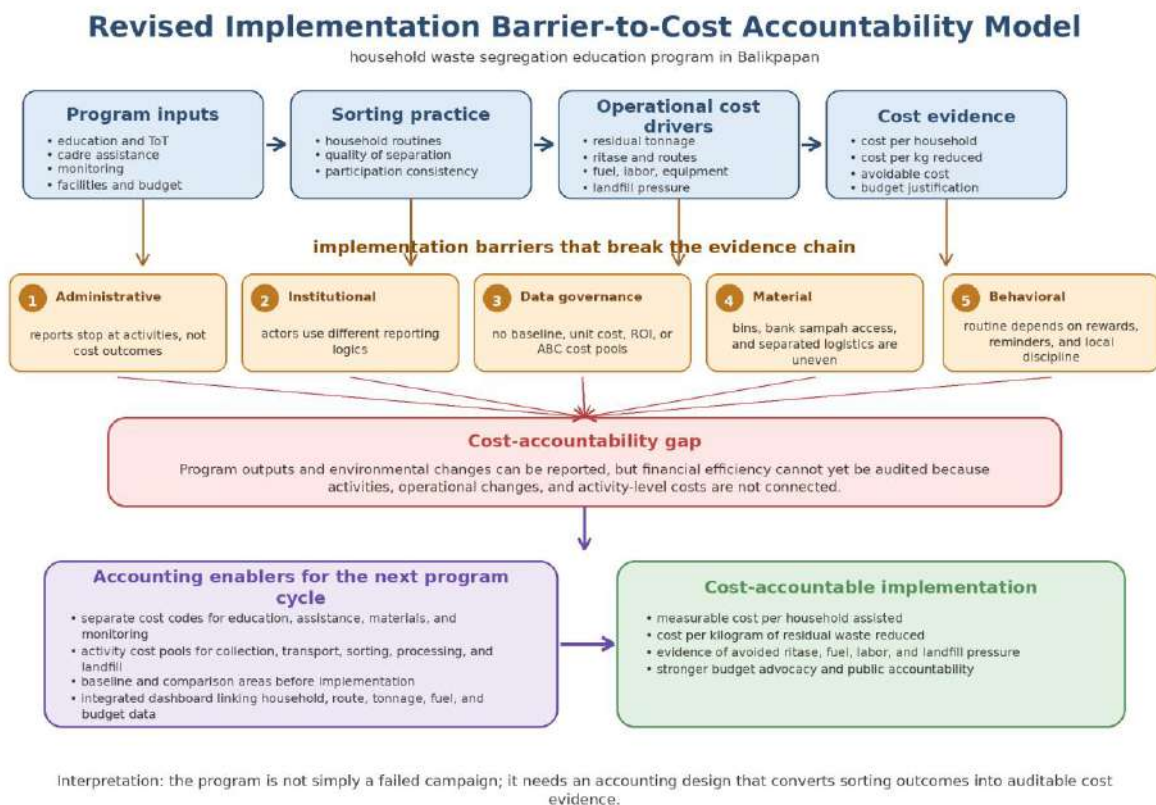


Fig. 1. revised implementation barrier-to-cost accountability model

Table 3. Minimum Accounting Requirements for Cost-Accountable Implementation

Component	Minimum requirement	Expected use
Program cost coding	Distinct codes for education, assistance, cadre support, monitoring, materials, and facilities.	Measure cost per household and cost per intervention area.

Activity cost pools	Collection, transport, sorting, organic processing, material recovery, landfill operation, and administration.	Determine which service activities are influenced by segregation.
Operational indicators	Residual tonnage, ritase, route fuel use, load factor, equipment hours, and labor hours.	Link household sorting behavior to operational change.
Baseline and comparison	Pre-program unit costs per ton, trip, route, and household, plus comparison areas without intensive assistance.	Estimate avoidable costs and strengthen cost-effectiveness claims.
Dashboard and review	Integrated reporting among DLH, UPTD TPA, cadres, bank sampah, and program facilitators.	Support budgeting, redesign, and public accountability using evidence.

Source: developed by the author from thesis findings and costing requirements [1], [20].

VI. CONCLUSION

This article concludes that Balikpapan's core problem is not the relevance of household waste segregation education. Its relevance is evident. The main concern is whether the program is implemented in a manner that makes cost-effectiveness measurable. Thesis evidence shows that the program created awareness, provided assistance, and encouraged several household-level changes, yet five barriers still prevent these outcomes from becoming auditable cost evidence: activity-based administration, fragmented institutional coordination, weak data governance, uneven material support, and inconsistent household routines [1].

The main strength of this paper lies in its attention to the missing evidence chain between behavioral change and public cost. Its practical implication is clear: future programs need cost codes, activity cost pools, baselines, route and tonnage indicators, and a simple dashboard before implementation begins. Such a design would enable Balikpapan to report not only the number of assisted households, but also whether residual waste decreased, collection trips changed, fuel use shifted, and the program generated measurable public value.

This paper is limited because it depends on a secondary re-analysis of one thesis and one city case. Actual savings are not calculated, and a complete costing system is not tested. Future research should apply action research with DLH, UPTD TPA Manggar, cadres, bank sampah, and selected RTs to pilot a cost-effectiveness dashboard. Comparative studies involving other Indonesian cities would also help identify which institutional arrangements make waste education more accountable as a public investment..

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