Research Article

Policy Triangle Framework on Community-based Solid Waste Management in South Tangerang City – A Comparative Case Study

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Abstract.
Solid waste continues to be a challenging environmental concern in Indonesia, especially in urban areas like South Tangerang City. To mitigate this issue, a community-based waste bank program has determined significant. This study focuses on the waste bank program analysis in the leading Sub-district of the city, Ciputat, using the Walt and Gilson implementation model to foster analysis of its content, context, process, and actors. This policy triangle framework is compelled by community participation's ladder to clarify the degree of public engagement. Through a qualitative-descriptive approach, the study compares three of the most prominent waste banks in Berkah Mulya, Suka Makmur, and Kartini 5. The findings indicate that the program was impactful against varied hampers including irregular community involvement, insufficient human resources, and less adequate government assistance. The study points to local authorities undertaking a more active role in working with the waste banks. The assistance should include the social dimension of training in waste management practices and community engagement and the business process of product creativity, marketing, and financial management. Furthermore, improving monitoring and evaluation efforts is critical to ensuring that the program meets its objectives. By resolving these issues and applying the suggested measures, community-based solid waste management through a waste bank is expected to promote sustainable waste management practices.

Keywords: solid waste management, community participation, waste bank, policy triangle framework

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1. INTRODUCTION

Domestic waste pollution remains one of Indonesia's most critical environmental issues, affecting both urban and rural areas. This issue spans from localized to national scales, with increasing pressure on ecosystems, public health, and urban infrastructure. This growing concern to Indonesia's rapid population growth, which directly correlates with increased waste production due to rising living standards, consumption patterns, and industrialization. The problem has become increasingly urgent in densely populated cities where infrastructure struggles to keep pace with human activities. To illustrate the scope of this issue, the National Waste Management Information System (SIPSN) provides insightful data that highlights the national waste profile for the year 2022. This data underscores both the magnitude of the waste generation and the shortcomings in its management:

Table 1: National Waste Statistics in Indonesia (2022).

No.	Indicator	Data
1.	Total Waste Generated	19.45 million tons
2.	Properly Managed Waste	8.29 million tons (42.6%)
3.	Improperly Managed Waste	11.16 million tons (57.4%)
4.	Major Waste Type	Organic (57%), Plastic (15%)
5.	Daily Waste Generation per Capita	0.7–0.8 kg

Source: [1]

The data above demonstrates a troubling scenario where more than half of Indonesia's waste is either dumped, burned, or left unmanaged. This mismanagement contributes directly to air and water pollution, clogged drainage systems, and greenhouse gas emissions. This context highlights why Indonesia needs a more integrated and participatory waste governance model.

Despite the implementation of various policies, conventional governmental waste management approaches have fallen short. For example, regulations such as the Minister of Environment and Forestry Regulation No. 10/2018 aim to streamline national waste management; however, the practical outcomes remain limited due to poor enforcement and lack of public engagement.

Although current regulations promote an integrated waste management system that includes the government, corporations, NGOs, and communities, their success depends heavily on public literacy and participation. One of the main obstacles remains the low

Table 2: Waste Management Policy Milestones in Indonesia.

No.	Policy/Regulation	Year	Description
1.	Minister of Environment Regulation No. 10/MENLHK/SETJEN/PLB.0/2018 [2]	2018	National waste management guidelines promoting integration across stakeholders
2.	Regulation of the Minister of Environment and Forestry No. 14 [3]	2021	Provides a framework for community-based waste banks and 3R initiatives
3.	Regional Regulation No. 13 (South Tangerang) [4]	2019	Regional household waste control, sanitation, and environmental preservation

Source: collected and analyzed by writers (2024)

level of public awareness regarding sustainable waste management practices. This situation is evident in South Tangerang City, which has a total area of 147.19 km^2 and a population of over 1.24 million. The city represents a microcosm of the national waste problem, with frequent flooding, drainage blockages, and visible piles of unmanaged garbage despite existing policies and frameworks.

Table 3: Demographic & Geographic Data – South Tangerang.

No.	Indicator	Value
1.	Total Area	147.19 km^2
2.	Total Population (2022 est.)	1,241,441 people
3.	Population Density	8,432 people/km^2
4.	Notable Sub-district	Ciputat
5.	Known Waste Banks	389 active units

To address the waste issue in South Tangerang, particularly in Ciputat Sub-district, the government introduced the waste bank program. Waste banks are community-run facilities that adopt the 3R principles—reduce, reuse, and recycle. These initiatives aim to convert waste into economic value while instilling environmental responsibility in local communities. Regulation No. 14 of 2021 [3]further institutionalized the importance of waste banks as a participatory solution to the domestic waste crisis. Among the 389 active waste banks in South Tangerang, three stand out due to their organization, reach, and community impact: Berkah Mulya, Suka Makmur 02, and Kartini 5. These institutions function as mini waste economies—allowing residents to deposit, sort, and monetize waste in a structured system.

These waste banks also serve as community learning hubs, where residents are educated about the environmental impact of poor waste disposal and the benefits of

Table 4: Case Study – Waste Banks in Ciputat Sub-District.

No.	Waste Bank Name	Established	Location	Managers	Customers Served	Key Attributes
1.	Berkah Mulya	2018	Jl. Suka Makmur No.34, RT02/RW02	5	22	Resident-driven, early pioneer
2.	Suka Makmur 02	2021	Jl. Bukit Indah No.8 Blok A6, RT7/RW15	6	38	Community-centered, moderate outreach
3.	Kartini 5	2022	Bukit Indah Serua Complex	9	104	Largest customer base, strong community support

sustainable living. Their participatory model builds local capacity, fosters environmental ownership, and generates economic incentives through savings or trade credits.

To analyze their success, the Walt and Gilson Policy Triangle is used. This model dissects policy effectiveness into four components—context, content, process, and actors—offering a structured lens for evaluating public health and environmental interventions [5].

Table 5: Factors Contributing to Waste Bank Success (Based on Walt & Gilson Framework).

No.	Dimension	Factors Identified
1.	Context	Urban waste crisis, limited landfill space, frequent urban flooding
2.	Content	Adoption of 3R principles, community education, economic incentives
3.	Process	Waste collection, sorting, recording transactions, environmental outreach
4.	Actors	Local government, NGOs, citizens, waste bank managers

By applying this model, it becomes evident that these waste banks thrive due to a combination of strong local leadership, community engagement, aligned policy frameworks, and incentivized participation. Their economic appeal—offering small monetary returns or household savings—further ensures high participation rates, especially among low- and middle-income households. However, challenges persist. These include inconsistent government support, limited access to larger recycling markets, and fluctuating community interest. Addressing these barriers will require a collaborative effort among local governments, NGOs, and community leaders. Strategic recommendations may include scaling up education programs, investing in recycling infrastructure, and fostering multi-stakeholder partnerships.

By applying the Walt and Gilson Policy Triangle, this study investigates the implementation of three community-based waste banks-Berkah Mulya, Suka Makmur 02, and

Kartini 5 in Ciputat Sub-district. Using a qualitative-descriptive approach, the research dissects how each of the four dimensions contributes to or hinders program outcomes. Special attention is given to the synergy between actors and process, particularly how waste bank managers mobilize communities, enforce rules, and sustain participation. In conclusion, Ciputat's community waste banks illustrate the transformative potential of grassroots environmental governance. By merging ecological responsibility with economic empowerment, they provide a replicable model for urban centers across Indonesia. Their success highlights how citizen-driven initiatives, when supported by institutional policy and local leadership, can contribute meaningfully to solving complex environmental challenges.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1. Policy Triangle Framework

In the realm of public policy implementation, a wide array of models and theories have been developed to explain the dynamics, challenges, and success factors in executing government programs. Traditional models, such as George C. Edwards III's Policy Implementation Theory and the Mazmanian and Sabatier framework, have been widely utilized to analyze linear pathways of implementation—emphasizing clear goals, resources, communication, and bureaucratic structure. However, the complexity and multi-stakeholder nature of community-based environmental initiatives, such as waste bank programs, demand a more holistic, context-sensitive framework.

To meet this need, this study adopts the Policy Triangle Framework developed by Walt [6]. Originally formulated for health policy analysis, the model has gained interdisciplinary traction due to its emphasis on the interplay between content, context, process, and actors in shaping policy outcomes. Unlike linear models, the Policy Triangle does not treat implementation as a one-way process but as an iterative negotiation among stakeholders influenced by political, social, economic, and cultural dynamics.

The framework's four interlinked dimensions are elaborated below to reflect their relevance to waste bank implementation in Ciputat:

1. Actors:This refers to all individuals, institutions, and groups involved in the formulation and execution of the waste bank programs. In this study, actors include the Department of Environment and Sanitation, waste bank managers, local community members, NGOs, and private recycling partners. Each actor plays a unique

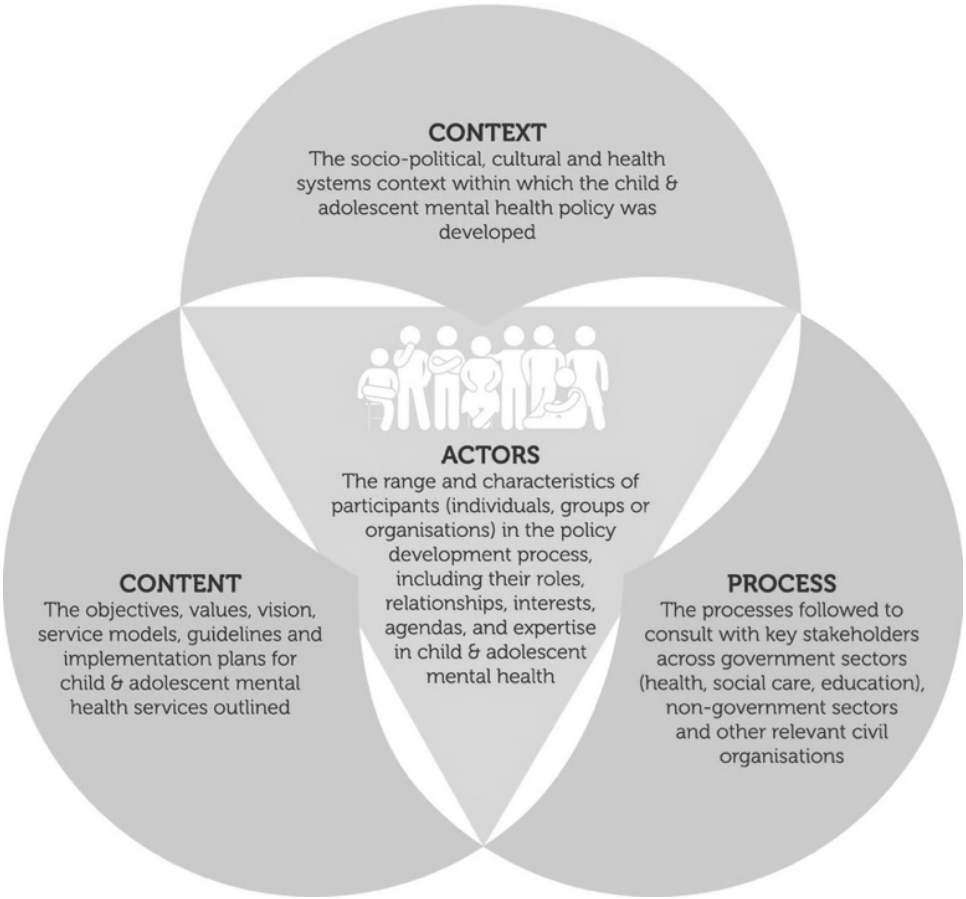

Figure 1: The Walt and Gilson Policy Triangle. **Source**: [6], adapted from [5].

role in influencing and operationalizing waste bank activities—from grassroots mobilization to policy enforcement.

2. Content:The content dimension reflects the goals, strategies, and instruments embedded in the waste management policy. It includes legal frameworks (e.g., Regulation No. 14/2021 on waste banks), procedural guidelines, and financial mechanisms such as incentives or credit systems for recyclables. This element examines whether the policies are coherent, actionable, and aligned with the needs of the target community.

3. Context:Context encompasses the external and structural factors that shape policy implementation. These include political stability, bureaucratic capacity, funding availability, socio-economic conditions, and cultural attitudes towards environmental responsibility. In South Tangerang, for instance, rapid urbanization, population density, and inconsistent waste behavior present both challenges and opportunities for waste bank success.

4. Process:This refers to the methods and sequences through which policies are translated into practice. It considers both formal procedures-such as stakeholder meetings, community training, and official monitoring—as well as informal dynamics like peer influence and local leadership. The waste banks' success in Ciputat is partly attributed to a process of continuous engagement, learning, and adaptation among community actors.

2.2. Theoretical Dialogues and Application in This Study

The Policy Triangle offers a four-pillar analytical lens—actors, context, content, and process—that allows researchers to assess not just the "what" of policy but also the "how," "who," and "why." This is critical for waste banks, where:

1. Actors include a diverse coalition of local governments, NGOs, waste bank managers, and community members.
2. Context includes socioeconomic variables (e.g., income levels, education), urban density, political will, and environmental awareness.
3. Content involves the 3R-based regulatory frameworks and incentives.
4. Process captures the dynamic and participatory nature of program delivery, often negotiated over time.

Such a comprehensive structure makes the Policy Triangle especially apt for programs with strong grassroots and decentralized characteristics, like community waste management. Unlike Edwards III's model, which focuses primarily on four top-down variables-communication, resources, bureaucratic structure, and disposition-the Policy Triangle integrates externalities such as local culture, power relations, informal norms, and socioeconomic inequalities. These are essential for understanding why some waste banks thrive while others stagnate, despite having similar official support.

For example, even when funding and communication are adequate, a lack of community trust or engagement (context and actor-related issues) can derail program success—factors Edwards III doesn't explicitly account for. *"The Policy Triangle makes it possible to view policy not just as an administrative function but as a socio-political process-something especially important in grassroots environmental governance."* — [6]. In contrast to the Mazmanian and Sabatier [7] framework, which emphasizes technical clarity and institutional commitment, the Policy Triangle accounts for the evolving and

interactive nature of implementation processes. Waste banks are not static policies but adaptive programs that change based on:

1. Community participation levels
2. NGO involvement
3. Environmental crises (e.g., floods caused by waste blockage)

The process dimension in the Policy Triangle helps trace these adaptations and highlights informal negotiation, learning, and stakeholder dynamics that are usually invisible in more rigid frameworks. Community waste management programs require collaborative governance. The "actors" dimension of the triangle allows analysis of:

1. How leadership is distributed (e.g., by waste bank managers)
2. How power is exercised or shared
3. How accountability is negotiated between citizens and the government

This is particularly valuable in South Tangerang's waste banks, where localized leadership and peer influence often matter more than municipal directives. Neither Edwards III nor Mazmanian-Sabatier provides a structured method to study this actor plurality. The Policy Triangle was originally developed to examine health systems in low- and middle-income countries, making it particularly relevant for Indonesia's policy landscape, which is characterized by:

1. Limited infrastructure
2. Decentralized governance
3. Strong local cultural values
4. Informal institutions

Waste bank programs thrive or fail not merely because of formal policy provisions, but because of how local actors interpret and implement them—something the Policy Triangle explicitly investigates. From a methodological standpoint, the Policy Triangle is also:

1. Flexible for qualitative-descriptive approaches
2. Compatible with case study designs
3. Able to incorporate elements from other models (e.g., administrative efficiency from Edwards III or institutional strength from Sabatier)

2.3. Collaborative Governance and Community Participation: Complementary Theoretical Frameworks

Collaborative Governance (CG) refers to a process where public agencies directly engage non-state stakeholders (e.g., communities, NGOs, private sectors) in a collective decision-making process that is formal, consensus-oriented, and deliberative [8]. It is particularly suitable for addressing complex public issues that transcend the capacity of a single actor or institution—such as domestic waste management.

In the context of waste banks in South Tangerang, collaborative governance is not just an ideal model—it is a practical necessity. The success of these community-driven waste banks hinges on the coordinated actions of various actors:

1. Local governments that regulate and provide technical support.
2. NGOs that provide facilitation and environmental education.
3. Private companies (such as waste collection services or recycling firms).
4. Local community members who participate in the sorting and deposit of waste.

This theory supports the idea that interdependence and trust between actors are central. Waste banks succeed when communication is open and continuous; roles and expectations are negotiated, and mutual benefits (e.g., environmental cleanliness and income generation) are recognized by all parties. *"Collaborative governance provides a structure for multi-sector cooperation, which is central to decentralized waste bank systems in urban Indonesia."* – [9]. Additionally, CG highlights that shared goals, such as environmental sustainability and community health, are more likely to be achieved when actors actively co-create policy and practice, rather than passively receiving mandates from the top.

Community Participation Theory emphasizes the active engagement of citizens in the planning, execution, and evaluation of programs that affect their lives [10], [11]. Participation can vary across a lens, from mere tokenism to genuine empowerment. In the waste bank context, high levels of community participation are essential because:

1. Waste sorting and recycling behavior depend on individual household actions.
2. Local knowledge helps in determining the most feasible sorting categories and bank locations.

3. Community members act as environmental advocates, influencing others' behavior.

4. Participants generate social capital and trust networks that sustain operations.

Waste banks function not only as environmental instruments but also as participatory platforms, where residents are co-implementers of policy, not just beneficiaries. In South Tangerang, especially in Berkah Mulya, Suka Makmur 02, and Kartini 5, strong civic engagement is evident in the formation of management teams, operational transparency, and recycling education efforts. *"Programs designed for the community but not by the community often fail. Real impact is created when community members feel ownership of both the problem and the solution."* – [12].

The table below describes the significance of how collaborative governance and community participation complement each other.

Table 6: The synergy between governance and community.

Collaborative Governance	**Community Participation**	**Synergy**
Structured, top-level cooperation among stakeholders	Grassroots-level involvement and empowerment	Together, they ensure both **strategic alignment** and **local relevance**
Focus on policy coherence and institutional support	Emphasizes lived experience and everyday action	Co-creation of policy and practice
Government as facilitator and convener	Community as active agents and co-implementers	Builds a **trust-based, inclusive ecosystem**
Prioritizes accountability and performance metrics	Prioritizes motivation, social norms, and relationships	Enhances both **effectiveness and legitimacy**

2.4. Interplay with the Policy Triangle Framework

Together, the Policy Triangle, Collaborative Governance, and Community Participation theories form a triadic analytical lens that is particularly effective for assessing waste bank programs. Here's how they complement each other:

3. METHODOLOGY

This research is a qualitative descriptive approach-based case study, which is particularly effective in understanding complex social phenomena in their natural context. As

TABLE 7: Theoretical Frameworks Relevance.

Framework	Core Focus	Relevance to Waste Banks
Policy Triangle (Walt & Gilson)	Structure and process of policy implementation	Captures context, actors, content, and process involved in program execution
Collaborative Governance	Cross-sector coordination and consensus	Explains how stakeholders work together to manage waste
Community Participation	Empowerment and civic engagement	Highlights the grassroots, voluntary nature of waste bank efforts

explained by Sugiyono [13] qualitative research is an investigative method where the researcher serves as the key instrument for data collection and interpretation. The aim of this approach is not merely to describe events, but to understand the meanings, relationships, and dynamics of the Waste Bank program as implemented in South Tangerang, Indonesia.

3.1. Research Design

A qualitative design was selected to explore the realities of community-based waste bank management, especially to uncover:

a. The supporting and inhibiting factors influencing implementation,

b. The roles of key actors (e.g., community members, managers, and local authorities),

c. The processes and contextual influences surrounding policy execution.

The Walt and Gilson Policy Triangle, Collaborative Governance, and Community Participation frameworks provided the theoretical foundation to examine these dimensions in a grounded and systematic manner.

3.2. Data Sources and Collection Techniques

This study utilized a combination of primary and secondary data sources to ensure data richness and credibility.

a. Primary Data

Primary data was collected directly by the researcher through:

1) In-depth semi-structured interviews with stakeholders involved in three waste bank programs (managers, customers, government officers).

2) Field observations to record real-time processes and community engagement.

3) On-site documentation such as waste transaction records, bank operational forms, and internal reports.

As defined by Hasan [14], primary data involves firsthand collection through direct engagement, enabling the researcher to capture deep insights from participants' experiences.

b. Secondary Data

Secondary data consisted of previously compiled materials that support contextual understanding. These included:

1) Government policies and regulations (e.g., South Tangerang Regional Regulation No. 13/2019 [4]),

2) Data from the National Waste Management Information System (SIPSN),

3) Prior research articles and NGO reports on waste management practices in urban Indonesia.

According to Sugiyono [13], secondary data provides historical and institutional perspectives that complement primary findings.

3.3. Data Analysis Technique

The data analysis followed the interactive model by Miles, Huberman, and Salda na (2014), which emphasizes iterative and dynamic processes involving:

Table 8:

No.	Stage	Description
1.	Data Reduction	Selecting, focusing, and simplifying data to identify patterns and categories.
2.	Data Display	Organizing data in tables, charts, and narrative forms for interpretability.
3.	Conclusion Drawing & Verification	Synthesizing findings to derive meanings, then verifying them with cross-checking processes.

This model is appropriate for studies that involve complex, multi-actor environments—such as community-based waste initiatives—where variables continuously interact and evolve.

3.4. Validity and Trustworthiness

To ensure the credibility and rigor of this research, several strategies were implemented:

a. Triangulation: Multiple sources and techniques (interviews, observation, documents) were used to cross-verify findings [13].

b. Member Checking: The researcher conducted follow-up discussions with participants to validate interpretations of their statements and ensure accuracy [15].

c. Audit Trail: Clear documentation of the research process was maintained, enabling transparency and reproducibility.

3.5. Research Setting and Participants

The study was conducted in three waste banks in Ciputat, South Tangerang:

a. Berkah Mulya – established 2018, serving 22 customers,

b. Suka Makmur 02 – established 2021, serving 38 customers,

c. Kartini 5 – established 2022, with 104 active participants.

Participants were selected using purposive sampling to ensure representation from various stakeholder groups actively engaged in the program.

4. RESULT AND DISCUSSION

This section presents and analyzes the implementation of the Waste Bank Management Program in South Tangerang City, guided by three main theoretical lenses: the Policy Triangle Framework [6], Collaborative Governance [8], and Community Participation [10], [12]. Each framework highlights different yet interconnected dimensions of how policies are developed, executed, and sustained through multi-stakeholder engagement and community ownership.

4.1. Policy Triangle Practices and Analysis

a. Actors

The Waste Bank Management Program involves three principal actor groups: government agencies, waste bank managers, and community members. Each plays a critical role in shaping the program's functionality and sustainability.

Table 9: Key Actor Roles in Waste Bank Implementation.

No.	Actor	Role
1.	Environmental Agency (DLH)	Policy development, technical guidance, inter-sector coordination, public education, and provision of operational support (e.g., weighing tools, savings books).
2.	Waste Bank Managers	Daily operations, data reporting, environmental education and outreach, data collection, and community mobilization/acting as agents of social change
3.	Local Community Members	Waste deposit, program monitoring, social campaigns, co-evaluation of program activities

The synergy among these actors creates a decentralized yet cohesive framework for waste governance. DLH's leadership facilitates legitimacy, while managers ensure grassroots execution. The community becomes not just beneficiaries but co-implementers—a sign of maturing local environmental governance. Elaborating on the table above, here is the extended analysis.

1) The Role of the Environmental Agency (DLH) of South Tangerang City

   The Environmental Agency (DLH) of South Tangerang City plays a central role in the governance and strategic direction of the waste bank management program. As the primary policy-making body, the DLH is responsible for formulating comprehensive waste management policies, strategies, and implementation frameworks. In addition to drafting regulations and technical guidelines, the agency facilitates effective collaboration among stakeholders to ensure program cohesion and sustainability. DLH also undertakes extensive public outreach through socialization and education campaigns aimed at increasing community awareness and participation in environmentally responsible waste practices.

2) The Role of Waste Bank Managers (Berkah Mulya, Suka Makmur 02, and Kartini 5)

The managers of the Berkah Mulya, Suka Makmur 02, and Kartini 5 Waste Banks serve as essential operational actors at the community level. They oversee day-to-day operations, ensuring efficiency and consistency in the waste collection and recycling process. Beyond logistical responsibilities, these managers act as grassroots agents of change—actively promoting environmental awareness and encouraging behavioral shifts toward sustainability. Through regular educational initiatives and community engagement, they help foster a culture of environmental stewardship. Their diligent record-keeping and reporting provide critical data for assessing program performance and guiding future improvements.

3) The Role of the Community

Community involvement is a cornerstone of the waste bank program's success. Local residents contribute by sorting and depositing recyclable materials, directly supporting environmental cleanliness and waste reduction. In addition, community members participate in awareness campaigns and socialization efforts, amplifying the reach and impact of the program. Their feedback and informal evaluations offer practical insights that help refine program strategies. Most importantly, the community's active monitoring and ownership of the program strengthen its sustainability and ensure that it aligns with local needs and values.

b. Content

1) Policy Objectives

The primary objective of the Waste Bank Management Program in South Tangerang City is to foster a clean, healthy, and pollution-free living environment, aligning directly with Law No. 18/2008 on Waste Management. This law emphasizes the reduction of waste at its source, improved recycling rates, and the strengthening of community participation. By establishing waste banks as a vehicle for sustainable waste management, the program aims to:

a) Promote public awareness and behavioral change through community-based participation,

b) Encourage the circular economy by turning waste into a resource,

c) Reduce the operational burden on local waste management infrastructure,

d) Create economic incentives through waste reselling and upcycling initiatives.

Empirical evidence supports these objectives. For example, according to South Tangerang's DLH data, over 7,910 residents were active waste bank customers as of 2019, with 285 waste banks operating city-wide — demonstrating substantial grassroots engagement. The legal framework governing the initiative includes:

a) Law No. 18/2008 on Waste Management

b) Ministerial Regulations from the Ministry of Environment and Forestry

c) South Tangerang Regional Regulation No. 13/2019

d) The Regional Strategy for Household Waste Management (Jakstrada)

In policy design, setting measurable objectives is critical. A tangible target such as "reducing non-degradable waste by 30% over two years" would offer a concrete metric for success. However, such objectives must also acknowledge potential barriers, including:

a) Limited budget allocations for education and infrastructure,

b) Lack of consistent data reporting from waste banks (only ~50% report monthly),

c) Variability in community participation and program sustainability.

Thus, robust policy formulation must integrate not only regulatory alignment but also a realistic appraisal of socio-economic, behavioral, and logistical challenges. This would inform adaptive strategies, such as performance-based funding, incentive systems, or partnerships with the private sector.

2) Program Instruments

The effectiveness of the Waste Bank Management Program hinges on integrated instruments — including actors, infrastructure, education mechanisms, and technological tools — that operationalize its objectives. Key program actors and roles are previously explained, while infrastructure and supporting facilities include a robust physical and operational infrastructure:

a) Collection points and sorting equipment,

b) Transport vehicles and accessible collection routes,

c) Integrated Waste Processing Sites (TPSTs),

d) Digital systems for data management and performance monitoring.

Challenges identified include insufficient facility maintenance and inconsistent logistics coordination, particularly in areas with lower civic engagement or difficult access. Strategies conclude that education drives changing behavior and promotes sustainable practices. In South Tangerang, waste bank managers frequently conduct workshops, door-to-door outreach, and school-based campaigns. For example, the Lotus Waste Bank has reported behavioral improvements in waste and water use through targeted education campaigns.

Social learning theory supports this strategy, when people observe peer behavior being rewarded (e.g., financial returns from recycling), they are more likely to replicate it. This reinforces the importance of continuous community interaction and feedback mechanisms. To increase impact, program instruments must be:

a) Interconnected: Linked to broader city waste management strategies (e.g., TPS3R, composting units).

b) Flexible: Responsive to demographic and socio-cultural dynamics.

c) Sustainable: Backed by funding continuity, institutional support, and community ownership.

c. Context

1) Political Factors.

Political support serves as the cornerstone of effective waste bank management in South Tangerang City. The commitment of local government leaders has materialized in the form of policy instruments such as Regional Regulation No. 13/2019 on Waste Management, along with budgetary allocations dedicated to the operationalization of waste banks. Political will has also been expressed through consistent public outreach campaigns, community education, and inter-agency coordination. Institutional Measures Undertaken are:

a) Inter-departmental Collaboration: The program is embedded within various sectors — including the environmental, education, and community development departments — enabling an integrated and systemic approach to waste management.

b) Public-Private Partnerships (PPPs): Strategic alliances with the private sector and NGOs have introduced innovative technologies and additional funding streams, expanding the program's reach and sustainability.

c) Accountability Mechanisms: Implementation of Key Performance Indicators (KPIs) and mandatory reporting for waste banks has enhanced transparency and encouraged results-oriented management.

d) Capacity Building: The city has invested in training programs for waste bank staff and municipal officials to strengthen administrative capacity and technical know-how.

Despite these advancements, continuity of political support remains a vulnerability, especially during leadership transitions. To ensure program resilience, the following strategies are crucial:

a) Institutionalization: Formalize the waste bank system into city-level frameworks and urban development plans, reducing dependency on individual leadership.

b) Long-Term Policy Frameworks: Adopt multi-year strategies that align with national waste reduction goals and transcend electoral cycles.

c) Coalition Building: Engage civil society, religious leaders, environmental activists, and business actors to broaden program ownership and political advocacy.

d) Demonstrating Impact: Continuously showcase economic, environmental, and social benefits (e.g., job creation, pollution reduction) to justify ongoing political investment.

Strong political leadership has also allowed the waste bank initiative to be positioned within broader regional development strategies — including urban planning, circular economy adoption, and green infrastructure development. These linkages reinforce the waste bank program's relevance beyond environmental sectors, increasing its strategic importance.

2) Economic Factors

The economic viability of the Waste Bank Management Program is essential to its long-term sustainability. Waste banks serve a dual function — as environmental solutions and community-based economic platforms — creating incentives for households and local entrepreneurs to participate in waste sorting and recycling. Core economic contributions are:

a) Income Generation: Communities benefit from selling sorted waste (plastic, paper, etc.), with some waste banks reporting monthly revenues of IDR 1–3 million per unit.

b) Job Creation: From waste collection to sorting and administration, waste banks create formal and informal employment opportunities.

c) Cost Reduction: Local governments reduce the volume of waste reaching landfills, lowering transportation and disposal costs.

Challenges and interventions are:

a) Economic Disparities: Low-income groups may prioritize immediate needs over environmental concerns, limiting participation.

b) Incentive Gaps: Inadequate or delayed financial returns from waste sales can demotivate participants and managers.

c) Funding Limitations: Not all waste banks receive consistent operational funding, relying heavily on local initiatives or donor support.

There are ways to address these issues, including:

a) Subsidies and Micro-financing: Offer initial grants, revolving funds, or microloans for equipment and startup costs.

b) Revenue Diversification: Encourage the creation of value-added products (e.g., crafts, compost) to generate higher income streams.

c) Private Investment: Foster partnerships with businesses to create supply chain linkages and absorb sorted waste as raw material.

d) Local Economic Integration: Embed waste banks into local economic planning (e.g., village-owned enterprises or cooperatives).

By turning waste into a valuable commodity, the program contributes to economic empowerment while reinforcing environmental sustainability.

3) Socio-Cultural Factors

The socio-cultural landscape of South Tangerang City plays a defining role in shaping community response to waste bank programs. Culture, social norms, education, and local leadership deeply influence the success or failure of waste initiatives. Indonesia's traditional values, such as gotong royong (mutual cooperation) and community solidarity, provide a fertile ground for mobilizing collective action. By aligning program messages with cultural norms:

a) Community-led Models: Empower respected local figures to lead waste management activities.

b) Cultural Integration: Incorporate waste bank themes into festivals, religious events, and traditional gatherings to normalize sustainable practices.

c) Intergenerational Learning: Involve elders as educators and role models, facilitating knowledge transfer to younger generations.

Higher education levels correlate strongly with program engagement. To bridge gaps:

a) Inclusive Education Campaigns: Use multimedia, local dialects, and visual materials to reach diverse education levels.

b) Hands-on Training: Employ practical, real-world demonstrations to improve understanding and retention.

c) Peer Educators: Train literate participants to act as community educators and program ambassadors.

d) School Partnerships: Collaborate with educational institutions to embed waste literacy into curricula.

Social cohesion varies widely between urban and peri-urban communities. In close-knit communities, social capital can be leveraged, while in more fragmented neighborhoods, program design must focus on trust-building and sustained engagement.

a) Mapping Social Assets: Identify key influencers, active groups, and community hubs for targeted mobilization.

b) Tailored Outreach: Adapt communication and engagement methods to suit neighborhood characteristics.

c) Online Communities: Use social media and mobile apps to create virtual engagement channels, especially in less connected communities.

Cultural Barriers and Opportunities:

Modern consumerism and disposable culture challenge traditional frugality and resourcefulness. Yet, local wisdom offers sustainable models:

a) Composting Traditions: Promote organic waste processing as a modern application of longstanding practices.

b) Craft-based Recycling: Support upcycling crafts rooted in traditional skills as both cultural expression and income generation.

c) Eco-values: Reinforce cultural narratives that emphasize respect for nature and communal responsibility.

Institutional Strategies:

To align socio-cultural factors with program goals, the South Tangerang DLH should:

a) Partner with NGOs and community leaders to co-design educational materials and engagement strategies.

b) Use cultural activities (e.g., art exhibitions, storytelling) as platforms for environmental education.

c) Embed environmental literacy into community development frameworks.

By deeply integrating political, economic, and socio-cultural dimensions, the Waste Bank Management Program in South Tangerang City can evolve into a resilient, inclusive, and adaptive model of sustainable urban waste governance. Holistic implementation that respects community identity while embracing innovation is essential to drive long-term behavioral change, environmental improvement, and economic empowerment.

d. Process

1) Formal Process

The formal process in the implementation of the Waste Bank Management Program by the Environmental Agency of South Tangerang City is fundamental to ensuring that the initiative is executed in a structured, efficient, and accountable manner. It involves a set of clearly defined, institutionalized procedures and administrative mechanisms that guide the design, execution, and evaluation of the program. Key Components of the Formal Process:

a) Policy Formulation

The program is underpinned by regulatory instruments, including Regional Regulation No. 13/2019 on Waste Management, which establishes the legal basis for waste banks. This policy foundation ensures that all stakeholders operate within a clearly defined framework.

b) Strategic Planning

The Environmental Agency is responsible for developing medium- to long-term strategies to guide the operation, expansion, and integration of waste banks into broader urban waste management systems. These strategies often include targets for waste reduction, community engagement, and environmental outcomes.

c) Budgeting and Resource Allocation

Effective waste bank operations depend on proper financial planning. Budgeting ensures the availability of funds for infrastructure, personnel, community education, and incentive schemes. Allocation must be transparent, efficient, and aligned with strategic priorities.

d) Monitoring and Evaluation (M&E)

A comprehensive monitoring system is critical for tracking the program's performance, identifying operational challenges, and making evidence-based improvements. M&E processes include regular audits, performance reports, site inspections, and feedback mechanisms to measure both quantitative (e.g., volume of waste collected) and qualitative (e.g., community satisfaction) outcomes.

e) Formal Communication and Coordination

Structured communication channels among stakeholders — including inter-agency coordination, official memos, public reports, and stakeholder meetings — help ensure information consistency and reinforce accountability. Public transparency is key to building trust and maintaining political and community support.

Formal structures provide legitimacy, consistency, and clear operational direction. When well-executed, these processes minimize ambiguity, improve institutional efficiency, and enhance overall program sustainability.

2) Informal Process

While formal procedures form the backbone of program implementation, informal processes are equally critical, offering the flexibility and responsiveness needed to adapt to real-time challenges and grassroots realities. Characteristics of Informal Processes:

a) Informal Communication and Interaction

Day-to-day implementation often involves unofficial interactions — such as community discussions, WhatsApp groups, or casual meetings between stakeholders — that enable faster information exchange and more organic decision-making.

These informal lines of communication often help resolve minor issues quickly and encourage collaborative problem-solving.

b) Community Engagement and Adaptive Learning

Informal processes are particularly effective in mobilizing community members. Local champions, neighborhood leaders, and waste bank coordinators often rely on social ties and community norms (such as gotong royong) to motivate participation and reinforce environmentally responsible behavior.

c) Innovation and Experimentation

Outside the confines of formal regulations, actors have more freedom to experiment with new practices, such as creating community composting initiatives, digital apps for waste tracking, or creative reuse of recyclables for art or business. These grassroots innovations often emerge organically and are later integrated into formal processes if proven successful.

d) Technological Adaptation

Informal processes also encompass the spontaneous adoption of new technologies — such as mobile-based coordination tools, real-time monitoring via apps, and digital education content — that enhance the efficiency and engagement of the program without necessarily being mandated by regulation.

e) Informal Partnerships and Networking

The Environmental Agency often collaborates with community-based organizations (CBOs), local businesses, and NGOs through informal networks. These relationships are instrumental in expanding the program's reach, facilitating donations, and sharing best practices.

Informal mechanisms provide the flexibility, creativity, and human connection needed to make formal structures work on the ground. They allow for contextual adaptation, which is particularly important in diverse urban settings where rigid policies may not address all local dynamics. In short, the effectiveness of the Waste Bank Management Program in South Tangerang City depends not only on a well-structured formal framework but also on the innovation afforded by informal processes. Here's a clear comparison table that highlights the key differences and complementarities between the formal and informal processes in the Waste Bank Management Program of South Tangerang City.

Table 10: Comparison of Formal and Informal Processes in Waste Bank Management.

Aspect	Formal Process	Informal Process
Nature	Structured, rule-based, and institutionalized	Flexible, adaptive, and organic
Key Activities	Policy formulation, budgeting, strategic planning, monitoring, formal reporting	Informal meetings, community discussions, peer learning, grassroots initiatives
Stakeholders	Government officials, formal institutions, regulatory bodies	Community members, local leaders, NGOs, informal networks
Communication	Official channels (memos, reports, stakeholder forums)	Unofficial interactions (chat groups, neighborhood meetings, personal networks)
Decision-Making	Top-down, based on established rules and procedures	Bottom-up, based on real-time context and relationships
Innovation Capacity	Limited to approved projects and government plans	High flexibility to test new ideas and approaches quickly
Technology Use	Institutional systems (e.g., databases, public dashboards)	Spontaneous adoption of tools (e.g., mobile apps, social media for coordination)
Community Engagement	Through formal campaigns, education programs, and public services	Through personal outreach, cultural events, and social ties
Monitoring & Evaluation	Based on official KPIs, inspections, and periodic reports	Real-time feedback, informal problem-solving, community observations
Strengths	Ensures accountability, stability, and long-term planning	Enables responsiveness, creativity, and strong local ownership
Challenges	Can be rigid, slow to adapt, bureaucratic	Can lack structure, documentation, and consistency
Ideal Role	Providing structure, resources, policy coherence	Supporting innovation, trust-building, and community empowerment

4.2. Collaborative Governance and Community Participation: Complementary Theoretical Frameworks

Collaborative governance refers to the structured interaction between government agencies, private entities, non-governmental organizations, and civil society to solve public issues that cannot be effectively addressed by any single actor alone. Ansell and Gash (2008) define it as a governing arrangement where public agencies directly engage non-state stakeholders in a collective decision-making process. In the context of the Waste Bank Management Program, collaborative governance is evident through:

a. Multi-stakeholder partnerships: The involvement of the Environmental Agency (DLH), waste bank managers, private companies, NGOs, and educational institutions.

b. Joint problem-solving: Policies and initiatives are co-designed with input from both institutional and grassroots actors.

c. Shared responsibilities: Waste sorting, education, monitoring, and awareness-raising are collectively undertaken.

d. Consensus-oriented decision-making: Dialogues and participatory forums help align goals across sectors.

Community participation emphasizes the direct involvement of citizens in planning, decision-making, and implementation of programs that affect their lives. It is a bottom-up approach that values local knowledge, cultural context, and agency. By integrating collaborative governance and community participation, the Waste Bank Management Program can:

a. Achieve more holistic and adaptive waste policies

b. Promote a culture of environmental responsibility

c. Foster innovation through both institutional support and local wisdom

d. Ensure program continuity despite political or leadership changes

e. Serve as a model of multi-level cooperation for sustainable urban management

5. CONCLUSION

The Waste Bank Management Program in South Tangerang City exemplifies a community-based approach to sustainable urban waste management. Analyzing the program through the Policy Triangle Framework—which examines context, content, process, and actors—reveals both its systemic strengths and areas for improvement. The contextual environment is relatively favorable, supported by progressive local regulations, cultural values like gotong royong, and increasing environmental awareness. However, the program's reliance on consistent political will poses a vulnerability, especially during transitions in local leadership. In terms of content, the policy aligns well with national objectives and promotes environmental sustainability and circular

Table 11: Comparative Summary Table: Waste Banks vs. Theoretical Frameworks.

Aspect	Waste Bank A (DLH South Tangerang)	Waste Bank B (Rumah Harum)	Waste Bank C (Bank Sampah Melati Bersih)
Type	Government-led	Community-based	Hybrid (Government + NGO)
Key Stakeholders	Environmental Agency (DLH), community units	Local residents, youth volunteers, community leaders	NGO, local gov, religious groups
Collaborative Governance	Strong inter-departmental coordination, formal procedures	Limited formal collaboration, more grassroots initiative	Formal partnership agreements, regular inter-institutional dialogue
Community Participation	Moderate: DLH-led socialization and campaigns	High: Local ownership, peer education, volunteer-driven	High: Participatory planning, religious and cultural outreach
Circular Economy Elements	Basic: Waste sorting and resale, limited upcycling	Intermediate: Composting, crafts, organic waste transformation	Advanced: Product reuse, compost markets, eco-enterprises
Technology Integration	Limited (paper-based tracking, basic logistics)	Social media for outreach, manual logs	Mobile apps, digital scales, WhatsApp monitoring groups
Challenges	Bureaucratic delay, inconsistent funding	Lack of infrastructure, volunteer burnout	Scalability, coordination complexity
Success Factors	Policy support, clear KPIs	Strong community motivation and leadership	Cross-sector collaboration, adaptable structure
Theoretical Fit -- Collaborative Governance	Strong institutional coordination	Informal collaboration, lacks formal structure	Effective cross-sector partnerships
Theoretical Fit -- Community Participation	Moderate participation, top-down approach	Deep-rooted community engagement	Culturally embedded and participatory
Theoretical Fit -- Circular Economy	Basic practices, room for improvement	Local upcycling and composting	Advanced resource circulation and eco-product innovation

economy principles, yet remains rigid in adapting to technological advancements and local socio-economic variations. The process of implementation reflects a dynamic interplay between formal systems—such as budgeting, regulation, and supervision—and informal practices like grassroots engagement, community innovation, and peer learning. This dual structure is effective but needs to be institutionalized through regular coordination, transparency, and adaptive feedback mechanisms.

The actor dimension shows that while multiple stakeholders—government agencies, waste bank managers, NGOs, and citizens—are involved, their roles and interactions often lack cohesion. Here, Collaborative Governance becomes crucial, offering a framework to promote structured partnerships, shared authority, and co-created solutions. At the same time, Community Participation ensures that the program is socially embedded and culturally accepted, making it more sustainable and resilient. When applied together, these frameworks reinforce the Policy Triangle by grounding strategic waste management not just in regulatory design but in lived community experience and stakeholder cooperation. Ultimately, the success and scalability of the Waste Bank Management Program depend on a governance model that is inclusive, adaptive, and deeply rooted in community values. South Tangerang's experience can thus serve as a blueprint for other regions, demonstrating how integrated policy design, collaborative structures, and active civic engagement can together address urban environmental challenges in a sustainable and participatory manner.

Responding to the conclusion, these are recommendations:

1. Policy Content Refinement
    a. Develop a modular policy framework that allows for local adaptations while maintaining alignment with national goals.
    b. Integrate circular economy principles explicitly into waste bank guidelines, including financial incentives and product lifecycle strategies.
2. Strengthen Policy Process
    a. Establish a participatory monitoring and evaluation (M&E) system, involving community members in setting and reviewing performance targets.
    b. Use digital dashboards for real-time feedback loops, enabling adaptive management at the program and city level.
3. Deepen Actor Collaboration (Collaborative Governance)
    a. Formalize multi-actor steering committees, including representatives from DLH, education sectors, NGOs, private enterprises, and community leaders.
    b. Institutionalize collaborative planning forums where stakeholders can align on goals, share innovations, and resolve issues transparently.
4. Empower Communities (Community Participation)

5. Introduce micro-grants for community-led waste innovations, allowing for experimentation with localized approaches.
6. Leverage social capital through neighborhood-based peer educators, waste champions, and youth green clubs.
7. Incorporate waste education into school curricula and community-based trainings, especially for underrepresented groups.

6. Reinforce Contextual and Political Sustainability

1. Advocate for a cross-administration waste policy charter, endorsed by political leaders to insulate the program from electoral shifts.
2. Build regional waste management coalitions across neighboring municipalities to share resources and strengthen systemic capacity.

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