

THE EFFECTIVENESS OF THE WASTE MANAGEMENT PROGRAM THROUGH WASTE BANKS IN REGOL DISTRICT, BANDUNG CITY

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Abstract

Urban waste growth and limited local processing capacity have intensified the need to evaluate waste bank programmes in Bandung City. This study evaluates the effectiveness of the Waste Bank Programme in Regol District using Sutrisno's five dimensions: programme understanding, target accuracy, timeliness, goal attainment, and tangible change. A qualitative descriptive design was employed, with data collected through semi-structured interviews, direct observation, and document analysis from purposively selected government officials, programme managers, participants, and environmental actors. The findings show that the programme was moderately effective. Customer participation increased from approximately 30 to 97 people, 421 kilograms of inorganic waste were recovered, customer savings reached about IDR 4.4 million, and financial turnover totalled IDR 15 million. The programme improved household waste sorting and awareness of waste's economic value, but limited storage capacity, weak business-sector participation, and incomplete neighbourhood coverage constrained environmental impacts. Strengthening infrastructure, institutional coordination, and programme expansion is therefore essential.

Keywords: Programme Effectiveness; Waste Bank; Waste Management

A. INTRODUCTION

Verified 2025 data indicate that Indonesia manages only 35,697 tonnes of waste per day, equivalent to 24.73% of the national total, while approximately 108,652 tonnes per day remain unmanaged (Ministry of Environment/Environmental Control Agency, 2025). Globally, municipal solid waste generation is projected to increase from 2.1 billion tonnes in 2023 to 3.8 billion tonnes by 2050 (United Nations Environment Programme, 2024). Bandung City generates approximately 1,500 tonnes of waste per day, of which nearly 981 tonnes are still transported to the Sarimukti final disposal site (Bandung City Government, 2025). In April 2026, approximately 500 tonnes of waste generated in Bandung had not been optimally processed, while fewer than 10% of neighbourhood units were reportedly capable of managing their waste independently (Bandung City Communication and Informatics Office, 2026). National regulations have explicitly incorporated waste banks into the formal waste-management framework, making programme effectiveness a critical determinant of local

governments' capacity to reduce dependence on final disposal sites (Ministry of Environment and Forestry of the Republic of Indonesia, 2021).

The establishment of a waste bank does not automatically demonstrate programme effectiveness because its success depends on implementation quality, beneficiary targeting, operational continuity, and tangible changes in community behaviour. A survey involving 118 village-level decision-makers in Indonesia found that routine operations, training, and public outreach strengthened the economic benefits of waste banks, although community participation remained concentrated at the consultation stage with limited decision-making authority (Antriyandarti et al., 2025). Research on the Kenanga Waste Bank in Bogor similarly identified relatively strong operational and institutional management, yet weaknesses persisted in waste-sorting enforcement, member involvement in decision-making, and financial sustainability (Al Zahra & Shohibuddin, 2025). Sutrisno's framework conceptualises programme effectiveness through five interrelated dimensions: programme understanding, target accuracy, timeliness, goal attainment, and tangible change (Sutrisno, 2010). Accordingly, the waste bank programme in Regol District must be assessed as a public intervention involving policy implementation, administrative capacity, beneficiary experience, and environmental outcomes.

Waste bank units in Regol District operate under different management arrangements and demonstrate uneven levels of community participation. Several units continue to face limited citizen engagement, unequal understanding of household waste separation, and declining motivation among programme participants. Inadequate storage facilities, weighing equipment, data-recording systems, logistical support, and coordination among stakeholders further constrain operational consistency. Irregular service schedules and occasional interruptions make it difficult to assess whether the programme has reduced waste volumes or produced sustained behavioural change. The central problem therefore concerns the extent to which the waste bank programme in Regol District has effectively achieved its intended processes, targets, objectives, and community-level outcomes.

Recent studies on waste banks have primarily examined their environmental contributions, institutional capacity, participation motives, and social consequences. Budiarto, Clarke, and Ross (2025), through a comprehensive review of scientific publications and policy documents, found that waste banks support waste separation, recycling, and community income generation, although their contribution to national waste management remains limited by inadequate infrastructure and managerial capacity. Widayat, Marnis, Suci, Samsir, and Jahrizal (2025), using survey data from 303 Indonesian residents, demonstrated that economic motives coexist with social, environmental, and educational motivations, while collective efficacy strengthens the effects of non-economic motives on participation in waste banks. Van Leeuwen and Surya (2024), through a case study of plastic-waste flow networks in Klaten, showed that waste banks reduced plastic pollution and increased recycling but simultaneously restricted informal waste pickers, mobile collectors, and intermediaries from accessing economically valuable waste. Collectively, these studies confirm the environmental and socioeconomic potential of waste banks while demonstrating that their effectiveness remains multidimensional, context-dependent, and vulnerable to governance weaknesses and inequalities among participating actors.

Previous studies and the present research similarly position waste banks as community-based mechanisms for improving municipal waste management. They also share an analytical concern with citizen participation, managerial capacity, institutional support, and the environmental, social, and economic benefits generated by waste bank activities. The principal distinction is that the present study does not restrict its analysis to recycling contributions, participation motives, institutional capacity, or relationships among waste-management actors but evaluates programme effectiveness as an integrated public-policy process. The evaluation applies Sutrisno's five effectiveness indicators in a densely populated urban district and incorporates perspectives from government implementers, waste bank managers, village officials, active customers, and environmental volunteers through a qualitative descriptive design. These conceptual, contextual, and analytical differences establish a distinct area of inquiry concerning how local implementation processes translate into programme achievements and observable community-level changes.

The considerable volume of waste generated in Bandung contrasts with a body of literature that more frequently explains the partial benefits of waste banks than their overall effectiveness as public programmes. The most prominent limitation constitutes a practical-knowledge gap. This gap is substantively relevant because previous studies have identified economic benefits, participation motives, institutional capacities, and risks of social exclusion without providing sufficient operational knowledge for assessing whether a local programme functions according to its intended targets and implementation plans. The integration of programme understanding, beneficiary and geographical targeting, implementation timeliness, goal attainment, and changes in community behaviour and environmental conditions remains insufficiently examined. The present study addresses this gap by evaluating the five dimensions of programme effectiveness comprehensively within the waste bank programme implemented in Regol District, Bandung City.

The urgency of this research arises from the disparity between Bandung's substantial daily waste generation and its limited community-level processing capacity, which remains dependent on the consistency of locally implemented waste bank programmes. Without an integrated evaluation, scholarly understanding of the relationship between programme implementation, goal achievement, and tangible behavioural and environmental changes will remain fragmented. At the practical level, uncertainty regarding programme effectiveness may perpetuate inaccurate targeting, inconsistent service schedules, inefficient resource allocation, weak public participation, and limited diversion of waste from final disposal sites. These consequences directly affect district and village governments, environmental agencies, sanitation service units, waste bank managers, programme customers, environmental volunteers, and communities exposed to unmanaged waste. An evaluation in Regol District is therefore necessary to generate contextually grounded evidence before existing operational weaknesses become institutionalised within local waste-management practices.

The principal distinguishing feature of this research lies in applying five programme-effectiveness dimensions to examine a waste bank as a public intervention comprising implementation processes, programme targets, operational schedules, intended objectives, and observable impacts. Conceptually, the study extends the application of Sutrisno's effectiveness

framework to community-based waste governance by connecting implementation quality with programme outcomes. Empirically, it produces multi-actor qualitative evidence regarding variations in programme understanding, target accuracy, operational consistency, goal achievement, and tangible changes within Regol District. Practically, the findings can provide a diagnostic basis for local governments and waste bank managers to improve public communication, infrastructure, institutional coordination, service schedules, monitoring systems, and participation strategies. The study's added value therefore lies in providing a comprehensive and conceptually structured evaluation that can be translated into context-specific recommendations for improving local waste bank governance.

This study aims to evaluate the effectiveness of the waste management programme implemented through waste banks in Regol District, Bandung City, based on programme understanding, target accuracy, timeliness, goal attainment, and tangible change. It also seeks to identify the institutional, operational, and participatory factors that support or constrain programme implementation.

B. LITERATURE REVIEW

Policy Implementation

Policy implementation refers to the process through which formally adopted policies are translated into operational activities, public services, and measurable programme outcomes. Edwards III (1980) argues that implementation performance is determined by the interaction of communication, resources, implementer disposition, and bureaucratic structure. Communication determines whether programme objectives, procedures, and responsibilities are conveyed clearly and consistently to implementing actors and target groups. Resources, disposition, and administrative arrangements shape the institutional capacity and commitment required to implement a programme according to its original design. In the context of waste banks, this concept explains why regulatory support may not generate effective outcomes when coordination, infrastructure, human resources, and operational commitment remain inadequate. Indicators:

- Communication: clarity, consistency, and transmission of programme information.
- Resources: personnel, funding, facilities, information, and authority.
- Implementer disposition: commitment, responsiveness, and acceptance of the programme.
- Bureaucratic structure: operational procedures, division of responsibilities, and coordination mechanisms.

Community Participation

Community participation refers to the active involvement of citizens in decisions and activities that affect their collective interests and local environment. Cohen and Uphoff (1980) conceptualise participation as community involvement in decision-making, programme implementation, benefit utilisation, and programme evaluation. This perspective positions residents not merely as programme beneficiaries but as active actors who contribute knowledge, labour, resources, and oversight. The depth and continuity of participation influence programme ownership, collective responsibility, behavioural change, and institutional sustainability. In waste bank programmes, community participation is essential

because household waste separation, waste depositing, administrative recording, and recycling activities depend directly on sustained citizen involvement. Indicators:

- Participation in decision-making: involvement in planning and determining programme priorities.
- Participation in implementation: contribution of time, labour, ideas, and resources.
- Participation in benefit utilisation: access to environmental, social, and economic benefits.
- Participation in evaluation: involvement in monitoring, assessment, and programme improvement.

Programme Effectiveness

Programme effectiveness refers to the extent to which an intervention achieves its predetermined objectives and produces the intended changes among its target groups. Sutrisno (2010) evaluates programme effectiveness through five dimensions: programme understanding, target accuracy, timeliness, goal attainment, and tangible change. This framework examines not only final outputs but also whether programme mechanisms are understood, appropriately targeted, and implemented according to the established plan. It therefore provides a comprehensive basis for identifying discrepancies between formal programme objectives and actual implementation conditions. In this study, the framework serves as the principal analytical basis for evaluating the waste management programme implemented through waste banks in Regol District, Bandung City. Indicators:

- Programme understanding: understanding of objectives, mechanisms, benefits, roles, and regulations.
- Target accuracy: suitability of beneficiaries, community needs, geographical coverage, and programme targeting.
- Timeliness: consistency between planned schedules, implementation duration, and programme realisation.
- Goal attainment: achievement of outputs, outcomes, benefits, and intended environmental targets.
- Tangible change: changes in attitudes, waste-sorting behaviour, environmental conditions, and programme performance.

C. RESEARCH METHODOLOGY

This study employed a qualitative descriptive method to evaluate the effectiveness of the waste management programme implemented through waste banks in Regol District, Bandung City. This method was selected because the study seeks to understand stakeholders' experiences, perceptions, and interpretations of programme implementation rather than statistically test causal relationships. A qualitative descriptive design enables an in-depth examination of programme understanding, target accuracy, timeliness, goal attainment, and tangible change within the programme's actual operational setting. It is particularly appropriate for analysing organisational processes, institutional coordination, community participation, implementation constraints, and programme outcomes in their natural context (Creswell & Poth, 2018). Accordingly, this method is relevant because waste bank effectiveness cannot be assessed solely through numerical outputs but must also consider administrative practices, stakeholder interactions, and changes in community waste-management behaviour.

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Data were collected through semi-structured interviews, direct observation, and document analysis. Semi-structured interviews explored programme objectives, implementation mechanisms, institutional support, operational consistency, community participation, programme benefits, and implementation barriers. Direct observation was conducted to examine waste-sorting and collection activities, interactions between managers and residents, the availability of facilities, administrative procedures, and the actual condition of waste bank operations. Document analysis included regulations, programme reports, operational records, administrative archives, activity photographs, and other materials relevant to waste bank management. The study applied purposive sampling by selecting informants based on their knowledge, responsibilities, experience, and direct involvement in the programme, including a waste-management official, a waste bank manager, a village government representative, an active waste bank customer, and an environmental volunteer; this technique is appropriate for identifying information-rich participants in qualitative research (Patton, 2015).

The data were analysed using the interactive qualitative analysis model developed by Miles, Huberman, and Saldaña, which comprises data condensation, data display, and conclusion drawing and verification (Miles, Huberman, & Saldaña, 2014). Data condensation involved selecting, coding, categorising, and simplifying information obtained from interviews, observations, and documents according to the five dimensions of programme effectiveness. The organised data were subsequently presented in thematic narratives and matrices to compare the perspectives of government officials, programme managers, beneficiaries, and community actors. Conclusions were drawn by identifying recurring patterns, inconsistencies, supporting conditions, implementation barriers, and relationships among the dimensions of programme effectiveness. The credibility of the findings was strengthened through source and method triangulation by comparing information across informants, observations, and documentary evidence.

D. RESULT AND DISCUSSION

Programme Reach and Operational Effectiveness

Field findings show that the Waste Bank Programme in Regol District expanded its customer base from approximately 30 to 97 participants. Programme managers disseminated information through flyers, district social media, government media coverage, and local communication groups to explain accepted waste categories and service procedures. The programme initially attracted district employees but subsequently reached residents, schools, and other educational institutions, while restaurants and cafés remained weakly represented. The *Nyandak Runtah* pickup service widened geographical access by collecting recyclable materials from communities across the district. Weekly collection activities operated every Thursday from 08:00, although limited storage capacity required managers to transfer accumulated waste to collectors within two to three days, establishing an operational profile that combines expanding access with persistent logistical constraints.

Table 1. Programme Reach and Operational Conditions in Regol District

Analytical Aspect	Field Evidence	Initial Assessment
Programme communication	Flyers, district social media, government media coverage, and communication groups	Information reached multiple community channels
Customer growth	Increase from approximately 30 to 97 customers	Participation expanded substantially
Target-group coverage	Expansion from district employees to residents, schools, and educational institutions	Community reach became more diverse
Geographical accessibility	Waste collection through the Nyandak Runtah pickup service	Access extended beyond the primary collection point
Operational regularity	Collection every Thursday from 08:00	Service delivery followed a consistent schedule
Commercial-sector participation	Limited involvement of restaurants and cafés	Coverage of commercial waste sources remained weak
Storage capacity	Waste transferred to collectors within two to three days	Limited storage reduced operational flexibility

Source: Processed from field interview findings (2025).

The increase in customers indicates that repeated communication and visible service delivery converted initial awareness into actual programme participation. The inclusion of residents and educational institutions broadened the programme beyond an internally oriented government initiative and strengthened its community basis. The pickup mechanism reduced access barriers for participants who could not deliver sorted waste directly to the collection point. Limited commercial participation and inadequate storage capacity nevertheless constrained the programme's ability to manage larger and more regular waste flows. This uneven combination of broader access and restricted operational capacity requires comparison with empirical evidence on infrastructure, participation, and institutional sustainability in community-based waste management.

A national review found that waste banks can extend waste-management coverage and improve household sorting, although inadequate infrastructure and limited managerial capacity constrain their contribution to municipal waste management (Budyarto et al., 2025). A mixed-methods study of the Kenanga Waste Bank similarly showed that strong operational performance can coexist with weak participation in decision-making, inconsistent sorting enforcement, and fragile financial sustainability (Al Zahra & Shohibuddin, 2025). Evidence from 118 rural decision-makers demonstrated that routine operations combined with training and socialisation significantly strengthen the economic benefits generated by waste banks (Antriyandarti et al., 2025). Research in Klaten revealed that waste banks can reduce plastic pollution while simultaneously restructuring material flows in ways that exclude informal collectors from economically valuable waste networks (van Leeuwen & Surya, 2024). A qualitative assessment of the Malang Waste Bank found that financial incentives, recycling education, and structured savings mechanisms can jointly support environmental management and community socioeconomic empowerment (Miftahorrozi et al., 2022).

The Regol evidence aligns with the broader literature by showing that access expansion depends on communication, service consistency, and practical convenience rather than formal programme availability alone. Social media dissemination and regular Thursday operations created a recognisable service pattern that helped residents understand when and how to

participate. School and educational-institution involvement also created potential channels for normalising waste sorting through repeated organisational practice. Weak commercial participation and limited storage capacity reduced the programme's ability to consolidate larger waste streams and maintain operational autonomy. Programme reach in Regol therefore reflects an expanding but incompletely institutionalised service system, which requires assessment beyond participation growth alone.

Operational reach constitutes a necessary condition for effectiveness, but broader access does not by itself demonstrate that the programme has achieved its environmental and socioeconomic objectives. Customer growth may represent improved awareness, yet the strength of that growth depends on continued depositing behaviour and consistent waste recovery. Regular service schedules may indicate administrative reliability, yet restricted storage and limited commercial involvement can reduce the volume and diversity of materials processed. Assessment must therefore connect programme reach with measurable outputs, financial benefits, behavioural change, and reductions in unmanaged waste. The relationship between these operational conditions and the programme's realised outcomes provides the basis for evaluating goal attainment and tangible change in Regol District.

Programme Outcomes and Tangible Change

Field findings show that the Waste Bank Programme in Regol District enrolled 97 customers, compared with approximately 30 participants during its initial operation. The programme recorded customer savings of approximately IDR 4.4 million and total financial turnover of about IDR 15 million. Programme managers also reported the recovery of approximately 421 kilograms of inorganic waste during the reporting period. Participants increasingly separated recyclable materials at the household level and deposited them through the waste bank instead of treating them as valueless residuals. Figure 1 documents this process through the direct involvement of managers and community members in weighing and collecting sorted recyclable materials.



Figure 1. Community Participation and Recyclable Waste Collection at the Regol District Waste Bank

Source: Field documentation, 2026.

These results demonstrate that the programme generated three distinct forms of outcome: material recovery, economic value, and behavioural adjustment. Customer savings and financial turnover indicate that waste sorting produced a visible return that could sustain participation beyond environmental awareness alone. The recovery of 421 kilograms of inorganic waste confirms that household sorting translated into measurable material diversion rather than remaining an attitudinal commitment. The growth in customers also suggests that repeated participation strengthened the social legitimacy of the programme within the community. The coexistence of measurable outputs and still-limited district-wide environmental effects requires comparison with evidence from other community-based waste management initiatives.

Research at public transport hubs in Jakarta found that interest, access to resources, planning capacity, and continuous learning significantly strengthened willingness to participate and behavioural control in waste bank activities (Ulhasanah et al., 2025). An agent-based study in Yogyakarta showed that knowledge enhancement increased waste sorting across socioeconomic groups, although many households remained at the stage of partial treatment rather than complete waste diversion (Asih et al., 2026). Evidence from Sukasari District in Bandung indicated that waste banks improved household income and contributed to local economic activity, particularly when government support strengthened their operating systems (Warlina et al., 2022). A study in Klaten found that waste banks reduced plastic pollution and increased recycling but also altered material flows in ways that excluded informal collectors from economically valuable waste streams (van Leeuwen & Surya, 2024). A national review concluded that waste banks support sorting, recycling, and community income, although inadequate infrastructure and limited managerial capacity restrict their aggregate contribution to waste management (Budiarto et al., 2025).

The Regol case reveals a sequential outcome pattern in which programme communication expands participation, participation generates economic transactions, and economic value reinforces household sorting practices. The financial turnover and customer savings therefore function as participation-retention mechanisms rather than incidental benefits. The recovered waste volume shows that behavioural change has begun to produce physical diversion, but its current scale remains insufficient to transform environmental conditions across the district. This divergence establishes an outcome threshold in which individual and organisational gains emerge earlier than territorial environmental improvement. Programme effectiveness in Regol consequently depends on converting localised behavioural and economic gains into broader, continuous, and verifiable material recovery.

The evidence positions programme outcomes as uneven across economic, behavioural, and environmental dimensions. Economic balances, customer growth, and routine waste deposits demonstrate immediate value, whereas district-level environmental improvement requires wider institutional coverage. Limited storage capacity, weak participation from commercial establishments, and the absence of waste banks in every neighbourhood unit prevent local achievements from accumulating into a larger ecological effect. Sustained effectiveness requires service expansion, stable material-flow arrangements, stronger organisational capacity, and performance indicators that connect participation with actual

waste reduction. These conditions place programme design, implementation capacity, and stakeholder coordination at the centre of the overall assessment of the Regol District Waste Bank Programme.

Integrated Discussion of Waste Bank Programme Effectiveness

Field findings indicate that the Waste Bank Programme in Regol District achieved uneven effectiveness across programme understanding, target accuracy, timeliness, goal attainment, and tangible change. Multi-channel communication increased public awareness and expanded the customer base from approximately 30 to 97 participants. Regular Thursday operations and the *Nyandak Runtah* pickup service improved access for residents, schools, and educational institutions, although restaurants and cafés remained weakly represented. The programme generated approximately IDR 4.4 million in customer savings, IDR 15 million in financial turnover, and 421 kilograms of recovered inorganic waste. Behavioural change emerged through household sorting and recognition of waste value, while district-wide environmental improvement remained limited by storage constraints, incomplete neighbourhood coverage, and restricted commercial participation.

The findings show that programme effectiveness developed through an interdependent sequence rather than through isolated indicators. Clear communication and predictable service schedules strengthened understanding and reduced practical barriers to participation. Broader participation then generated measurable material and economic outputs that reinforced the perceived usefulness of the programme. Limited storage capacity and narrow institutional coverage interrupted this sequence before local gains accumulated into district-level environmental change. The programme can therefore be classified as moderately effective because strong early-stage performance coexisted with weak system-scale conversion.

Intervention campaigns and visual guidance can improve household knowledge and sorting practices, although improved sorting does not automatically reduce the total amount of waste generated (Sembiring et al., 2024). Economic, social, environmental, and educational motives jointly influence participation in Indonesian waste banks, while collective efficacy strengthens the contribution of non-economic motives (Widayat et al., 2025). Routine operations, training, socialisation, and community empowerment strengthen the economic contribution of waste banks, although participation in managerial decision-making can remain limited (Antriandarti et al., 2025). Strong operational and institutional performance can coexist with weak sorting enforcement, limited participatory governance, and fragile financial sustainability in community-based waste banks (Al Zahra & Shohibuddin, 2025). Waste banks support household sorting, recycling, and community income, but inadequate infrastructure and weak integration into municipal systems restrict their broader contribution to waste management (Budiarto et al., 2025).

The combined evidence identifies a staged effectiveness mechanism in which communication acts as the entry point, participation functions as the transmission process, and material recovery represents the first observable programme output. Economic returns strengthen continuity by converting sorted waste into visible household value. Behavioural change becomes durable when repeated transactions normalise sorting as a routine rather than a temporary response to socialisation. District-level environmental impact appears only when

local participation reaches sufficient spatial coverage and operates through adequate storage, logistics, and institutional coordination. Figure 2 visualises this pathway and identifies operational capacity as the threshold separating local programme success from broader environmental effectiveness.

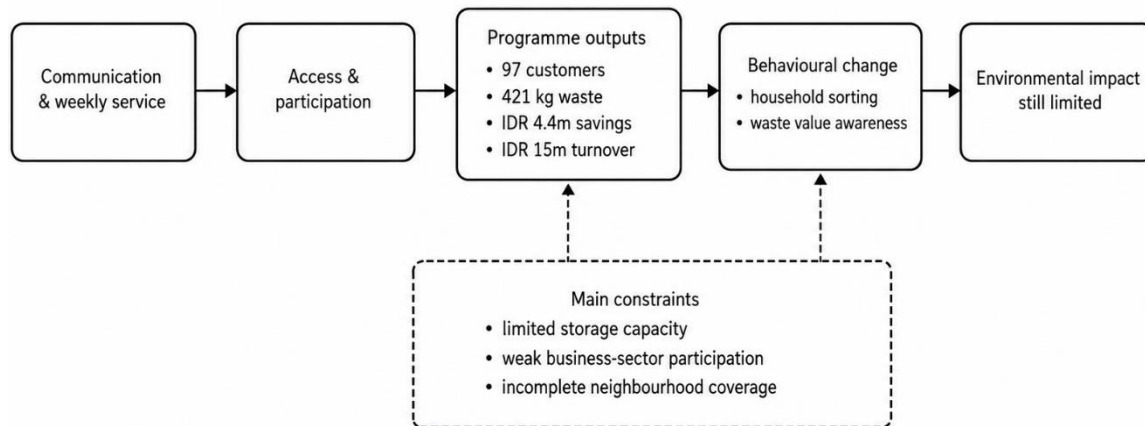


Figure 2. Framework of Waste Bank Programme Effectiveness in Regol District

Source: Authors' analysis based on field findings, 2026.

The integrated pattern places institutional capacity at the centre of sustained programme performance. Service expansion requires storage facilities that can absorb higher material volumes without forcing immediate sales to collectors. Broader commercial engagement can diversify recyclable flows and reduce dependence on household participation alone. Performance monitoring must connect customer growth and financial turnover with material recovery rates, service continuity, and verified waste reduction. These requirements provide an analytical basis for determining which governance arrangements and operational interventions can convert localised achievements into durable district-wide outcomes.

E. CONSLUSION

The Waste Bank Programme in Regol District can be classified as moderately effective because it has improved programme understanding, expanded participation, maintained regular service delivery, generated economic value, and encouraged household waste sorting, although its district-wide environmental impact remains limited. These findings indicate that the research objectives were achieved by demonstrating that programme effectiveness depends not only on participation growth and operational continuity but also on the capacity to convert local behavioural and economic gains into broader waste reduction outcomes. The study contributes an integrated assessment of waste bank effectiveness by linking communication, access, participation, material recovery, economic benefits, behavioural change, and operational constraints within a single local governance framework. Regol District authorities and waste bank managers should expand storage capacity, strengthen collaboration with restaurants and other business actors, establish wider neighbourhood-level coverage, improve performance monitoring, and integrate waste bank targets into local waste-management policy. Future research should involve more informants, longer observation periods, comparative locations,

and quantitative measurement of waste reduction to address the present study's limited geographic scope, small qualitative sample, and reliance on programme-level records.

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